# Health anxiety and attentional bias towards external stimuli

Thesis submitted for the degree of

Doctorate in Clinical Psychology

at the University of Leicester

by

Debbie Hanson (BSc) Sheffield

Department of Clinical Psychology

University of Leicester

April 2010

## Statement of originality

I confirm that this is an original piece of work. The literature review and research report contained within this thesis have not been submitted for any other degree or to any other institution.

## Target Journals:

**Literature Review:** British Journal of Clinical Psychology

**Research Report:** British Journal of Clinical Psychology

**Health anxiety and attentional bias towards external stimuli**

**Author: Debbie Hanson**

## Abstract

***Objectives*** - Hypochondriasis and health anxiety have much in common. Both are classified as somatoform disorders within the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR), however anxiety is often the predominant clinical feature. The chronic nature of the conditions can seriously interfere with an individual's quality of life and current approaches to treatment are often ineffective. Attentional bias towards bodily symptoms is a defining feature of hypochondriasis and health anxiety and thus may contribute to the persistence of the conditions. Evidence for attentional bias towards external health/illness-related stimuli however is contradictory. The current study used the change blindness paradigm to examine the association between attentional bias towards external health/illness-related stimuli and health anxiety, in a non-clinical population. The clinical utility of the change blindness paradigm as a research tool for clinical psychologists was also evaluated.
***Design*** - The change blindness experimental paradigm was used to examine the association between attentional bias towards health/illness-related stimuli and level of health anxiety. ***Method*** - 80 participants were recruited who were all members of a private health club in the Midlands. Levels of health anxiety were measured using the Short Health Anxiety Inventory. The change blindness paradigm was implemented within the private health club and participants' reaction times in detecting changes to external health/illness-related and neutral items were recorded. ***Results*** - No association was found between attentional bias towards health/illness-related stimuli and level of health anxiety. The data also revealed the potential presence of confounding variables. ***Conclusion*** - No evidence was found for attentional bias towards external health/illness-related stimuli as level of health anxiety increases. Further modifications to the change blindness paradigm are required to improve its clinical utility.

**Acknowledgements**

I would like to express my gratitude to Mary O' Reilly and Andrew Young for their patience, support and advice throughout the research process. I would also like to say a big thank you to Phil Scott, health club manager and all club members who participated in my research.

Many thanks to all my friends and neighbours for their words of encouragement, hugs and squeezes when the going got tough. I know I couldn't have managed without you all.

Heartfelt thanks also to my husband, children and parents. No more locking myself away in the loft for days on end. Thank you all for your tolerance, patience, and affection. May the fun and laughter finally begin again!

## Word Count

**Literature Review:** 5666 (References 643)

**Research Report:** 12, 100 (References 976)

**Critical Appraisal:** 2, 413

**Total:** 20, 179 (excluding tables, references and appendices)

**Total:** 27, 072 (including tables, references and appendices)

## Contents

**Thesis Abstract**

**Part One – Literature Review**

Section

1 **Abstract** **1**

2 **Introduction**
- 2.1 Background **2**
- 2.2 Development and Maintenance of Hypochondriasis and Health Anxiety **2**
- 2.3 Implications for treatment **3**
- 2.4 Cognitive experimental paradigms and attentional bias **5**
- 2.5 Aims of the current review **6**

3 **Method** **7**
- 3.1 Search strategy and terms **7**
- 3.2 Synthesis of data **8**

4 **Results** **10**
- 4.1 Overview **10**
- 4.2 Single independent variable studies **11**
- 4.3 Multiple independent variable studies **14**
- 4.4 Review articles **17**

5 **Discussion** **19**
- 5.1 Operational definitions and psychometric tools **19**
- 5.2 Samples **20**
- 5.3 Experimental paradigms **20**
- 5.4 Single versus multiple studies **21**
- 5.5 Clinical implications **22**
- 5.6 Limitations of current review **23**

6 **Conclusion** **24**

7 **References** **25**

8 **Appendices** **30**

**Part Two – Research Report**

Section

1 **Introduction** **37**
- 1.1 Background **37**
- 1.2 Definition of hypochondriasis and health anxiety **37**
- 1.3 Definition of attention **38**
- 1.4 Theoretical framework underpinning hypochondriasis and health anxiety **39**

| | | | |
|---|---|---|---|
| | 1.5 | Theoretical framework underpinning attentional allocation during visual perception | **42** |
| | 1.6 | An integrated framework for hypochondriasis and health anxiety | **43** |
| | 1.7 | Potential benefits of experimental research | **46** |
| | 1.8 | Clinical research using the change blindness paradigm | **48** |
| | 1.9 | National context for the research | **49** |
| | 1.10 | Rationale for the current study | **50** |
| | 1.11 | Potential clinical benefits | **51** |
| | 1.12 | Research aims and objectives | **52** |
| 2 | **Method** | | **54** |
| | 2.1 | Design | **54** |
| | 2.2 | Participants | **54** |
| | 2.3 | Apparatus and stimuli | **56** |
| | 2.4 | Psychometric scale | **61** |
| | 2.5 | Procedure | **62** |
| | 2.6 | Analytic strategy | **64** |
| 3 | **Results** | | **67** |
| | 3.1 | Gender, age and Short Health Anxiety Inventory Scores | **67** |
| | 3.2 | Inferential analyses – research strand one | **69** |
| | 3.3 | Inferential analyses – research strand two | **78** |
| 4 | **Discussion** | | **80** |
| | 4.1 | Summary of research findings | **80** |
| | 4.2 | Interpretation of findings | **80** |
| | 4.3 | Clinical utility of change blindness paradigm | **87** |
| | 4.4 | Strengths and limitations of current study | **89** |
| **5** | **Conclusion** | | **93** |
| **6** | **References** | | **95** |
| **7** | **Appendices** | | **101** |

**Part Three – Critical Appraisal**

Section

| | | | |
|---|---|---|---|
| 1 | **Critical Appraisal** | | **124** |
| | 1.1 | Choice of research topic | **125** |
| | 1.2 | Research setting and sample | **126** |
| | 1.3 | Research design | **127** |
| | 1.4 | Analysis and write-up | **128** |
| | 1.5 | Supervision | **129** |
| | 1.6 | Contextual issues | **130** |
| | 1.7 | Development of research knowledge and practice | **132** |
| | 1.8 | Conclusion | **133** |
| 2 | **References** | | **134** |

## List of Tables

**Research Report** **Page**

Table


1 Mean ratings indicating health-relatedness of target stimuli **57**

2 Mean Short Health Anxiety Inventory Scores **67**

3 Mean age of sample **68**

4 Mean reaction times for health/illness-related and neutral changes **70**

5 Mean number of health/illness-related and neutral changes detected **73**

6 Mean number of health/illness-related changes for health anxious and non-health anxious individuals **76**

7 Mean percentage of health/illness-related changes for health anxious and non-health anxious individuals **77**

## List of Figures

**Research Report** **Page**

Figure


1 Cognitive behavioural conceptualisation of health anxiety **41**

2 Schematic diagram of coherence theory **43**

3 Integrated framework of hypochondriasis and health anxiety **45**

4 Photographic stimuli **58**

5 Scatterplot of age and Short Health Anxiety Inventory Scores **69**

6 Scatterplot of Short Health Anxiety Inventory Scores and reaction times in detecting health/illness-related changes **71**

7 Scatterplot of Short Health Anxiety Inventory Scores and reaction times in detecting neutral changes **72**

8 Scatterplot of Short Health Anxiety Inventory Scores and number of health/illness-related changes **74**

9 Scatterplot of Short Health Anxiety Inventory Scores and number of neutral changes **75**

## List of Appendices


**Literature Review** **Page**

Appendix

A Standard questions for appraising research articles **30**

B Appraisal Questions for review papers **31**

C Data extraction tool **32**

D Summary grids of papers reviewed **33**

**Research Report**

Appendix

A Health related ratings of target items in photographic stimuli **101**

B Short Health Anxiety Inventory **102**

C Participant information leaflet **105**

D Consent form **107**

E Confirmation of approval from Ethics Committee **108**

F Raw experimental data **109**

G SPSS output data **111**

H Change blindness paradigm instructions **123**

# Part One

## Literature Review

**Does experimental research reveal a relationship between health anxiety and attentional bias towards external health/illness-related stimuli?**

**Author:** Debbie Hanson

**Target Journal:** British Journal of Clinical Psychology

## Section 1: Abstract

*Purpose*

A systematic review of the literature was undertaken to identify and evaluate the findings of quantitative research using cognitive experimental methodologies, to explore attentional bias towards external health/illness-related stimuli in health anxious individuals.

*Method*

Three electronic databases were searched for articles, published between 1999 and 2009, using key search terms. Inclusion and exclusion criteria were applied to facilitate selection of the most relevant articles. Reference lists of the selected articles were hand searched for additional relevant articles. A total of ten articles were selected for inclusion in the review. Quantitative checklists were used to provide a framework for appraising the methodological rigour and quality of the studies.

*Results*

Evaluation of the findings across studies included in the review revealed inconsistent evidence for an attentional bias towards health/illness-related stimuli in health anxious individuals. Comparison of studies was complicated by the variety of methodologies and psychometric tools implemented across the studies. A consistent methodological limitation was the extent to which ecological validity was compromised in each of the studies. Valuable information was derived however, including suggestions for future research.

*Conclusion*

To date, there is no conclusive evidence for the existence of an attentional bias towards health/illness-related stimuli in health anxious individuals. The nature of experimental stimuli used and the extent to which health-related cognitions are active within individuals, appear to be influential factors in detecting attentional bias. The role of attentional bias towards health/illness-related stimuli in contributing to the development and maintenance of health anxiety is largely unknown. Further research is therefore imperative in order to facilitate a better understanding of health anxiety and to inform evidence-based psychological treatment of the condition.

## Section 2: Introduction

### *2.1 Background*

Health anxiety has been conceptualised as a mild form of hypochondriasis, within a non-clinical population (Williams, 2004). Health anxious individuals are often therefore described as having hypochondriacal tendencies or even as the 'worried well' (Williams, 2004). Hypochondriasis is categorised as a somatoform disorder, within the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (APA, 2000). The central feature of hypochondriasis is a preoccupation with a fear of or belief in having a serious illness, which causes significant distress and interferes with an individual's functional activity. Despite the differential conceptualisations, the terms hypochondriasis and health anxiety are very frequently used interchangeably within the literature (Warwick and Salkovskis, 1990, Williams, 2004).

According to the DSM-IV, hypochondriasis is prevalent within approximately one to five percent of the general population in the United States, however health anxiety is much more common (APA, 1994). The prevalence of the disorders in men and women is approximately equal and though frequently seen in adults, the disorders can actually appear at any age. There are high costs associated with both hypochondriasis and health anxiety, both to the individual and to society, in terms of absence from work, personal distress, unnecessary medical investigations and demands placed on health services.

### *2.2 Development and Maintenance of Hypochondriasis and Health Anxiety*

Cognitive behavioural formulations of hypochondriasis and health anxiety share the same developmental and maintaining factors and though hypochondriasis is categorised as a somatoform disorder within the DSM-IV (APA, 2000), these factors are strikingly similar to those associated with several types of anxiety disorders. Both

conditions are derived from the self-assessment of health, which involves, at some level, a perceived threat to one's physical integrity, even in the absence of physiological evidence (Williams, 2004). Perceived threat rests on general health assumptions, which in turn are informed by the media and personal experiences of illness. Overly broad assumptions of ill health generate health anxiety, which is thought to contribute to distorted cognitive processing (Abramowitz, Schwartz and Whiteside, 2002). It is thought, for example, that such assumptions increase the probability of individuals consciously and non-consciously attending to internal and external information consistent with their illness belief. This may then lead the person to engage in a variety of help-seeking behaviours in an attempt to reduce their associated anxiety. Reassurance from health professionals often helps to reduce health anxiety in the short term, however long term, the perceived threat of serious illness usually returns, cognitive distortions become more pronounced and help seeking behaviour thus becomes habitual (Abramowitz et al., 2002) .

*2.3 Implications for Treatment*

Abramowitz et al., (2002) emphasise the importance in understanding the persistence of hypochondriasis and health anxiety, including the consideration of biological, psychological and social factors, which may operate at a conscious or non-conscious level. Psychodynamic therapeutic approaches have been implemented in an attempt to address unconscious motivational factors contributing to hypochondriasis and health anxiety, however the efficacy of this approach is difficult to evaluate (Abramowitz et al., 2002).

In view of the cognitive and behavioural factors associated with the development and maintenance of hypochondriasis and health anxiety, cognitive behaviour therapy (CBT) for anxiety is now a recommended treatment National

Institute for Health and Clinical Excellence (NICE, 2007). Treatment includes identifying and modifying the unhelpful assumptions, thoughts and behaviours underpinning health anxiety and as such, is therefore amenable to scientific investigation (Warwick & Salkovskis, 1990). Abramowitz et al., (2002) point out however, that many individuals with hypochondriasis are convinced that there is a physical explanation for their difficulties and are therefore reluctant to consider psychological treatment. Furthermore, given the very small percentage of individuals accessing psychological services for treatment, the majority of individuals experiencing health anxiety are more likely to be limited to primary care treatment only. Consultations with GPs therefore provide ideal opportunities to introduce a biopsychosocial formulation of health anxiety to the patient, yet some GPs feel that simple normalising explanations are insufficient and can often cause patients to seek out disconfirming evidence (Salmon, Humphris, Ring, Davies & Dowrick, 2007). Insufficient explanations reflecting inadequacies in understanding hypochondriasis and health anxiety, result in diagnostic uncertainty, ineffective treatment and persistent reassurance seeking, all of which are a source of frustration for both patients and GPs (Khan, Khan, Harezlak, Wanzhu & Kroenke, 2003). Fink and Rosendal (2008) emphasise the value of ongoing research to facilitate improved understanding and treatment of somatoform disorders presenting in primary care, especially in terms of their persistence. To date, a range of methods and approaches have been implemented within psychological research to explore cognitive processes which may contribute to the pervasiveness of hypochondriasis and health anxiety (Brown, Kosslyn, Delamater, Fama & Barksy, 1999; Van den Heuval et al., 2005; Witthoft, Rist & Bailer, 2008; Owens, Asmundson, Hadjistavropoulos & Owens, 2004; Lecci, & Cohen, 2002; Lecci

& Cohen, 2007; Karademas, Christopoulou, Dimostheni & Pavlu, 2008; Lees, Mogg & Bradley, 2005).

*2.4 Cognitive Experimental Paradigms and Attentional Bias*

One particular aspect of cognition, brought under experimental control to explore the extent to which it might contribute to the development and maintenance of anxiety disorders, is attentional bias (Williams, Watts, Macleod & Mathews, 1999). In terms of hypochondriasis and health anxiety, the modified Stroop task has been implemented to explore attentional bias (Karademas et al., 2008; Lecci & Cohen, 2002; Lecci & Cohen, 2007; Owens et al., 2004; Van den Heuval et al., 2005; Witthoft et al., 2008). The task involves the visual presentation of health/illness-related and neutral words printed in different colours and the task is to name the colour of the word as quickly as possible. The expectation is that health/illness-related words will be more salient to health anxious individuals and will therefore disproportionately capture attention. Such biased attention will then impair performance, as evidenced by increased reaction times when naming the colour of the health/illness-related words, compared with less salient neutral words.

The visual dot probe task has also been applied to the study of attentional bias in health anxiety (Lees et al., 2005). This task involves visually presenting simultaneous pairs of words on a screen for a brief interval. The words are located one above the other and one word is health/illness-related whilst the other is neutral. The task is to read out aloud the top word, however on some trials, a dot probe replaces either of the two words and when this happens, the individual has to respond by pressing a response button as soon as they become aware of the dot. The expectation with this paradigm is that reaction times for health anxious individuals will be shorter when the dot replaces

the health/illness-related word, irrespective of the location of that word, as these words will be more salient and therefore will disproportionately capture attention.

Finally the degraded word task has been utilised in the exploration of attentional bias in health anxiety (Brown et al., 1999). This paradigm involves presenting individuals with a set of health/illness-related and neutral words, in a degraded format and the task is to identify the word as quickly as possible. The expectation is that health anxious individuals will be faster to identify health/illness-related words, due to an attentional bias towards health/illness-related stimuli.

Given the importance of providing hypochondriacal or health anxious individuals with comprehensive biopsychosocial formulations (Warwick & Salkovskis, 1990; Abramowitz et al., 2002), research using cognitive experimental paradigms has the potential to add clarity to existing formulations.

*2.5 Aims of Current Review*

The aims of the current review are to search the existing literature to identify articles describing cognitive experimental research, examining an attentional bias towards external health/illness-related stimuli, in health anxious individuals. The findings from research studies will then be appraised and compared. Finally, the review will conclude with a synthesis of the evidence gathered so far and propose recommendations for future research.

## Section 3: Method

### *3.1 Search Strategy and Terms*

For the purpose of the current review, three electronic databases were accessed in the search for relevant articles. Databases searched were Medline, PsychInfo and Scopus. These three databases were specifically chosen as they are the main sources of reference for clinical psychologists undertaking research projects.

The key search terms included: 'health anxiety', 'hypochondria*', 'attention*' 'percept*' and 'information process*', using truncation to facilitate the retrieval of articles containing slight variations in terminology (e.g. hypochondriacal, hypochondriasis etc).

Initially the search was limited to articles published between 1999 and 2009, however due to the small number of articles retrieved, the search was expanded in order to capture further relevant articles. The final search was limited to articles published in the English language between 1990 and 2009.

The titles and abstracts of all articles produced by the searches were scanned and those articles specifically focusing on health anxiety or hypochondriasis, containing any information about attentional processes, were selected for further analysis.

In order to maximise the quality of the current literature review, the following inclusion and exclusion criteria were subsequently applied:

### *3.2 Inclusion Criteria:*

- Empirical studies using experimental methodologies
- Studies using external/environmental stimuli to assess attentional bias
- Review articles containing information about empirical studies of attentional bias towards external stimuli in hypochondriasis or health anxiety

*Exclusion Criteria:*

- Empirical studies using internal/bodily symptoms to assess attentional bias in health anxiety or hypochondriasis
- Discussion/essay articles
- Books/chapters/dissertation abstracts

The inclusion/exclusion criteria were specifically chosen to enable the researcher to capture and review the most relevant, published empirical studies, focusing purely on attentional bias towards external stimuli. Articles not yet published or those focusing on attentional bias towards internal bodily sensations and more general sources of information within books and chapters were therefore excluded.

After hand searching the reference lists of the selected articles produced by the electronic search for further potentially relevant articles, a total of ten articles met the inclusion criteria. Of these, two were review articles and the other eight were empirical studies using experimental methodologies. The quality of these were appraised using two checklists, one for appraising quantitative studies (Crombie, 1996) (see appendix A), the other for literature reviews (Crombie, 1996) (see appendix B). Two discussion papers were not included in the current review as they focused more on providing a cognitive behavioural conceptualisation of hypochondriasis and health anxiety. The articles were used however, to provide background information (Warwick & Salkovskis, 1990; Abramowitz et al., 2002).

*3.3 Synthesis of Data*

To facilitate comparison and synthesis of data across studies, information was gathered using a data extraction tool (Jones, 2007) (see appendix C), before being

tabulated (see appendix D) and further described within the results section of the current review.

## Section 4: Results

### *4.1 Overview*

Eight of the articles selected for inclusion in the current review, focused on empirical studies using a cognitive, experimental design to examine attentional bias toward health/illness-related external stimuli, in health anxious individuals. The other two were review articles. The articles could be broadly categorised into three main areas: five studies examined attentional bias manipulating a single independent variable, three examined attentional bias manipulating more than one independent variable and two review articles each considered the empirical evidence for the existence of an attentional bias.

The total number of participants across all the studies was 918. The total number of male participants reported was 326 and females 592. It is not possible to compare the number of participants assigned to experimental conditions with those assigned to control conditions, as some of the studies were lacking a clearly defined control group. Most studies reported the mean age of participants, which ranged from 18.9 to 58.18 years. With the exception of two studies, (van den Heuval et al., 2005; Brown et al., 1999), all participants were recruited from a non-clinical, university student population, the mean age of whom did not exceed 27 years.

All of the samples were sub-divided to facilitate the separation of sub-groups of health anxious from non-health anxious individuals. A variety of standardised psychometric scales were used to measure levels of health anxiety, however some studies did not provide information about the reliability and validity of the scales (van den Heuval et al., 2005; Brown et al., 1999; Karademas et al., 1998). Two studies included structured clinical interviews as an additional method of identifying health anxiety levels (van den Heuval et al., 2005; Brown et al., 1999). Although some of the

sub-groups contained a small number of individuals (van den Heuval et al., 2005; Brown et al., 1999; Owens et al., 2004) statistical analysis was used to examine and compare the experimental data.

### *4.2 Single Independent Variable Studies*

The five studies involving the manipulation of a single independent variable, planned to identify the presence of an attentional bias towards health/illness-related external stimuli, in health anxious individuals. Various dependent variables were used as a measure of attentional bias, however the independent variable used across all studies involved exposure to specific types of external stimuli.

#### *4.2.1 Sample Details.*

Three studies used non-clinical samples drawn from a university student population (Witthoft et al., 2008; Owens et al., 2004; Karademas et al., 2008). The other two studies used clinical samples (Brown et al., 1999; van den Heuval et al., 2005). Sample sizes varied between 51 and 129 participants.

#### *4.2.2 Psychometric Tools.*

Although all studies used objective measures of health anxiety with proven reliability and validity, some authors did not explicitly provide reliability and validity information within the research articles (Brown et al., 1999; van den Heuval et al., 2005; Karademas et al., 2008). One study used the Yale-Brown Obsessive Compulsive Scale for Hypochondriasis (Y-BOCS) (van den Heuval et al., 2005). One study used the Illness Attitudes Scale (Owens et al., 2004). The other three studies used either the Whitely Index, the Short Health Anxiety Inventory or combination of both (Brown et al., 1999; Karademas et al., 2008; Witthoft et al., 2008). The above measures were also used in the studies to sub-divide samples into health anxious and non-health anxious sub-groups to facilitate data comparison.

### *4.2.3 Comparison of Experimental Methods Using a Single Independent Variable.*

Brown et al. (1999) used a degraded word task to examine attentional bias in two separate clinical samples of health anxious individuals. The independent variable was specifically chosen words, either health-related or neutral, presented for 500 milliseconds in a degraded format and therefore difficult to perceive. The dependent variable was the number of words correctly identified. The researchers hypothesised that health anxious individuals would be more adept at identifying health-related words, due to an attentional bias towards external health-related stimuli.

Three later experimental studies (Owens et al., 2004; Karademas et al., 2008; Witthoft et al., 2008) used the modified Stroop task to examine attentional bias towards health/illness-related stimuli. The independent variables in all studies were the presentation of health-related and neutral words, consistent with the earlier degraded word study (Brown et al., 1999). Owens et al. (2004) however, used two additional word categories relating to positive and negative emotions but unrelated to health. Karademas et al. (2008) used an additional category of more general threat-related words and Witthoft et al. (2008) used neutral words and words which varied in the level of health/illness-related threat (e.g. pain, dizziness, heart attack, cancer). The dependent variable in the modified Stroop task studies was the time taken to name the colour each word was written in. All researchers hypothesised that health anxious students would show greater Stroop interference for health/illness-related words, which would be indicative of an attentional bias towards external health/illness-related stimuli. Witthoft et al. (2008) further hypothesised that Stroop interference would increase as the level of threat increased in the health/illness-related words.

One final study using the modified Stroop task also attempted to identify the neuronal substrate associated with an attentional bias (van den Heuval et al., 2005). The study included three small clinical samples of OCD, panic disorder and hypochondriacal patients, in addition to a healthy control group. The independent variable once again involved manipulation of the words presented, to include panic/health-related, OCD-related and neutral words, however participants performed the Stroop task whilst simultaneously undertaking an MRI scan. The researchers hypothesised that hypochondriacal patients would show greatest Stroop interference for panic/health-related words and that their MRI data would show differential neuronal activity during the Stroop task, compared to OCD and panic disorder patients.

*4.2.4 Findings Across Studies.*

Of the five studies using one independent variable, one study did not find evidence of attentional bias (Brown et al., 1999), three studies found evidence (Owens et al., 2004; Karademas et al., 2008; van den Heuval et al., 2005) and one study found equivocal evidence (Witthoft et al., 2008).

Brown et al., (1999) failed to find evidence for an attentional bias in the degraded word task. Their results showed that comparable numbers of health-related and neutral words were correctly identified in one clinical sample and fewer health-related than neutral words were correctly identified in the other clinical sample.

In the modified Stroop experiments, Owens et al. (2004) and Karademas et al. (2008) found evidence of an attentional bias towards health/illness-related words in health anxious students. No evidence of an interaction was found however, between attentional bias and the number of physical symptoms the students reported experiencing at the time of testing. Similarly, van den Heuval et al. (2005) identified an attentional bias towards panic/health-related words in hypochondriacal and panic

disorder patients and MRI data revealed clear differences in the activation of neuronal substrate between the different samples during the Stroop performance. Prefrontal activity involving ventral and dorsal brain regions was visible in both panic disorder and hypochondriacal patients but not in OCD patients and healthy controls.

Conversely, Witthoft et al. (2008) found that both health anxious and non-health anxious students indicated an equivalent attentional bias, taking longer to name the colour of symptom and illness-related words, irrespective of level of threat. The attentional bias diminished however, after the first half of the presentation of symptom and illness-related words, as colour naming reaction times during the subsequent presentation of neutral stimuli gradually increased thereafter.

### *4.3 Multiple Independent Variable Studies*

The three studies involving the manipulation of more than one independent variable were undertaken to examine various contextual factors influencing attentional bias towards external health/illness-related stimuli in health anxious individuals.

#### *4.3.1 Sample Details.*

All three studies used non-clinical samples drawn from a university student population (Lecci & Cohen, 2002; Lees et al., 2005; Lecci & Cohen, 2007). Sample sizes varied between 48 and 328 and included both male and female students.

#### *4.3.2 Psychometric Tools.*

Objective measures of health anxiety used in the studies consisted of the Illness Attitudes Scale (IAS), the Somatosensory Amplification Scale (SAMPI), the Anxiety Sensitivity Index (ASI) and the Whitely Index (WI). All have proven reliability and validity, though one study failed to comment about this within the research article (Lees et al., 2005). The above measures were also used in the studies to sub-divide samples into health anxious and non-health anxious sub-groups to facilitate data comparison.

*4.3.4 Comparison of Experimental Methods Using Multiple Independent Variables.*

Lecci and Cohen (2002) manipulated two independent variables to examine the effects of activating illness-concerns on the subsequent performance of the modified Stroop task. The first independent variable involved half the students receiving distressing false feedback following a fictitious physical examination to activate illness concerns, prior to completing the Stroop task. The second independent variable involved the presentation of both health/illness-related and neutral words during the Stroop task. The researchers hypothesised that health anxious students receiving distressing false feedback would show greater interference for health/illness-related words on the subsequent Stroop task.

A later study by Lecci and Cohen (2007) involving the modified Stroop task and manipulation of two independent variables to examine the effects on attentional bias was conducted after intense media coverage about the elevated risk of contracting anthrax following a bioterrorism threat. The two independent variables consisted of the type of stimuli, either anthrax-related or neutral words and the manipulation of perceived control over contracting anthrax, by asking half the students to write down three risk factors (low control) and the other half three protective factors (high control). The researchers hypothesised that health anxious individuals perceiving themselves to have low control over contracting anthrax would show greater interference for anthrax-related words on the modified Stroop task.

An additional study involving a visual dot probe task and the manipulation of three independent variables was conducted by Lees et al. (2005). They presented health/illness-related and neutral word and pictorial stimuli for either 500 or 1250 milliseconds, to identify the presence of differential attentional biases. The dependent

variable was the reaction time taken to detect the appearance of a dot probe replacing either the health/illness-related or neutral word.

*4.3.5 Findings Across Studies.*

Evidence for an attentional bias in the studies using multiple independent variables was variable.

Lecci and Cohen (2002), for example, found evidence of attentional bias towards health/illness-related words during the modified Stroop task, in health anxious students, only however, in the condition where illness concerns had been activated and when using the SAMPI as a measure of heath anxiety. No evidence of attentional bias was found when using the WI as a measure of health anxiety. Similarly, Lecci and Cohen (2007) also found evidence of an attentional bias towards anthrax-related words in health anxious students in their later study but only when perceived control over the disease was low. A significant interaction was found between SAMPI scores and word content in the low perceived control condition but not in the high perceived control condition. Lecci and Cohen (2007) therefore suggested that perceived control moderates attentional bias towards threat-related stimuli, even when disease schemas are activated.

The results from the visual dot probe study indicated an attentional bias towards health/illness-related pictures but not words, in health anxious students, when presented for 500 milliseconds and when using the ASI measure of health anxiety (Lees et al. 2005). Essentially, evidence of an attentional bias was found in the higher health anxiety group, compared to the lower health anxiety group. Attentional bias was also found in the 500 millisecond condition but not the 1250 millisecond condition.

*4.3 Review Articles*

The two review articles included in the current review considered cognitive approaches to health anxiety and hypochondriasis (Williams, 2004; Marcus et al., 2007). Each review contained a specific section summarising empirical data from experimental information processing paradigms, examining an attentional bias towards external health/illness-related stimuli, in health anxious individuals.

Williams (2004) used a narrative approach to review the existing evidence base. Although the review identified three of the empirical studies included in the current review (Brown et al., 1999; Lecci & Cohen, 2002 Owens et al., 2004), the author did not provide details about which databases were searched, which inclusion and exclusion criteria were used to select articles and how articles within the review were assessed for quality and analysed, compromising the overall quality of the review article. Williams (2004) concludes however, that as the evidence for an attentional bias towards external health/illness-related stimuli in health anxious individuals is increasing, there is a need to expand experimental paradigms not reliant on self-report. This will then enable researchers to more directly examine how such an attentional bias might contribute to the development and maintenance of health anxiety.

Marcus et al. (2007) used a more systematic approach to examine an attentional bias and other health anxiety related phenomena. The review contained a comprehensive method section, providing details of search terms, databases accessed, specific inclusion and exclusion criteria used to select relevant articles and how the articles were assessed for quality and analysed. The review however, did not include any further studies examining attentional bias towards external health/illness-related stimuli, despite being published three years later. Like Williams (2004), Marcus et al. (2007) also highlighted the need to expand cognitive experimental paradigms to

facilitate a better understanding of how an attentional bias might underpin health anxiety disorders.

## Section 5: Discussion

The aim of the current review was to examine literature derived from cognitive experimental research, in search of empirical evidence supporting the existence of an attentional bias towards external health/illness-related stimuli, in health anxious individuals. Although some studies did find evidence of an attentional bias (Owens et al., 2004; Karademas et al., 2005; van den Heuval et al., 2005), other studies failed to find evidence or only found evidence under certain conditions (Brown et al., 1999; Lecci & Cohen, 2002; Lees et al., 2005; Lecci & Cohen, 2007). Given the apparent inconsistency, it is important to consider potential reasons which might explain the discrepant results.

### *5.1 Operational Definitions and Psychometric Tools*

One possible reason which might explain the discrepancy in results is use of different terminology 'hypochondriasis', 'hypochondriacal tendencies' or 'health anxiety' and the assumption that these terms are sufficiently similar in describing a single construct, to enable studies to be compared. Some studies lacked clearly defined operational definitions (van den Heuval et al., 2005; Lees et al., 2005), although others used DSM-IV based criteria, equating hypochondriasis with high or extreme levels of health anxiety and hypochondriacal tendencies with sub-clinical hypochondriasis. Clearly, differential definitions raise the question about the extent to which the participants in the studies represent a homogenous population, which further constrains the generalisability of the results. Indeed, some researchers have openly questioned the validity of construct of hypochondriasis (Mayou, Kirmayer, Simon, Kroenke & Sharpe, 2005).

Another difference imposing constraints upon the extent to which it is possible to compare studies, is the specific psychometric tools administered to measure

hypochondriasis or health anxiety. In total, at least seven different psychometric tools were used. Although most studies commented about the reliability and validity of the tools, accurate comparison of the data is difficult because of the lack of a single standardised psychometric tool across studies, which in turn is likely to be due to a lack of clarity in conceptualising the conditions.

*5.2 Samples*

With the exception of two studies (Brown et al., 1999; van den Heuval et al., 2005) non-clinical samples drawn from university student populations were used. Given the demographic homogeneity of such samples, in terms of age and educational standard, it is uncertain how far the results might be representative of the general population. According to the National Institute for Mental Health in England (DOH, 2008), between 20% and 30% of patients seen in primary care have health anxiety in the absence of any clear physiological evidence. In secondary care, this rises to an average of 52%. Only 25% of people with anxiety disorders however, access treatment. This suggests that the majority of individuals with health anxiety are embedded within a non-clinical population and therefore it seems entirely appropriate to use a non-clinical population in research into health anxiety. That said, in order to improve the generalisability of results, more demographically diverse samples are required.

*5.3 Experimental Paradigms*

The inconsistency in findings across the studies included in the current review might be explained by the variety of experimental paradigms implemented, which again limited the extent to which the results could be compared. Furthermore, the suitability of each paradigm in examining attentional bias in health anxiety is questionable. The degraded word task (Brown et al., 1999) for example, is prone to response bias, as individuals may choose not to identify a word, especially if uncertain about its identity.

Similarly, alternative paradigms for examining attentional bias utilising reaction times, included in the current review, are the Stroop (Lecci & Cohen, 2002; Owens et al., 2004; van den Heuval et al., 2005; Lecci & Cohen, 2007; Witthoft et al., 2008; Karademas et al., 2008) and visual dot probe tasks (Lees et al., 2005). Both paradigms also however, have methodological limitations. The Stroop colour naming task, for example is not reflective of a 'real world' task and as it requires self-report, it cannot discriminate between the existence of a perceptual attentional bias towards external health/illness-related stimuli or response bias in naming the colour of the word stimulus. The visual dot probe, on the other hand, does attempt to discriminate between perceptual and response bias by requiring participants to provide a neutral response (button pressing) to a neutral stimuli (dot probe), preventing a response bias. The visual dot probe task however, does have other significant limitations. Firstly, it is possible that a visual, motion signal occurring upon the presentation of a dot probe to replace a word, might in itself attract attention, introducing a potential confound. Secondly, the dot probe task lacks naturalistic, ecological validity, restricting the extent to which findings are generalisable to the real world.

*5.4 Single Versus Multiple Independent Variables*

In addition to the variety of paradigms implemented, the manipulation of a single versus multiple independent variables highlights a further experimental difference which might have contributed to inconsistent findings. As discussed earlier, despite attempts to use appropriate health/illness-related target stimuli, matched across a number of dimensions with neutral control stimuli, the experimental studies using a single independent variable were clearly lacking in ecological validity (Brown et al., 1999; Owens et al., 2004; van den Heuval et al., 2005; Karademas et al., 2008; Witthoft et al., 2008). Other studies involving the manipulation of more than one independent

variable proved useful in highlighting how specific contextual factors such as mood, duration of stimulus exposure and perceived control interact with or moderate an attentional bias towards external health/illness-related stimuli (Lecci & Cohen, 2002; Lees et al.,, 2005; Lecci & Cohen, 2007). Arguably however, examining the effects of more than one independent variable, using paradigms such as the modified Stroop and visual dot probe paradigms, lacking in ecological validity, may not provide additional information about attentional bias in a real world setting.

*5.5 Clinical Implications*

Based on the studies included in the current review, the evidence for an attentional bias towards external health/illness-related stimuli, in health anxious individuals, is inconclusive. All of the studies and the two review articles however, acknowledge the current methodological limitations and emphasise the need to develop and implement new cognitive experimental paradigms, with improved ecological validity, to further examine attentional processing underpinning health anxiety.

If an attentional bias towards health/illness-related stimuli is found to correlate with levels of health anxiety, then it highlights the potential benefit of health anxious individuals receiving appropriately-designed, evidence-based psychological interventions. Current clinical guidelines detailing the preferred psychological therapy for the treatment of both anxiety and somatic disorders however, do not include any clear guidance on the treatment of hypochondriasis or health anxiety (DOH, 2001). On the other hand, Hawton (2004) emphasises the potential benefit of cognitive behaviour therapy (CBT) in modifying any psychological processes maintaining health anxiety.

Any psychological intervention however, should rest on a solid evidence base and therefore given the inconclusive evidence to date in relation to the existence of an attentional bias towards external health/illness-related stimuli in health anxiety or

hypochondriasis, more rigorous, ecologically valid research is imperative. Presenting words or pictorial objects in isolation using paradigms such as the modified Stroop, degraded word and visual dot probe tasks however, is probably far removed from the real world. Similarly, the current review has perhaps highlighted the lack of clarity on conceptualising hypochondriasis and health anxiety, in that the studies reviewed administered several different psychometric tools.

*5.6 Limitations of Current Review*

The current review examined empirical studies, using cognitive experimental paradigms, conducted between 1990 and 2009, to examine attentional bias towards external health/illness-related stimuli, in health anxious individuals. A potential limitation however might be the researcher's choice of search terms and dates in locating relevant articles. Imposing restrictions on the initial search might have limited the number of relevant articles retrieved. Additionally, the current review was undertaken without collaboration with fellow researchers, with whom it might have been possible to undertake wider scoping of the literature, revealing further studies. That said however, two relatively recent reviews were retrieved, neither of which made reference to any other articles not identified during the literature search for the current review.

## Section 6: Conclusion

In conclusion, it is possible that an underlying attentional bias towards external health/illness-related stimuli, might contribute to the development and maintenance of health anxiety, despite the lack of conclusive evidence from cognitive experimental empirical studies. Given that attentional biases might operate at a non-conscious level, cognitive experimental paradigms using non-conscious dependent variables such as reaction times might be an appropriate alternative. Improving methodological rigor however, in terms of ecological validity and utilising more demographically diverse samples should be an essential consideration for future researchers. Furthermore, all future research should rest on a solid theoretical conceptualisation of hypochondriasis and health anxiety, in order to ensure incremental value, over and above that of existing research.

## Section 7: References


Abramowitz, J. S., Schwartz, S. A & Whiteside, S. P. (2002). A contemporary and conceptual model of hypochondriasis. *Mayo Clinic Proceedings,* 77, 1323-1330.

American Psychiatric Association, (2002) Diagnostic *and Statistical Manual of Mental Disorders.* American Psychiatric Association.

Brown, H. D., Kosslyn, S. M., Delamater, B., Fama, J & Barksy, A. J (1999). Perceptual and memory biases for health-related information in hypochondriacal individuals. *Journal of Psychosomatic Research,* 47(1), 67-78.

Crombie, I. K (1996). *The Pocket Guide to Critical Appraisal.* BMJ Publishing Group, London.

Department of Health (2001). *Treatment Choice in Psychological Therapies and Counselling.* Retrieved March 2010 from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4007323

Department of Health (2008). *Improving access to psychological therapies commissioning toolkit. .* Retrieved March 2010 from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_084065

Fink, P & Rosendal, M (2008). Recent developments in the understanding and management of functional somatic symptoms in primary care. *Current Opinion in Psychiatry*, 21, 182-188.

Hawton, K., Salkovskis, P. M., Kirk, J & Clark, D (2004). *Cognitive Behaviour Therapy for Psychiatric Problems.* Oxford University Press, New York.

Jones, K (2007). *Doing a Literature Review in Health.* Retrieved October 2009 from http://www.sagepub.com/upm-data/13615_03_Saks_ch03.pdf

Karademas, E. C, Christopoulou, S., Dimostheni, A & Pavlu, F (2008). Health anxiety and cognitive interference: evidence from the application of a modified Stroop task in two studies. *Personality and Individual Differences*, 44, 1138-1150.

Karoly, P & Lecci, L (1993). Hypochondria and somatisation in college women: a personal projects analysis. *Health Psychology*, 12(2), 103-109.

Khan, A. A., Khan, A., Harezlak, J., Wanzhu, M. S & Kroenke, K (2003). Somatic symptoms in primary care: aetiology and outcome. *Psychosomatics*, 44(6), 471-478.

Lecci, L & Cohen, D (2002). Perceptual consequences of an illness concern induction and its relation to hypochondriacal tendencies. *Health Psychology*, 21(2), 147-156.

Lecci, L & Cohen, D (2007). Altered processing of health-threat words as a function of hypochondriacal tendencies and experimentally manipulated control beliefs. *Cognition and Emotion,* 21(1), 211-224.

Lees, A., Mogg, K & Bradley, B. P (2005). Health anxiety, anxiety sensitivity and attentional biases for pictorial and linguistic health-threat cues. *Cognition and Emotion,* 19(3), 453-462.

London School of Economics (2006). *The depression report: a new deal for depression and anxiety disorders.* The Centre for Economic Performance's Mental Health Policy Group.

Marcus, D. K., Gurley, J. R., Marchi, M. M & Bauer, C (2007). Cognitive and perceptual variables in hypochondriasis and health anxiety: A systematic review. *Clinical Psychology Review,* 27, 127-139.

National Institute for Health and Clinical Excellence (2007). *Management of anxiety (panic disorder with or without agoraphobia and generalised anxiety disorder in adults in primary, secondary and community care.* Retrieved January 2010, from http://guidance.nice.org.uk/CG22

Owens, K. M. B., Asmundson, G. J. G., Hadjistavropoulos, T & Owens, T. J (2004). Attentional bias toward illness-threat in individuals with elevated health anxiety. *Cognitive Therapy and Research,* 28(1), 57-66.

Salmon, P., Humphris, G. M., Ring, A., Davies, A. C & Dowrick, C. F (2007). Primary care consultations about medically unexplained symptoms: patient presentations doctor responses that influence the probability of somatic intervention. *Psychosomatic Medicine*, 69, 571-577.

Van den Heuval, O. A. Veltman, D. J., Groenewegen, H. J., Witter, M. P., Merkelbach, J., Cath, D. C., Van Balkom, A. J. L. M., Van Oppen, P & Van Dyck, R (2005). Disorder specific neuroanatomical correlates of attentional bias in obsessive compulsive disorder, panic disorder and hypochondriasis. *Archives of General Psychiatry*, 62, 922-933.

Warwick, H. M. C & Salkovskis, P. M (1990). Hypochondriasis. *Behaviour Research Therapy*, 28(2), 105-117.

Williams, J. M. G., Watts, F. N., Macleod, C & Mathews, A (1999). *Cognitive Psychology and Emotional Disorders.* John Wiley & Sons Ltd.

Williams, P (2004). The psychopathology of self-assessed health: a cognitive approach to health anxiety and hypochondriasis. *Cognitive Therapy and Research*, 28(5), 629-644.

Witthoft, M. Rist, F & Bailer, J (2008). Enhanced early emotional intrusion effects and proportional habituation of threat response for symptom and illness words in college students with elevated health anxiety. *Cognitive Therapy Research,* 32, 818-842.

## Section 8: Appendices

### Appendix A

**The Standard Appraisal Questions (**Crombie, 1996**)**

- Are the aims clearly stated?
- Was the sample size justified?
- Are the measurements likely to be valid and reliable?
- Are the statistical methods described?
- Did untoward events occur during the study?
- Were the basic data adequately described?
- Do the numbers add up?
- Was the statistical significance assessed?
- What do the main findings mean?
- Are important effects overlooked?
- How do the results compare with previous reports?

## Appendix B

**Appraising Review Papers (**Crombie, 1996**)**

- How were the papers identified?
- How was the quality of papers assessed?
- Is the topic well defined?
- Are the statistical methods described?
- Were the detailed study designs reviewed?
- Was missing information sought?
- Were the basic data adequately described?
- Was publication bias taken into account?
- Was heterogeneity of effect investigated?
- What do the main findings mean?
- Are there other findings which merit attention?
- Are the conclusions justified?
- How do the findings compare with previous reports?

## Appendix C

Data Extraction Form (Jones, 2007).

| | | |
|---|---|---|
| Article Number | | Review Date |
| Title: | | |
| Author(s): | | Publication Date: |
| Journal: | | |
| Volume: | Number: | Pages: |
| Keywords/definitions: | | |
| Aims/design/method: | | |
| Sampling/participants/analysis | | |
| Controls/reliability/validity/conclusions: | | |
| Notes: | | |

# Appendix D

## Table 1. showing data extracted from experimental studies included in review

| Study | Aims | Design/Method | Sample | Analysis | Reliability & Validity |
|---|---|---|---|---|---|
| **Brown et al (1999)** | Investigates memory & percept bias for health/illness words | Experimental<br>WI<br>Degraded word task, IV word type, DV no. of words correctly identified | 2 x Clinical – 129 ppl<br>Hypochondria patients, 44 males, 85 females,, mean age 58.18yrs | No AB found<br>ANOVA, ANCOVA<br>($F<1$, $\eta=0.04$), ($F(1,84) = 5.77$, $p<0.025$, $\eta=0.25$) | No details included |
| **Karademas et al (2008)** | Investigate AB to illness/gen threat words | Experimental<br>PANAS, STAI, SHAI<br>Modified Stroop, IV word type, DV colour naming reaction time | Uni students – 51 ppl<br>19 male, 32 female, mean age 20.39yrs | AB found<br>Pearson's Correlation<br>$r = 0.25$, $p<.010$,<br>ANCOVA<br>($F(1,33) = 13.99$, $p<0.01$) | No details included |
| **Lees et al (2005)** | Investigate AB to health/illness-related threat words and pictures over different exposure duration | Experimental<br>IAS<br>Visual dot probe task, IV word/picture type & exposure duration, DV reaction time in detecting dot probe | Uni students – 48 ppl<br>7 males, 41 females, mean age 20.63yrs | AB for pics (500ms)<br>ANOVA<br>($F(1,46) = 5.19$, $p < 0.05$),<br>($F(1,46) = 4.76$, $p < 0.05$) | No details included |
| **Lecci & Cohen (2002)** | Investigate AB to health/illness-related words following illness- concern induction | Experimental<br>WI, SAMPI<br>Modified Stroop task, IVs word type & illness-concern induction, DV colour naming react time | 2 x Uni student samples – 111 ppl & 157 ppl<br>61 males, 206 females, age range 17-27 yrs | AB found for illness with sampi<br>Hierarchical regression<br>($b_{SAMPI\ x\ word\ x\ condtion} = 15.6$, $t = 2.95$, $p < 0.005$)<br>($t = -0.96$, $p > 0.10$) | WI test-retest 0.81, SAMPI test –retest 0.85 |

## Appendix D

## Table 2. showing data extracted from experimental studies included in review

| Study | Aims | Design/Method | Sample | Analysis | Reliability & Validity |
|---|---|---|---|---|---|
| **Lecci & Cohen (2007)** | Investigate AB to anthrax threat words following manipulating perceived control over illness | Experimental<br>SAMPI, PANAS<br>Modified Stroop task, IV word type & perceived control manipulation, DV colour naming react time | Uni students – 328 ppl<br>105 males, 223 females, mean age 18.9yrs | AB found with low per.control<br>Hierarchical regression, T test<br>($B_{SAMPI\ x\ word}$=11.08, t=3.08, p<0.01)<br>(t = -0.35, p >0.10) | SAMPI test-retest 0.85, PANAS test-retest 0.70 |
| **Owens et al (2004)** | Investigate AB to illness-related info | Experimental<br>IAS, STAI<br>Modified Stroop, IV word type, DV colour naming react time | Uni students – 78 ppl<br>39 males, 39 females, mean age 19.8yrs | AB found<br>ANOVA<br>(F(4,146) = 12.16, p<.0.001) | Comments about r & v for IAS, STAI but no details |
| **Van de Heuval et al (2005)** | Investigate attentional bias and functional neural correlates in OCD/panic/hypochondria patients | Experimental<br>Y-BOCS<br>Modified Stroop paradigm, IV word type, DV colour naming reaction time | Clinical – 66 ppl<br>OCD/panic/hypochondria patients, 36 males, 30 females, mean age 40.6yrs | AB found<br>ANOVA<br>(F1,30 = 6.5; p = 0.02)<br>MRI | No details included |
| **Witthoft et al (2008)** | Investigate if AB varies with level of health threat & if habituation to threat occurs | Experimental<br>WI, SHAI, ACQ, PHQ, STAI-T,<br>Modified Stroop task, IV level of threat of words, DV colour naming react time | Uni students – 107 ppl<br>36 males, 71 females, mean age 23yrs | AB not confirmed<br>Cohen's d<br>0.61 & 0.45 | WI test-retest 0.85, SHAI internal consistency 0.89, ACQ test-retest 0.80, PHQ-9 Cronbachs coeff 0.80, STAI-T Cronbachs coeff 0.88 |

## Appendix D

**Table 3. sowing data extracted from review articles included in current review**

| | **Marcus et al (2007)** | **Williams et al (2004)** |
|---|---|---|
| How were papers identified? | Detailed search terms and databases searched included. Hand searched reference lists | Key search terms included but no details of databases searched. No mention of manual search. |
| How was quality of papers assessed? | Inclusion criteria: reported in English, peer-reviewed, studies using valid health anxiety assessment tool, DV must measure cognitive or perceptual factor, analyses must correlation or main or simple effect of health anxious group to control group | No details of how quality was assessed. No inclusion/exclusion criteria, checklists etc |
| How were results summarised? | Tabulated and narrative descriptions of results included | Narrative descriptions of results only |
| Is topic well defined? | Very detailed introduction of cognitive/perceptual model of health anxiety/hypochondriasis | Hypochondriasis very well defined and detailed description of cognitive approach to hypochondriasis |
| Was publication bias taken into account? | No limitations of systematic review mentioned | No limitations of review mentioned |
| Were missing details sought? | Not mentioned within article | Not mentioned within article |
| Were detailed study designs reviewed? | Yes – different study designs compared within discussion section | Yes – study designs discussed within results narratives |
| Was heterogeneity of effect investigated? | Yes – statistical analysis and brief narrative | Not mentioned – no statistical information within review |
| Are there other findings which merit attention? | Yes – review summarises evidence to date but also reports gaps in knowledge and areas for further research | Yes – areas for further research suggested, together with suitable methodologies |
| Were conclusions justified? | Yes – conclusions seem to be reflective of review content. Existing evidence is applied to theory but shortfalls existing research were also highlighted | Yes – emphasises need to further develop understanding and benefits of research in developing new treatments |

# Part Two

## Research Report

## Examination of the relationship between health anxiety and attentional bias towards external health/illness-related, using the change blindness paradigm

## Section 1: Introduction

### *1.1 Background*

The terms hypochondriasis and health anxiety are often used interchangeably both within conversation and within literature and as such, there is perhaps an implicit assumption that they are synonymous. Vulnerability factors for the development of hypochondriasis and health anxiety include personality traits, temperament and social learning experiences, whilst perceptual and cognitive processes are thought to contribute to maintaining the conditions (Abramowitz, Schwartz and Whiteside, 2002). One specific perceptual process which might be of significance in the maintenance of the conditions, is the deployment of attention during visual perception. Once again however, within the literature, several different meanings have been ascribed to the construct of attention. It would therefore be prudent to provide definitions for 'hypochondriasis', 'health anxiety' and 'attention' in the current research, before considering theoretical frameworks, encapsulating the role of attention during visual perception and its possible contribution to the development and maintenance of hypochondriasis and health anxiety.

### *1.2 Definition of Hypochondriasis and Health Anxiety*

Hypochondriasis can be defined as 'a preoccupation of having, or the idea that one has, a serious disease based on the misinterpretation of bodily symptoms, which cannot be better accounted for by an anxiety or depressive disorder' (APA, 2002). The preoccupation must also 'cause clinically significant distress or impairment in social or occupational functioning, for a duration of six months or more, despite appropriate medical investigation and reassurance' (APA, 2002). It is estimated that the lifetime prevalence for hypochondriasis is between 1 and 5% (APA, 2002). It is equally

common in both males and females and although there is no specific age of onset, the peak age appears to be in the twenties and thirties (Noyes, 2002).

Although hypochondriasis is classified within the somatoform disorder section of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR), (APA 2002), anxiety symptoms are often the predominant clinical feature of the disorder, which has led to ongoing debate about whether it might be better classified as an anxiety disorder. Recent research suggests that hypochondriasis can be conceptualised as an extreme form of health anxiety (Williams, 2004). As such, hypochondriasis is associated with a clinical population and health anxiety a non-clinical population, sometimes labelled as the 'worried well' (Williams, 2004).

The typical indicators of a hypochondriacal or health anxious individual are very similar. Individuals might believe, for example, that chest pain is an indication of an impending heart attack or that a blemish on the skin is an observable manifestation of skin cancer. Despite a lack of confirmatory evidence from subsequent medical investigations, individuals remain sceptical, become anxious and usually enter into a cycle of repetitive reassurance seeking, which in turn becomes a huge source of frustration for both the individual and the GP. Clearly, the sustained preoccupation in the belief of having a serious health condition can dramatically interfere with the individual's quality of life. It is not unusual for example, for individuals to refrain from work, physical activity and social participation, as a result of persistent worry and anxiety.

*1.3 Definition of Attention*

The construct of attention is defined as comprising 'a set of dynamic processes that influence the interaction between core cognitive functions such as memory and perception and the internal and external environment' (Snyder and Nussbaum, 1998).

Although it is of limited capacity, deployment of attention is thought to facilitate, enhance or inhibit cognitive processing, enabling individuals to attend to specific stimuli, whilst simultaneously ignoring other stimuli (Snyder and Nussbaum, 1998). Thus, the deployment of attention serves a crucial function across all sensory modalities. However in relation to visual perception, the primary function of attention is to facilitate preferential selection of the most important or salient stimuli within the visual field, for further cognitive processing, depending on the current task at hand (Rensink, 2002). Perceptual factors such as size, shape and colour all influence the salience of stimuli, as does semantic knowledge, derived from past experience. Preferential selection of visual stimuli often operates at a non-conscious level.

### *1.4 Theoretical Framework Underpinning Hypochondriasis and Health Anxiety*

Williams (2004) postulates that vulnerability to anxiety stems from personality factors, temperamental factors and childhood experiences. Specifically, Williams suggests that personality and temperamental factors render some individuals more prone to worry and less able to regulate emotions. Of these, individuals who are exposed to or experience illness during childhood are likely to develop negative core beliefs about vulnerability to illness and are then predisposed to developing health anxiety.

Warwick and Salkovskis (1990), acknowledge the role of attention in further contributing to the development and maintenance of hypochondriasis and health anxiety, in their cognitive behavioural (CB) conceptualisation. They propose that health anxious individuals might preferentially attend to bodily stimuli and sensations and consequently might misinterpret benign stimuli and sensations as indicators of illness, for which they might then seek help.

In addition to preferentially attending to bodily stimuli and sensations, Williams (2004) extends the CB conceptualisation to include the possibility of perceptual

hypervigilance to external or environmental health/illness-related stimuli. Williams's (2004) CB conceptualisation of health anxiety therefore proposes that individuals predisposed to health anxiety might be more likely to notice and negatively interpret internal and external health/illness-related stimuli. Such perceptual hypersensitivity and biased interpretation might then maintain negative core beliefs about vulnerability to illness, in addition to triggering anxiety and subsequent coping behaviours such as reassurance seeking through the GP or by accessing informational resources.

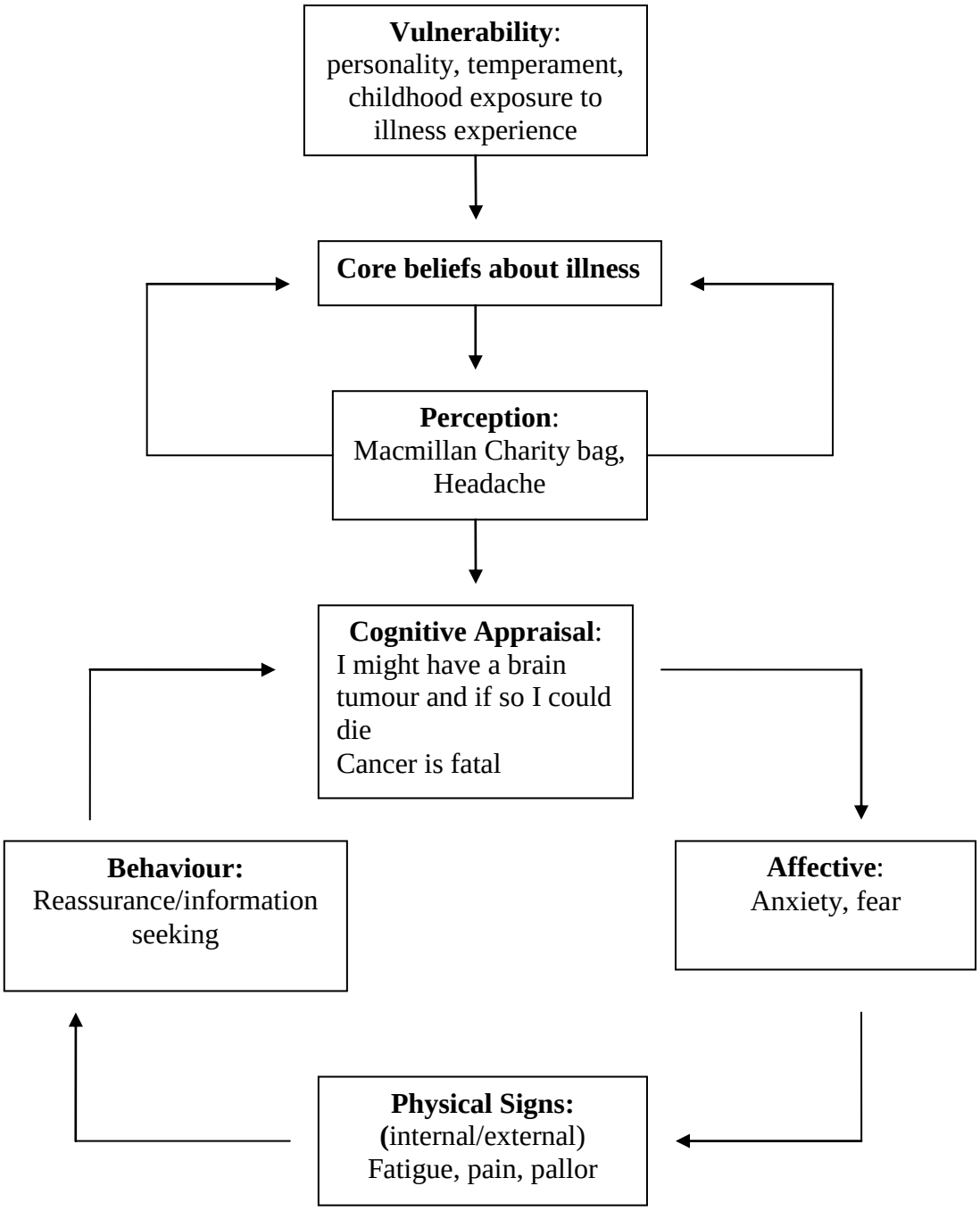


Figure 1. Cognitive Behavioural Conceptualisation of Health Anxiety (Warwick & Salkovskis, 1990, Williams, 2004)

## *1.5 Theoretical Framework Underpinning Attentional Allocation During Visual Perception*

If health anxious individuals are more likely to notice external health/illness-related stimuli, as Williams (2004) suggests, it would seem prudent to consider how specific stimuli are preferentially selected during visual perception.

Hypersensitivity to external health/illness-related stimuli rests on the assumption that visual perception must be biased in individuals with hypochondriasis or health anxiety. This assumption appears to be entirely consistent with 'coherence theory', which attempts to explain how attention is deployed during visual perception, to ensure that the most salient aspects of the visual scene are preferentially captured (Rensink, 2000).

Coherence theory posits that sensory information entering the eyes is not projected on to the retina as an identical, stable (i.e. coherent) representation of the visual scene. Instead, early retinal representations are said to be volatile, constantly changing as light continues to enter the eyes. According to coherence theory, because of the vast array of visual stimuli surrounding us at any one time, only the most salient aspects of, or objects within the visual scene can be represented coherently within the visual system. The reason for this is that coherent representation of visual stimuli, requires the deployment of attention, which is of limited capacity.

Perceptual features such as colour, size and shape are known to 'grab' attention. However Rensink (2002) also emphasises how semantic knowledge plays an important part in determining the salience of aspects of, or objects within the visual scene. It follows therefore, that if attentional allocation is to be effective, only the most important aspects of the visual scene, relative to the task at hand, should be preferentially selected for subsequent information processing.

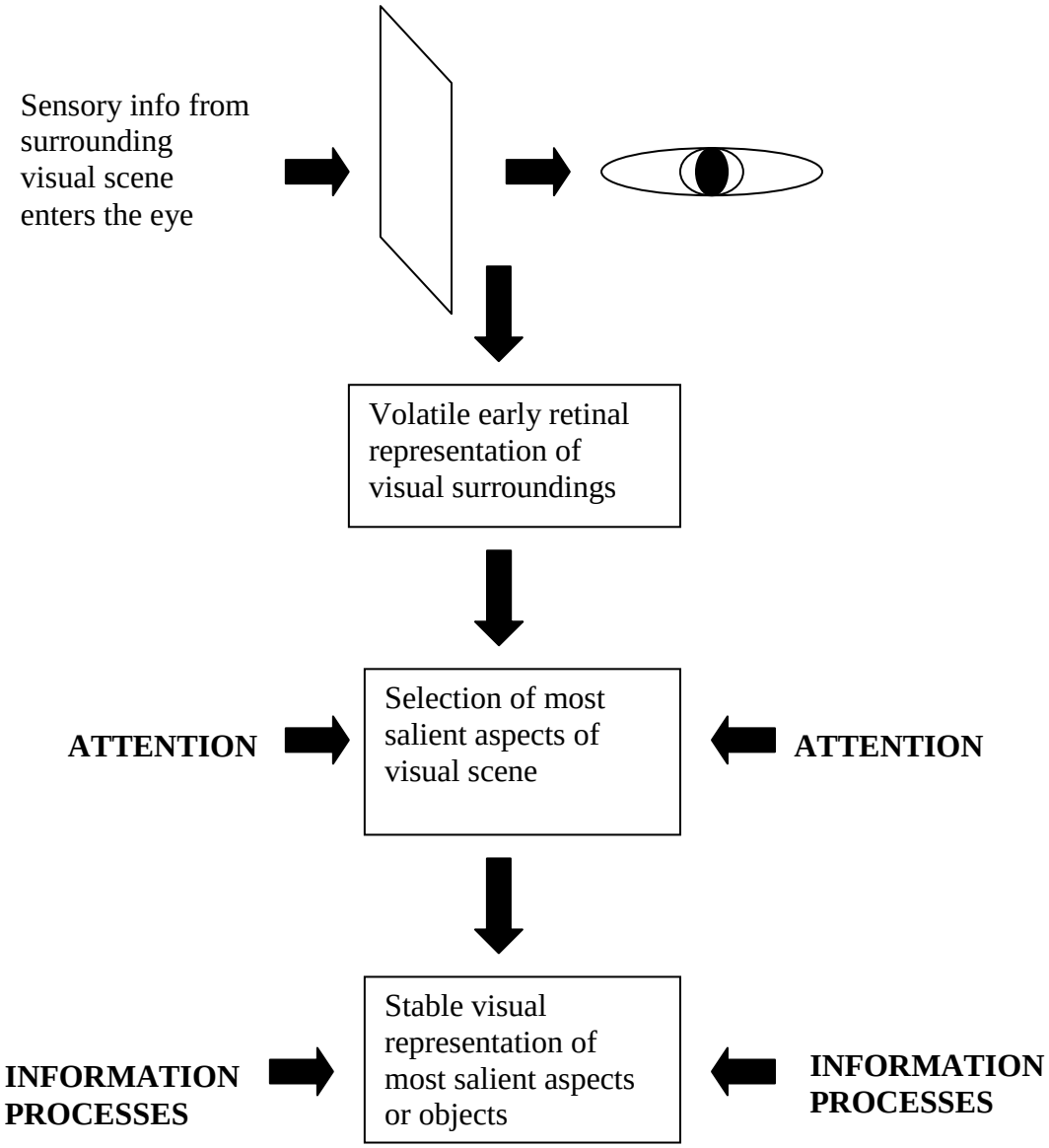


Figure 2. Schematic Diagram of Coherence Theory (Rensink, 2002)

*1.6 An Integrated Framework for Hypochondriasis and Health Anxiety*

So far, the hypothesis that a visual attentional bias towards external health/illness-related stimuli might contribute to the development and maintenance of health anxiety or hypochondriasis is plausible. A CB conceptualisation however, is not sufficient in explaining how and why an attentional bias might occur.

Conversely, coherence theory predicts that attentional bias towards specific external stimuli within a visual scene, is dependent on the extent to which the stimuli are salient for each individual. Coherence theory alone however, is not sufficient in providing a comprehensive explanation for how visual attentional bias might contribute to the development and maintenance of conditions such as health anxiety and hypochondriasis.

An integrated framework comprising principles from CB and coherence theories might offer one solution to comprehensively encapsulate the role of visual attentional bias in contributing to the development and maintenance of health anxiety and hypochondriasis. The integrated framework would propose that external health/illness-related stimuli would be of greater salience for individuals of a specific personality/temperamental disposition, or those who have previously been exposed to illness in either themselves or others. Consequently, during the perceptual appraisal of visual surroundings, such individuals will notice health/illness-related stimuli quicker than more neutral stimuli, due to the allocation of attention to the most salient aspects or objects within the visual scene. Perception and appraisal of health/illness-related stimuli will then activate core beliefs about vulnerability to illness, in addition to generating worry and anxiety about one's health status and the subsequent engagement in help seeking behaviour. Clearly, the non-conscious operation of attentional allocation imposes constraints upon the extent to which individuals are able to gain an awareness and control of biased visual perception. Thus, lack of awareness and control might explain why health anxiety and hypochondriasis persist, even in the absence of any confirmatory evidence of injury or illness.

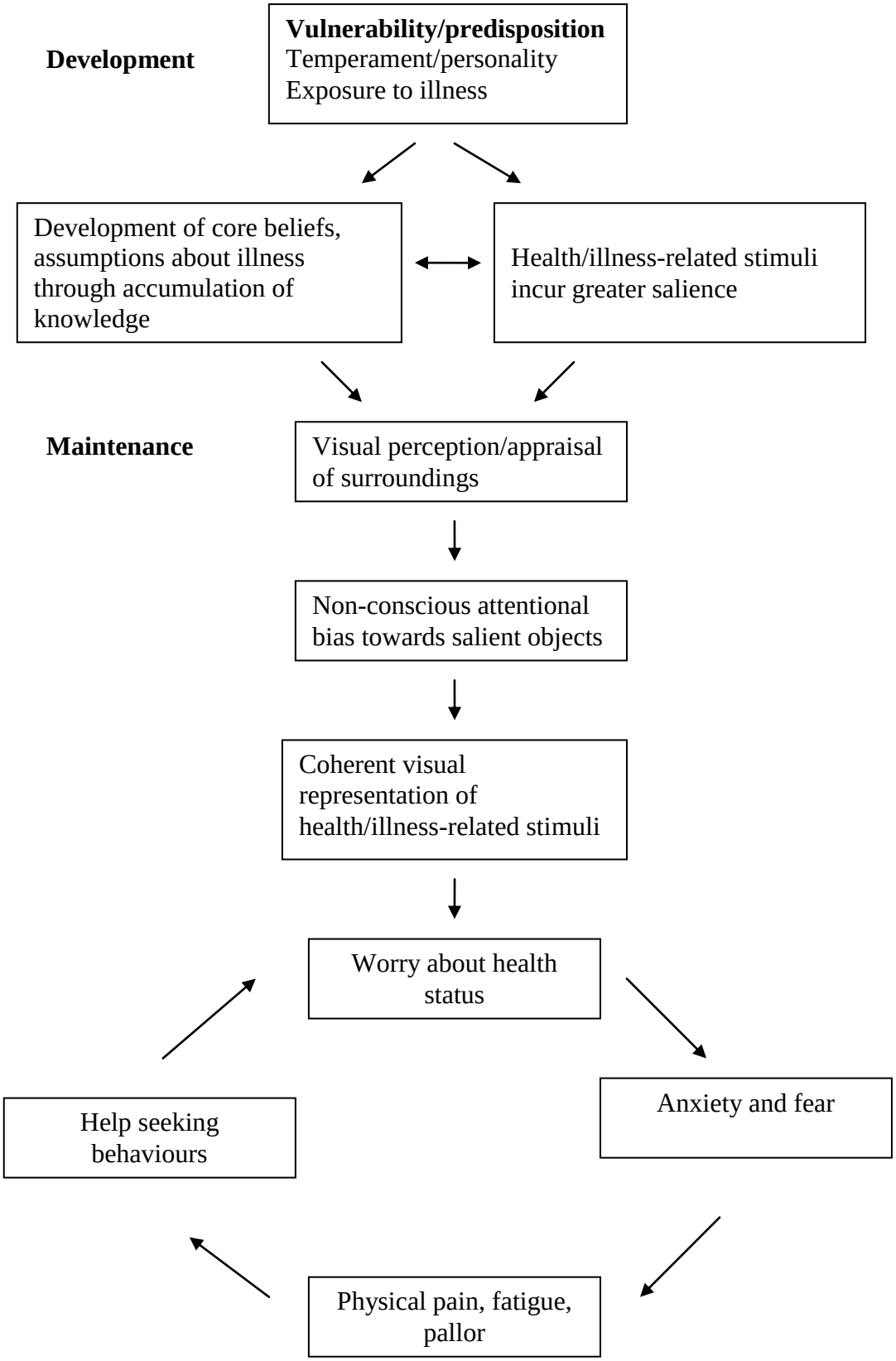


Figure 3. Integrated framework of hypochondriasis and health anxiety

*1.7 Potential Benefit of Experimental Research*

Given the hypothesis that a visual attentional bias towards health/illness-related stimuli might serve to maintain hypochondriasis and health anxiety, there would seem to be scope to extend existing experimental research. Furthermore, if health anxious individuals notice health/illness-related stimuli quicker than more neutral stimuli, experimental paradigms measuring reaction times during visual perception might prove to be especially valuable.

Historically, experimental paradigms such as the Stroop, degraded word and visual dot probe tasks have been implemented in an attempt to capture a visual attentional bias towards external stimuli (Brown, Kosslyn, Delamater, Fama & Barksy, 1999; Witthoft, Rist & Bailer, J, 2008; Van den Heuval et al., 2005; Lecci & Cohen, 2002; Karademas, Christopoulou, Dimostheni & Pavlu, 2008; Owens, Asmundson, Hadjistavropoulos & Owens, 2004; Lecci & Cohen, 2007; Lees, Mogg & Bradley, 2005).

More recently however, an alternative, the change blindness paradigm has been introduced, in an attempt to increase sensitivity and to improve ecological validity, in detecting visual attentional bias (Jones, Bruce, Livingstone & Reed, 2006; Jones, Jones, Blundell & Bruce, 2002; Jones, Jones Smith and Copley, 2002).

Essentially, the change blindness paradigm involves alternately presenting an observer with pairs of virtually identical photographs of naturalistic, visual objects or scenes, on a computer screen. Both photographs are repeatedly presented very briefly. The only difference between the pairs of photographs is a change in one or two visual features in one photograph within each pair. The task of the observer is to try to detect the change as quickly as possible, much the same as in a spot the difference type task. The assumption underpinning the change blindness paradigm is that reaction times in

detecting changes might vary between individuals and in accordance with different types of visual stimuli. In order to explore the extent to which different types of visual stimuli affect performance however, it is essential to minimise motion, which inevitably occurs when introducing the change to the visual features. Motion cues represent a confounding variable as they facilitate the detection of change. Thus a blank screen separates the presentation of each pair of photographs, masking the actual change and obscuring the motion cues, which otherwise would have been apparent when making the change.

A further assumption underpinning the change blindness paradigm, consistent with coherence theory, is that focused attention is required to detect change. If therefore, attention is directed towards the most salient aspects of the visual scene, reaction times in detecting changes to those specific aspects or objects should be faster than reaction times in detecting changes to less salient aspects or objects.

With reference to the integrated formulation described earlier, it is hypothesised that health anxious or hypochondriacal individuals are more likely to attend to health/illness-related stimuli within their visual surroundings, because of a visual attentional bias. The change blindness paradigm might therefore prove to be a valuable experimental tool for further exploration of this hypothesis. It is a relatively flexible experimental tool, in that it is possible to vary the simplicity or complexity of the actual visual stimuli and the nature of the change (e.g. presence or absence, location, size, shape, colour etc) (Rensink, 2002). In addition, photographs used within the change blindness paradigm can be representative of naturalistic, visual scenes, facilitating ecological validity.

Previous research examining attentional bias and health anxiety using the Stroop, visual dot probe and degraded word tasks have yielded inconsistent results

(Brown et al., 1999; Witthoft et al., 2008; Van den Heuval et al., 2005; Lecci & Cohen, 2002; Karademas et al., 2008; Owens et al., 2004; Lecci & Cohen, 2007; Lees et al., 2005). Clearly, when comparing results across research studies using different methodologies, it is difficult to draw any firm conclusions. Additionally, a consistent weakness of the Stroop, visual dot probe and degraded word tasks is their lack of ecological validity. In a recent publication, Fink (2008) emphasises the difficulty in treating health anxiety and hypochondriasis, when neither have been adequately conceptualised. Fink therefore highlights the necessity of the implementation of more valid, modern research methodologies, embedded within a solid theoretical framework, in order to improve understanding and to facilitate the development of effective interventions.

### *1.8 Clinical Research Using the Change Blindness Paradigm*

Previous clinical research using the change blindness paradigm has included studies exploring attentional bias in alcohol and substance misuse. Jones, Bruce, Livingstone & Reed (2006) for example, presented a sample of problem drinkers and social drinkers with a matrix of 18 colour photographs comprising 9 alcohol-related and 9 neutral (household) objects on each side. The results revealed that problem drinkers' reaction times in detecting changes made to the alcohol objects were faster than those of social drinkers and faster than reaction times in detecting changes to neutral objects. Jones et al., (2006) therefore suggest that problem drinkers have an attentional bias to alcohol-related stimuli. Similarly, Jones, Jones, Blundell & Bruce (2002) conducted two studies using the change blindness paradigm to explore attentional bias in alcohol and cannabis use. After presenting photographs containing either neutral and alcohol-related objects or neutral and cannabis-related objects, Jones et al. (2002) found participants detecting substance-related changes reported higher level of substance use than those detecting

neutral object changes, once again suggesting an attentional bias. Jones, Jones, Smith and Copley (2002) also found that heavier social users of alcohol and cannabis detected substance-related changes quicker than lighter or non-users and reaction times were quicker for substance-related, rather than neutral changes.

It is possible that hypervigilance to external health/illness-related stimuli in health anxiety is to some degree, due to an underlying visual attentional bias, which in turn might contribute to both the development and maintenance of the condition. Just in the same way that substance-related objects disproportionately capture the attention of substance users, it is possible that the same will be true of health/illness-related objects and health anxious individuals. The change blindness paradigm might therefore prove to be a valuable clinical tool for investigating attentional bias and possibly in measuring treatment outcome in health anxious individuals. The data might prove useful in adding clarity to the theoretical conceptualisation of health anxiety, facilitating the development of a reliable and coherent concept from which therapeutic interventions might be derived.

*1.9 National Context for the Research*

The Department of Health has recently launched an initiative to 'improve access to psychological therapies (IAPT)' (DOH, 2008). Amongst the communities identified as being in need of psychological therapy was the population of individuals with 'medically unexplained physical symptoms', 70% of whom are known to have depression or anxiety (DOH, 2008).

The aim of the IAPT initiative is to help Primary Care Trusts implement the NICE guidelines, in the treatment of depression and anxiety. Additionally, the initiative focuses on the importance of providing a range of psychological therapies to meet the needs of individuals with depression and anxiety and the need for health professionals

to develop the knowledge and skills to deliver those therapies. The research would therefore appear to complement current interest in IAPT for anxiety disorders.

*1.10 Rationale for the Current Study*

Previous research has highlighted that visual attentional bias towards salient stimuli can contribute to the development and maintenance of clinical disorders. Visual attentional bias has been shown to operate during nonconscious information processing. Experimental information processing paradigms appear to be well suited to exploring nonconscious information processes underlying emotional disorders such as health anxiety, even in non-clinical populations (Williams, 2004). According to Lecci and Cohen (2002) however, attentional bias toward health/illness-related stimuli is most noticeable when health/illness-related beliefs are activated. Such beliefs can be temporarily induced by artificial mood induction techniques, whereby individuals are pre-exposed to positive or negative emotional messages or stimuli influencing their mood state, before engaging in experimental tasks measuring attentional bias.

An alternative, more ecologically valid method of detecting an attentional bias towards health/illness-related stimuli, whilst health/illness beliefs are active however, might be to apply an experimental information processing paradigm within a health/illness-related environment. Karoly and Lecci (1993) propose that health anxious individuals tend to pursue more health-related goals, which serve to maintain health/illness-related beliefs. The current research therefore aims to implement an ecologically valid experimental information processing paradigm, within an ecologically valid health/illness-related environment, to explore the relationship between level of health anxiety and attentional bias towards health/illness-related stimuli. The change blindness paradigm administered within a private health club would appear to lend itself to this kind of research.

*1.11 Potential Clinical Benefits*

The proposed research will provide an opportunity to consider the clinical utility of the change blindness paradigm as a research tool for clinical psychologists in exploring attentional bias. The findings will also hopefully provide a greater insight into the nature of hypochondriasis and health anxiety, facilitating conceptual clarity, which in turn might be more informative in the development of appropriate psychological interventions.

Previous research suggests that only 25% of individuals with anxiety based conditions receive psychological treatment (London School of Economics, 2006). This indicates that the majority of individuals experiencing anxiety are embedded within the so-called 'non-clinical population'. It would therefore seem reasonable to use a non-clinical population when conducting research into health anxiety, with sufficient confidence about the generalisability of the findings. If an attentional bias towards health/illness-related stimuli is found to correlate with levels of health anxiety however, then it highlights the potential need to address nonconscious information processes within psychological interventions for managing health anxiety. Indeed, Abramowitz , Deacon and Valentiner (2007) consider it essential that clinicians should identify and modify information processes maintaining catastrophic thinking in health anxious individuals during psychological intervention. Graded, subliminal to supraliminal exposure to anxiety provoking stimuli for example, has proven to facilitate desensitisation and a reduction in catastrophic thinking in the treatment of phobias (Lee and Tyrer, 1980 cited in Williams et al., 1999) and anxiety in male homosexuals (Silverman, 1973, cited by Williams et al., 1999). Similarly, more recently, Dijksterhuis and Smith (2002) demonstrated that subliminal exposure to extreme or threatening stimuli was effective in decreasing their extremity, ultimately reducing

anxiety levels. It is therefore hoped that the findings of this research will be clinically useful, especially given the emphasis currently being placed on developing more effective psychological services.

### *1.12 Research Aims and Objectives*

The aim of this research is to apply the change blindness paradigm, to explore the relationship between health anxiety and attentional bias towards health/illness-related stimuli.

The three main objectives are:

- to develop a better understanding about the psychopathology of health anxiety, in particular, the role of attentional bias in contributing to the development and maintenance of health anxiety
- to consider any implications for potential psychological interventions for managing health anxiety
- to evaluate the clinical utility of the change blindness experimental paradigm, for exploring attentional bias is health anxiety

#### *1.12.1 Main research questions.*

There are two main strands to the current research. The first strand relates to the first two objectives which focus on developing a better understanding of health anxiety and considering how this might inform subsequent psychological interventions. With the aim being to investigate whether there is an association between level of health anxiety and attentional bias towards external health/illness-related stimuli, the following two experimental hypotheses are proposed:

1. There will be a significant negative correlation between level of health anxiety and reaction times in detecting changes to health/illness-related stimuli, in a

change blindness paradigm. That is, as level of health anxiety increases, the time taken to detect health/illness-related changes will decrease.

2. There will be a significant positive correlation between level of health anxiety and the number of health/illness-related stimuli changes detected, in a change blindness paradigm. That is, as level of health anxiety increases, the number of health/illness-related changes detected will increase.

The second strand to the research refers to the third objective to utilise the findings of the current study to evaluate the clinical utility of the change blindness paradigm as a research tool for clinical psychologists investigating attentional bias in health anxiety and other psychological or clinical conditions. An additional exploratory, statistical analysis will therefore be conducted to consider the extent to which any attentional bias found, might be attributed to confounding variables. Specifically, the analysis will determine whether any of the target items used within the photographic stimuli were consistently detected, across the sample. If so, this would represent a potential confound, in the sense that some target items were simply more attention grabbing than others, irrespective of whether they were health/illness-related or neutral and thus would bring into question the internal validity of the change blindness paradigm. In order to facilitate evaluation of the clinical utility of the paradigm therefore, the following null hypothesis is proposed:

3. Across the whole sample, the frequency of correctly identified changes for each of the paired target items within the photographic stimuli, will not be significantly greater than would be expected by chance

## Section 2: Method

### *2.1 Design*

The research lends itself to an experimental design, using the change blindness paradigm, as this technique has previously been successfully applied to examine visual attentional bias in other clinical disorders (Jones, Jones, Smith and Copley, 2002, Jones, Jones, Blundell and Bruce, 2002, Jones, Bruce and Livingstone, 2006).

#### *2.1.1 Quantitative approach.*

The research questions require a quantitative approach. The first two hypotheses, for example, require a correlational approach, as they each focus on the association between two variables. The two variables in the first question are level of health anxiety and change detection times and those in the second question are level of health anxiety and number of health/illness-related stimuli detected.

The third hypothesis examining confounding variables however, requires a repeated measures approach, to determine the effect of the independent variable (i.e. stimulus identity) on the dependent variable (i.e. total number of correct detections) within each participant and across the whole sample.

### *2.2 Participants*

#### *2.2.1 Sample Size.*

Statistical power analysis was applied to calculate the appropriate sample size to facilitate accurate and reliable statistical inferences (Barker, Pistrang and Elliott, 2002). Previous clinical research using the change blindness paradigm to examine attentional bias has revealed inconsistent correlation coefficients (Jones et al., 2002, Jones et al., 2006). A low effect size (i.e. $r = 0.30$) was therefore used in the power analysis for the current research, as recommended by Barker et al., (2002). An alpha value of $\alpha = 0.05$

and Beta value of β =0.80 were also used to minimise the chances of making a type I and type II error, respectively (Cohen, 1992). Inspection of the power tables for a one-tailed correlational analysis using the aforementioned values, yielded an estimated sample size of 70 individuals. In total, 85 individuals were asked to participate in the experiment. Of these, only 5 declined, all of whom stated that they could not spare the time.

*2.2.2 Sampling method.*

Following ethical approval from the University of Leicester, School of Psychology Ethics Committee (see appendix E), participants were recruited via convenience sampling (Barker et al., 2002). A randomised sampling method was not possible, as the researcher was not given permission to access a complete list of names and contact details for all members of the private health club, due to data protection regulations.

*2.2.3 Inclusion and exclusion criteria.*

Participants were recruited in accordance with the following inclusion and exclusion criteria:

*Inclusion Criteria*

- Individuals aged 18 years and above
- English speaking individuals
- Individuals who give informed consent

*Exclusion Criteria*

- Individuals with an uncorrected visual impairment
- Individuals who have studied psychology at University or at degree level
- Individuals with a serious health condition

*2.2.4 Demographics.*

Eighty participants, all members of a private health club in the Yorkshire region, completed the experiment (37 men, 43 women, mean age = 42.5 years, SD = 12.5 years), after providing written consent. 87% were white British and the remaining ethnic categories included other white, Caribbean, Asian British, black British, other black and other Asian.

*2.3 Apparatus and Stimuli*

*2.3.1 Apparatus.*

Attentional bias was assessed using the change blindness paradigm (Rensink, 2000), written in E-Prime version 1.1 and was implemented using a Toshiba Portege M300 laptop. The screen size was 19cm by 14cm and the viewing distance was approximately 45cm. A response button attached to and compatible with the laptop, was used to enable reaction times to be recorded.

*2.3.2 Stimuli.*

The stimuli used within the experiment were full-colour, digital photographs (3008 x 2000 pixels) taken in natural daylight, using a tripod to ensure all photographs were taken from the same perspective. The dimensions of the photographs were manipulated to equal to that of the screen (19cm x 14cm). Three separate visual scenes (a shopping basket full of groceries, the contents of a bathroom cabinet and a packed holiday suitcase) containing a mixture of health/illness-related and neutral items, represented the original stimuli (OS). Each of the three OS were paired with three separate changed stimuli (ChS) yielding nine pairs in total (see Fig. 4). The only difference between the OS and ChS in all pairings was the simultaneous omission of two target items, both present in the OS but omitted from the ChS. Specifically, two neutral target items positioned to the left and right of centre were omitted in one ChS.

A health-related and a neutral target item were omitted in the other two ChS, one with the health-related omission positioned left and neutral right of centre, whilst in the other, the position of the omissions were laterally reversed. The target items within the OS and ChS were positioned to the left and right of centre, to ensure that any attentional bias towards the health/illness-related stimuli could not be explained solely in terms of a positional bias. Thus in total, there were 6 trials containing simultaneous health-related and neutral changes representing the experimental trials and the remaining three trials containing two simultaneous neutral changes represented filler trials.

All of the paired target items were carefully selected so that their shape, colour, size etc were similar and all were independently rated on a five point scale, by five clinical psychology students, in terms of how strongly the students agreed they were health/illness-related. Higher scores corresponded to strongly agreeing and lower strongly disagreeing. (see appendix A).

**Table 1. Mean ratings indicating health-relatedness of target stimuli (n=5)**

| | **Health Stimuli** | **Neutral Stimuli** |
|---|---|---|
| **Mean Ratings** | 4.83 | 1.03 |

As far as possible, all non-target items within the visual scenes were also matched for size, shape and colour and arranged symmetrically either side of the centre. Careful consideration of symmetry and the physical properties of the items within the photographs ensures that when target items within the ChS are omitted, confounding variables such as the size, shape, colour and position of the surrounding, non-target items are minimised and are therefore less likely to influence the allocation of attention (Rensink et al., 2007).

**a) Bathroom Cabinet**


Original Stimulus


Changed Stimulus – 2 neutral changes, top shelf (razor) left & (toothbrush) right


Changed Stimulus – neutral item (bubble bath) mid shelf left, health item (plasters) right


Changed stimulus – health item (cold/flu remedy) bottom left, neutral (shower gel) right

**b) Suitcase**


Original Stimulus


Changed Stimulus – 2 neutral changes, (brush) far left & (sunglasses) right


Changed Stimulus – neutral item (mobile phone) mid left, health (diarrhoea relief) right


Changed stimulus – neutral item (crisps) bottom right, health (first aid kit) left

**c) Shopping Basket**


Original Stimulus


Changed Stimulus – 2 neutral items, matches far left & oxo right


Changed Stimulus – health item (paracetamol) bottom left, neutral (mackerel) right


Changed Stimulus – neutral item (four cheese mix) back left, health (bandage) right

Figure 4. Photographic Stimuli

*2.4 Psychometric Scale*

The Short Health Anxiety Inventory (SHAI), a derivative of the Health Anxiety Inventory (HAI) (Salkovskis, 2002) was administered to measure participants' level of health anxiety (see appendix B). This tool was chosen because it has been shown to be sensitive to normal levels of health concern as well as clinical hypochondriasis (Salkovskis, 2002). Abramowitz et al., (2007) also note that one advantage of the SHAI is its brevity, rendering it an ideal research tool, where time constraints are important. Furthermore, items within the HAI and SHAI were carefully chosen based on a cognitive behavioural formulation of health anxiety and were therefore considered to be appropriate measures for the current research.

Comprised of two subscales, the first 14 questions are designed to identify the symptoms of health anxiety and the final five questions relate to attitudes and beliefs about the negative consequences of experiencing health anxiety symptoms. Individual items on each subscale are scored 0-3 and the aggregation of the two subscale scores represents the total health anxiety score. A cut-off score of 15 to 17 represents very health anxious individuals, whilst a score of 18 or above meets the diagnostic criteria for hypochondriasis (Warwick and Salkovskis, 1990). The cut-off score of 15 and above was therefore applied to operationally define individuals with higher health anxiety and 14 and below individuals with lower health anxiety.

*2.4.1 Reliability and validity.*

The SHAI is reputed to be a reliable and validated assessment tool, having evidenced comparable reliability and validity to that of the HAI (Salkovskis, 2002). A significant main effect of group on the scores has been found in distinguishing health anxious individuals from those with other physical or psychological conditions and from non-clinical controls (Salkovskis et al., 2002). Additionally, Kline (1993, cited by

Clark-Carter, 1997) notes that satisfactory internal consistency of a scale using Cronbach's alpha, should be 0.7 or above and therefore with an alpha coefficient of 0.89, the SHAI has satisfactory internal consistency (Salkovskis et al., 2002).

### *2.5 Procedure*

#### *2.5.1 Recruitment phase.*

Prior to recruitment, the researcher met with the private health club manager to discuss the proposed research and to request permission to conduct the research within the health club, using health club members. After gaining permission, the researcher subsequently approached individuals within the health club lounge, to ask if they would be willing to participate. Willing participants were provided with an information sheet detailing the study (see appendix C) and screened in accordance with the inclusion/exclusion criteria, before being asked to sign a consent form (see appendix D). All participants were then allocated an identification number to ensure personal details remained anonymous. It was not possible to reveal the true purpose of the experiment until data had been gathered for all participants. This was because of the potential for participants to inadvertently disclose the nature of the experiment during conversation with other club members, which would then prevent those other members from taking part, if they hadn't already done so. Participants were therefore informed that the researcher was interested in whether engagement in physical exercise had an impact on subsequent levels of concentration. They were informed that their task would be to complete a computerised spot-the-difference type exercise on the laptop, as a measure of their concentration level and were asked the decoy question of whether or not they had exercised within the last two hours. They were also informed that the researcher was interested in obtaining a subjective appraisal of their health, which would involve completing a short questionnaire, in order to embed the research within a health-related

framework. This was to avoid generating any suspicion or confusion which might have occurred in being asked to complete the SHAI, in the absence of any relevant context.

*2.5.2 Testing phase.*

After providing consent, participants were seated in a quiet area of the lounge, in front of the laptop, at a viewing distance of approximately 45cm. The researcher then read out aloud the standardised instructions of the change blindness task, as they appeared simultaneously on the computer screen (see appendix H). Specifically, participants were informed that a photograph would appear on screen for a brief period of time, followed by a blank screen, before the photograph reappeared but that this time it would flicker. The researcher explained that at this point, every alternate photograph, although appearing identical, actually contained something missing (i.e. a change) and the task of the participant was to identify what was missing as quickly as possible. Participants were asked to depress a button on the button box after the first presentation of each photograph and to release the button upon detecting the change, during the subsequent presentations, before verbalising the identified change. The time taken to release the button would be automatically recorded and would represent the reaction times in detecting the changes. They were also informed that there would be a familiarisation trial and were reassured that the instructions would appear on the computer screen during each of the individual task trials.

*2.5.3 Experimental task.*

Specifically, the change blindness paradigm involved the successive presentation of the nine pairs of photographic stimuli (i.e. nine trials), each pair containing an original stimulus (OS) and a changed stimulus (ChS). The OS was presented for a duration of 240 milliseconds (ms), followed by a mask (i.e. a blank screen) for 80ms, then the ChS for 240 ms and finally the mask again for 80ms. This

four-stage cycle was repeated until participants indicated that they had detected the change between the photographs. The nine pairs of photographs were counterbalanced ensuring all possible orders of presentation were included, to control for confounding factors such as decreased levels of attention over time (Hinton, 1995).

At the end of the change blindness task, participants were asked to complete the SHAI (Salkovskis et al., 2002) and once the data had been analysed, all participants were contacted and debriefed about the true purpose of the study.

*2.6 Analytic Strategy*

*2.6.1 Excluded data.*

Data from 3 of the 80 participants completing the change blindness paradigm was excluded from statistical analyses. One participant did not meet the age inclusion criterion and another expressed concern about the flickering photographs inducing a migraine. A preliminary, visual exploration of the data to check for outlying values, also revealed that reaction times from a third person were of an exceptionally long duration. Consequently the data was excluded to prevent it distorting further statistical analyses (Barker et al., 2002). Data from the three filler trials containing two simultaneous neutral changes was also excluded from statistical analysis.

Of the remaining 77 participants, additional spurious data was also excluded where participants:

1) correctly identified both simultaneous health/illness-related and neutral changes
2) failed to correctly identify the health/illness-related or neutral change
3) accidently released the response button, prior to detecting a stimulus change

*2.6.2 Descriptive analyses.*

Descriptive statistical analyses were performed on the raw data, to inform all subsequent inferential analyses. Prior to performing further statistical analyses, the descriptive data were inspected to determine the distributions of scores, which in turn, informed the choice of performing either parametric or non-parametric inferential statistics.

*2.6.3 Inferential analyses – research strand one.*

A one-tailed, non-parametric Spearman's correlational analysis was used in order to examine the first two hypotheses:

1. There will be a significant negative correlation between level of health anxiety and reaction times in detecting changes to health/illness-related stimuli, in a change blindness paradigm.
2. There will be a significant positive correlation between level of health anxiety, and the number of health/illness-related stimuli changes detected, in a change blindness paradigm.

One tailed, non-parametric correlations were chosen because both hypotheses are directional (Hinton, 1995) and health anxiety scores and reaction times were ratio variables, with skewness values of greater than one, indicating positively skewed distributions (Morgan, Griego and Gloeckner, 2001).

*2.6.4 Inferential analyses – research strand two.*

Non-parametric, repeated measures statistical analyses were applied to evaluate the third hypothesis:

3. Across the whole sample, the frequency of correctly identified changes for each of the paired target items within the photographic stimuli will not be significantly greater than would be expected by chance

Binomial tests were applied to determine whether across the whole sample, the frequency of correctly identified changes for each of the paired target items was significantly greater than would be expected by chance. A non-parametric test was chosen because each participant was simultaneously presented with both types of target items (i.e. health/illness-related and neutral) and thereby produced two categorical yes/no responses in terms of the type of target item detected and not detected. Responses were then recoded to transform the data into numerical frequencies, using the values '1' for a yes response and '0' for a no response, before conducting the statistical analyses.

## Section 3: Results

### *3.1 Gender, age and SHAI scores*

In addition to the main research questions, data derived from the current study were also used to examine the relationship between gender differences and SHAI scores and age and SHAI scores.

#### *3.1.1 Gender and SHAI scores.*

Table 2. Mean SHAI scores for sample, males and females (n=77)

| | **SHAI Scores Sample (n=77)** | **SHAI Scores Males (n=34)** | **SHAI Scores Females (n=43)** |
|---|---|---|---|
| Mean | 11.68 | 10.68 | 12.49 |
| Std. Deviation | 6.43 | 6.40 | 6.42 |
| Minimum | 0.00 | 0.00 | 3.00 |
| Maximum | 31.00 | 31.00 | 29.00 |

In the current sample, the SHAI scores of the females were slightly higher than those of the males. The mean and standard deviation values are consistent with previous research examining the validity of the SHAI using a non-clinical sample (Salkovskis et al, 2002).

The skewness value of the sample's SHAI scores was 1.10, indicating that the distribution was markedly positively skewed, with more individuals obtaining lower rather than higher scores (Morgan, Griego and Gloeckner, 2001). As the distribution of SHAI scores was positively skewed, a Mann Whitney statistical analysis was selected to compare the SHAI scores of males and females.

The median ranked SHAI score for females (41.99) was higher than that of the males (35.22), indicating that overall, higher SHAI scores were found in the female

category. No significant difference however, was found between the median SHAI scores of males and females ($U = 602.50$, $N_1 = 34$, $N_2 = 43$, $p = 0.186$ ns).

*3.1.2 Age and SHAI scores.*

Table 3. Mean age in years (yrs), of sample (n=77)

| **Age in years (n=77)** | |
|---|---|
| Mean | 42.47 |
| Std. Deviation | 12.48 |
| Minimum | 18.00 |
| Maximum | 87.00 |

The skewness value of the distribution of ages across the sample was 0.39, indicating a normal distribution (Morgan et al, 2001).

The association between age and SHAI scores was examined via non-parametric statistical analysis, as the distribution of one of the variables, SHAI scores, was positively skewed. A one-tailed Spearman's correlation was therefore selected to analyse the data.

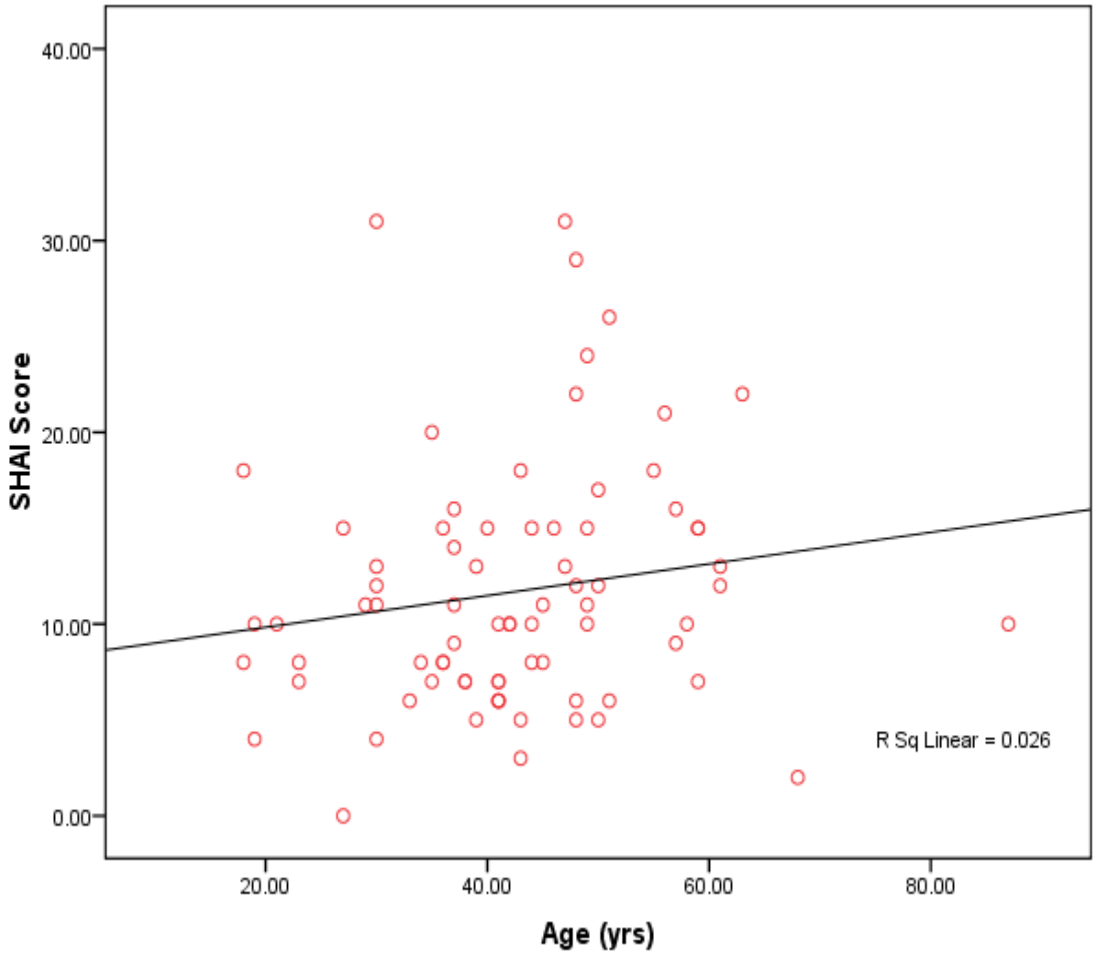


Figure. 5. Scatterplot of age and short health anxiety scores (n=77)

A significant positive correlation was found between SHAI scores and age (rho = 0.213, p = 0.031).

*3.2 Inferential Analyses – Research Strand one*

The following inferential statistical analyses correspond to the first two hypotheses, investigating the association between level of health anxiety and attentional bias towards external health/illness-related stimuli.

*3.2.1 Hypothesis 1.*

1. There will be a significant negative correlation between level of health anxiety and reaction times in detecting changes to health/illness-related stimuli, in a change blindness paradigm.

Table 4. Mean reaction times in milliseconds, in detecting health/illness-related and neutral stimulus changes, across all participants (n=77).

| | **Reaction Times for Health/illness-related Change Detections (ms)** | **Reaction Times for Neutral Change Detections (ms)** |
|---|---|---|
| Mean | 5512.53 | 5088.43 |
| Std. Deviation | 3069.46 | 2065.79 |
| Minimum | 2035.00 | 2662.00 |
| Maximum | 15561.00 | 12737.00 |

Altogether, there were fourteen missing values in the above data set, where participants correctly identified two changes, did not correctly identify the changes or took their finger off the response button prior to noticing a change. Skewness values of the reaction times for health/illness-related and neutral stimulus changes were 1.59 and 1.62 respectively, indicating that both distributions were positively skewed, with a greater cluster of scores around the shorter than longer reaction times, within the range (Morgan et al., 2001).

The association between reaction times in detecting both types of stimulus changes and SHAI scores was examined via non-parametric statistical analysis, as the

distributions of both variables were positively skewed. A one-tailed Spearman's correlation was therefore selected to analyse the data.

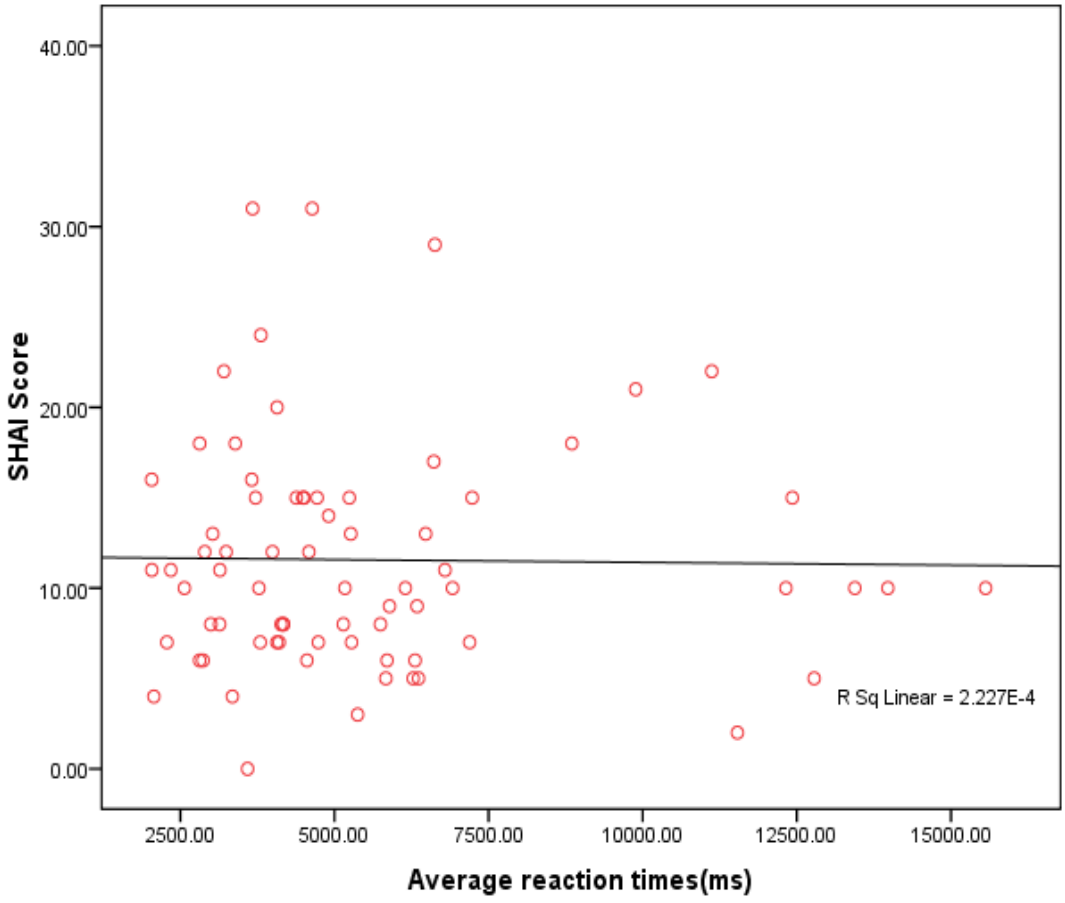


Figure 6. Scatterplot of average reaction times in detecting health/illness-related changes and SHAI scores

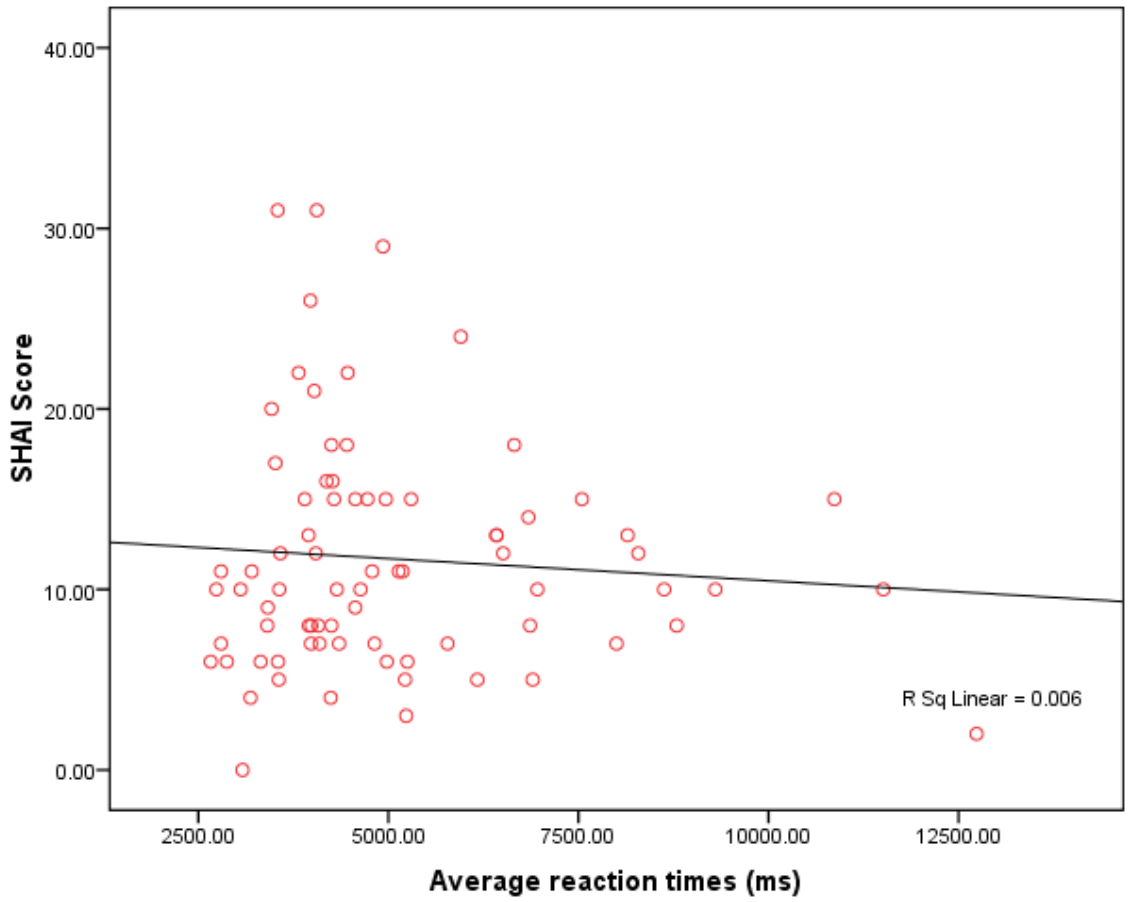


Figure 7. Scatterplot of average reaction times in detecting neutral stimuli and SHAI scores

No significant correlation was found between SHAI scores and reaction times in detecting health/illness-related changes (rho = -0.019, N = 73, p = 0.437 ns). No significant correlation was found between SHAI scores and reaction times in detecting neutral changes (rho = 0.054, N = 77, p = 0.321 ns). The results did not support the hypothesis that as SHAI scores increase, reaction times in detecting changes to health/illness-related stimuli decrease.

*3.2.2 Hypothesis 2.*

2. There will be a significant positive correlation between level of health anxiety and the number of health/illness-related stimuli changes detected, in a change blindness paradigm.

Table 5. Mean number of health/illness-related and neutral changes detected within the six experimental trials, across all participants (n=77)

| | **Number of health/illness-related changes detected** | **Number of neutral changes detected** |
|---|---|---|
| Mean | 2.22 | 3.57 |
| Std. Deviation | 1.10 | 1.08 |
| Minimum | 0 | 1 |
| Maximum | 5 | 6 |

Once again, there were 14 missing values. On average, across all participants, more neutral changes were detected than health/illness-related changes. The skewness value of the number of health/illness-related changes detected was 0.110 and that of the neutral changes was -0.157, both indicating that the scores were normally distributed (Morgan et al.,2001).

The association between the number of health/illness-related and neutral changes detected and SHAI scores was examined via non-parametric statistical analysis, as the distribution of SHAI scores was positively skewed. A one-tailed Spearman's correlation was therefore used to further examine the data.

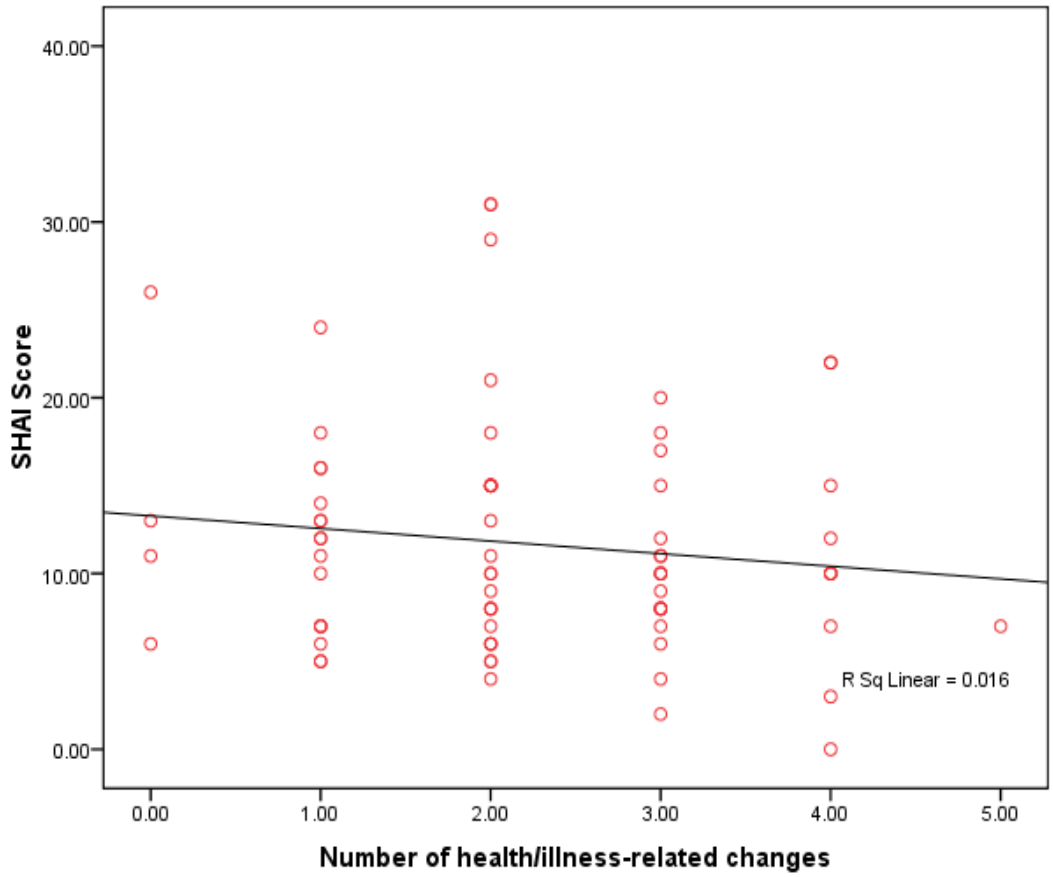


Figure 8. Scatterplot of SHAI scores and number of health/illness-related changes detected within the six experimental trials, across all participants (n=77)

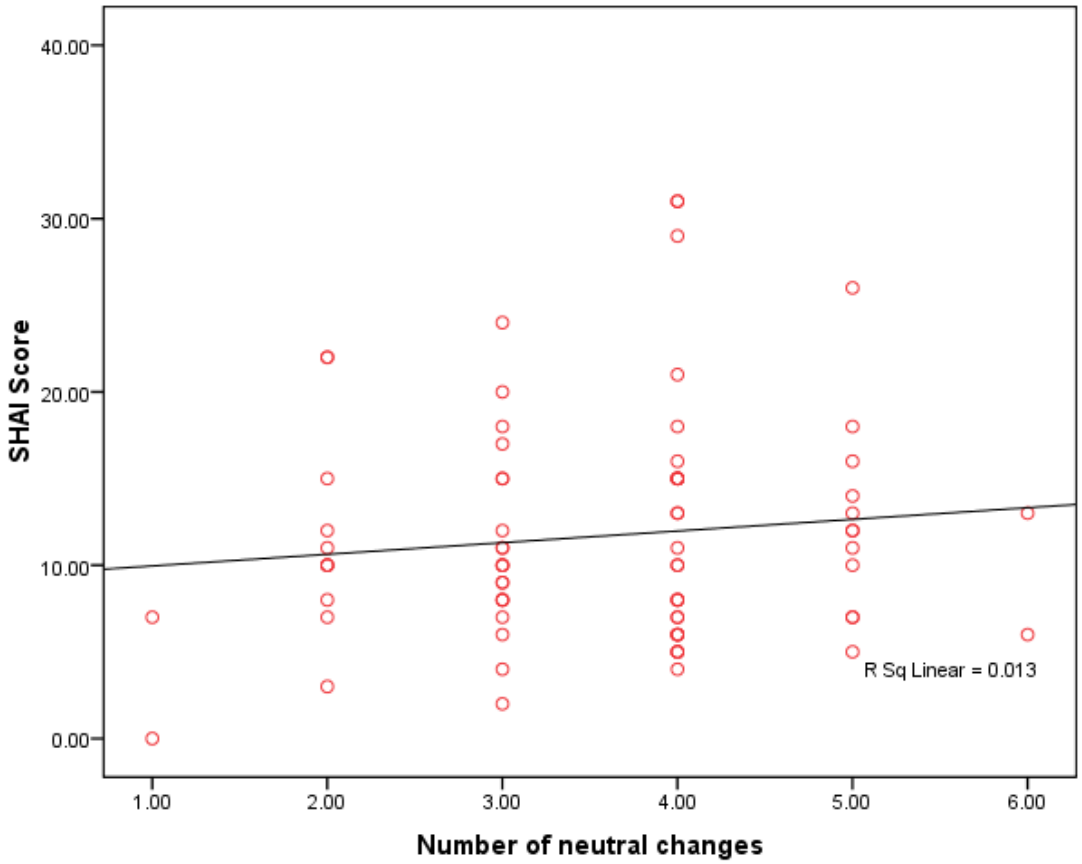


Figure 9. Scatterplot of SHAI scores and number of neutral changes detected within the six experimental trials, across all participants (n=77)

No significant correlation was found between SHAI scores and number of health/illness-related changes detected (rho = -0.108, N = 75, p = 0.175 ns). No significant correlation was found either between SHAI scores and number of neutral changes detected (r = 0.085, N = 77, p = 0.231 ns). The results therefore did not support the hypothesis that as SHAI scores increase, the number of health/illness-related changes detected increase.

*3.2.3 Additional inferential analyses.*

In addition to correlational analyses, the data derived from the current study was further examined to determine whether the mean number of health/illness-related

changes detected by individuals classified as health anxious, (using the SHAI score threshold of 15 and above), was greater than that of non-health anxious individuals (with a SHAI score of 14 or below).

Table 6. Mean number of health/illness-related changes detected within the six experimental trials, by health anxious and non-health anxious individuals (n=77)

| | **Health Anxious** | **Non-health Anxious** |
|---|---|---|
| **Number of Individuals** | 23 | 54 |
| **Mean** | 2.17 | 2.24 |
| **Standard Deviation** | 1.03 | 1.18 |

23 individuals obtained a SHAI score of 15 or above and were therefore classified as health anxious. The remaining 54 individuals obtained a SHAI score of 14 and were thus classified as non-health anxious. The mean number of health/illness-related changes detected was slightly higher for non-health anxious individuals.

As the scores were normally distributed, a parametric statistical analysis was used to compare the mean number of health/illness-related changes detected by the health anxious and non-health anxious individuals. A‘t’ test was therefore applied and as Levine’s test for equality of variances proved to be non-significant, equal variances were assumed (Morgan et al., 2001).

No significant difference was found between the number of health/illness-related changes detected by the health anxious and non-health anxious individuals ($t = 0.236$, $df = 75$, $p = 0.814$ ns).

As discussed previously however, it was not possible to obtain a complete data set for each participant during the current study. This was either because of individuals

making incorrect guesses, taking their finger off the response button before identifying a change or noticing both the health/illness-related and neutral changes simultaneously. Thus, although the previous analysis suggested that there was no difference between the number of health/illness-related changes detected between health anxious and non-health anxious individuals, the data did not reflect the overall proportion of health/illness-related to neutral changes detected by each participant. By converting the data into percentages however, it was possible to determine the overall proportion of health/illness-related changes out of the total number of correct responses provided by each individual. It was then possible to compare the overall mean percentage of health/illness-related changes detected in the health anxious and non-health anxious individuals.

Table 7. Mean percentage of health/illness-related changes detected by health anxious and non-health anxious individuals (n=77)

| | **Health Anxious** | **Non-health Anxious** |
|---|---|---|
| **Number of Individuals** | 23 | 54 |
| **Mean** | 37.01 | 38.63 |
| **Standard Deviation** | 16.62 | 19.87 |

Non-health anxious individuals detected slightly more health/illness-related changes, than health anxious individuals. As the skewness value of the percentage of health/illness-related changes detected indicated that the data was normally distributed, a 't' test was applied to compare the mean percentage of health/illness-related changes detected by the health anxious and non-health anxious individuals (Morgan et al., 2001). Levine's test for equality of variances proved to be non-significant, therefore equal variances were assumed (Morgan et al., 2001).

No significant difference was found between the overall mean percentage of health/illness-related changes detected by health anxious and non-health anxious individuals ($t = 0.343$, $df = 75$, $p = 0.733$ ns).

*3.3 Inferential Analyses – Research Strand Two*

The following inferential statistical analyses correspond to the third hypothesis, considering the influence of confounding variables when evaluating the clinical utility of the change blindness paradigm as a research tool for clinical psychologists.

*3.3.1 Hypothesis 3.*

3. Across the whole sample, the frequency of correctly identified changes for each of the paired target items within the photographic stimuli will not be significantly greater than would be expected by chance.

Across the sample, the percentage of correct responses in identifying the elastic bandage was 64. The percentage of correct responses in identifying the four cheese mix was 36. A binomial statistical analysis revealed a significant difference in the frequency of correctly identified changes to the elastic bandage and four cheese mix, compared to the frequencies expected by chance ($p = 0.024$).

The percentage of correct responses in identifying the paracetamol was 20. The percentage of correct responses in identifying the mackerel was 80. A binomial statistical analysis revealed a significant difference in the frequency of correctly identified changes to the paracetamol and mackerel, compared to the frequencies expected by chance ($p = 0.000$).

The percentage of correct responses in identifying the crisps was 84. The percentage of correct responses in identifying the first aid kit was 16. A binomial statistical analysis revealed a significant difference in the frequency of correctly

identified changes to the crisps and first aid kit, compared to the frequencies expected by chance ($p = 0.000$).

The percentage of correct responses in identifying the diarrhoea relief was 53. The percentage of correct responses in identifying the mobile phone was 47. A binomial statistical analysis revealed that there was no significant difference in correctly identified changes to the diarrhoea relief and mobile phone, compared to the frequencies expected by chance ($p = 0.644$).

The percentage of correct responses in identifying the cold/flu remedy was 37. The percentage of correct responses in identifying the shower gel was 63. A binomial statistical analysis revealed a significant difference in the frequency of correctly identified changes to the shower gel and cold/flu remedy, compared to the frequencies expected by chance ($p = 0.034$).

The percentage of correct responses in identifying the plasters was 39. The percentage of correct responses in identifying the bubble bath was 61. A binomial statistical analysis revealed that there was no significant difference in correctly identified changes to the bubble bath and the plasters, compared to the frequencies expected by chance ($p = 0.064$).

## Section 4: Discussion

### *4.1 Summary of Research Findings*

There were two main strands to the current research. The first was to apply the change blindness paradigm, to explore the relationship between health anxiety and attentional bias towards health/illness-related stimuli. The second was to evaluate the clinical utility of the change blindness paradigm as a research tool for clinical psychologists investigating attentional bias in health anxiety and other psychological or clinical conditions. The following discussion is therefore a summary and interpretation of the findings, in relation to the two main strands.

#### *4.1.1 Demographic Data.*

Analyses of demographic data revealed a statistically significant, positive correlation between age and SHAI score, indicating that health anxiety increases with age. No statistically significant difference was found however between the mean SHAI scores of males and females

#### 4.1.2 *Inferential Data – research strand one.*

Inspection of the inferential analyses reveals that no associations were found between health anxiety scores and reaction time in detecting changes to health/illness-related stimuli, or health anxiety scores and number of health/illness-related change detections, in the change blindness paradigm. As such, the results suggest that as health anxiety increases, reaction times in detecting changes to health/illness-related stimuli do not decrease and that as health anxiety increases, the number of health/illness-related stimuli detected, as opposed to neutral stimuli, do not increase.

Furthermore, no significant difference was found between number of health/illness-related change detections, when comparing individuals with higher and lower health anxiety scores.

If reaction times and number of change detections in the change blindness paradigm are accepted as being observable representations of an underlying attentional bias, the current study did not find converging evidence of an attentional bias towards health/illness-related stimuli in health anxious individuals.

#### *4.1.3 Inferential Data – Research Strand Two.*

Inspection of the exploratory analyses examining the effects of potential confounding variables, reveals some evidence supporting the presence of stimuli selection bias in the current study. Across the whole sample, some of the target items within the experimental trials were consistently correctly detected significantly more frequently than would have been expected by chance indicating that they were generally more salient than others.

### *4.2 Interpretation of Findings*

#### *4.2.1 Suitability of Sample.*

A non-clinical population was recruited for the current study essentially for two main reasons. The first was because previous research suggests that many individuals with health anxiety are actually embedded within the general, non-clinical population (London School of Economics, 2006). The second was because using non-clinical individuals is thought to reduce the likelihood that any health anxiety is confounded by actual health conditions (Abramowitz, Deacon and Valentiner, 2007). The preferred population from which to recruit the current sample were members of a private health club. The rationale for preferring to recruit from this sample was based on the proposal by Karoly and Lecci (1993) that individuals with health anxiety tend to pursue more health-related goals.

According to the SHAI scoring criteria, a score between 15 and 17 indicates that the individual is very health anxious, whilst scores of 18 and above represent clinical

health anxiety or hypochondriasis (Warwick and Salkovskis, 1990). Scores within the current sample ranged from 0 to 31, 30% of which were 15 and above. The scores therefore add support to the notion of health anxious individuals being embedded within the so called general, non-clinical population and that such individuals do indeed pursue health-related goals. Moreover, the current sample was also demographically diverse in terms of age, gender and ethnicity. As such, although the sample might be considered homogenous, in that the individuals were all members of a private health club, both demographic diversity and variation in SHAI scores would appear to be reflective of the wider population, providing scope for generalising the results.

That being so, the absence of supporting evidence for an attentional bias towards health/illness-related stimuli is unlikely to be because the sample is not representative of the general population in which health anxious individuals are embedded. Indeed, the diversity across age, gender and SHAI scores in the current sample, arguably facilitates comparison of the performance of sub-sets of health anxious and non-health anxious individuals within the sample (Clark-Carter, 1997).

*4.2.2 Suitability of research setting and experimental paradigm.*

The preferred research setting in which to conduct the current study was the private health club. The rationale for conducting the research actually within the health club was based on the prediction that stimuli within the surrounding environment might naturally activate health-related schemas, thereby alleviating the need for artificial induction, as has been applied in previous research (Lecci and Cohen, 2002).

Experimental paradigms are reputed to be particularly suitable for examining attentional bias (Williams, 1999). Given that much of human cognition and behaviour is context dependent however, experimental stimuli which simulate naturalistic, real-life phenomena are currently favoured.

As previously discussed, given the ecological validity (Rizzo, Sparks, McEvoy, Viamonte, Kellison and Vecera, 2009) and adaptability (Jones et al., 2002) of the change blindness paradigm, it was the preferred method of investigation for the current study.

The process of adapting the change blindness paradigm to examine attentional bias in health anxious individuals required the development of specific photographic stimuli containing both health/illness-related and neutral items. The inherent challenge in doing so was the need to preserve ecological validity by developing suitable stimuli which were reflective of real world visual phenomena. Generation of ideas and careful preparation of the photographic stimuli were thus found to be particularly challenging.

The actual implementation of the change blindness paradigm requires the installation of the E-Prime version 1.1 computer software application. The portable nature of laptop computers however, enables the paradigm to be implemented in different research settings and as such proved to be invaluable in the current study.

A major advantage of implementing the change blindness paradigm to examine attentional bias was that it involved the completion of a quick, easy and seemingly enjoyable task, facilitating the recruitment of participants. Furthermore, in framing the paradigm as a spot-the-difference type task examining concentration levels, it was also possible to implement the paradigm without revealing the true purpose of the experiment and without any obvious signs of scepticism from the participants.

If the change blindness paradigm has construct validity in operationalising shorter change detection times as a reliable indicator of visual attentional bias towards salient stimuli, then no evidence of an attentional bias towards health/illness-related stimuli was found in the current study, despite 30% of the sample being categorised as health anxious. It is essential to bear in mind however, that previous research has

shown that individuals do sometimes fail to detect changes to objects of central interest (Simons and Levin, 1997), thereby bringing into question the construct validity of the paradigm.

*4.2.3 Suitability of Stimuli.*

According to coherence theory (Rensink, 2000), only the most salient aspects of, or items within the visual scene are attended to and will become stable representations within the visual system. If health anxious individuals preferentially attend to health/illness-related items, one might predict that the greater the disparity between the extent to which items within the visual scene are health-related or neutral, the more pronounced should be any attentional bias.

A statistically significant difference was found between the mean ratings of the health/illness-related and neutral target items, used in the current study, in terms of the extent to which they were considered to be health/illness-related, yet no attentional bias was found.

Further exploratory analyses however, revealed that within four of the six experimental trials, the frequencies with which each of the target stimuli were correctly detected were significantly different from the frequencies expected by chance, indicating the presence of a potential confounding variable.

The reasons for some stimuli being consistently detected more frequently than others in the current study can only be speculated. One possibility might be that some of the stimuli used were genuinely more salient or that individuals were more familiar with some stimuli. Indeed, one limitation of coherence theory is that is does not appear to provide an explanation for the process by which equally salient, and thus competing visual stimuli are preferentially selected and attended to.

Alternatively, close inspection of the target items reveals slight variations in terms of size, shape and colour, which in turn inadvertently imposes slight asymmetry within the photographic stimuli. Visual information processing is thought to utilise these kinds of perceptual features (Rensink, 2002). It is therefore essential that attentional bias cannot be explained in terms of preference for any of these cues when implementing the change blindness paradigm (Rensink, 2002). Real world visual scenes however, are rarely symmetrical thus endeavouring to create perfectly symmetrical photographic stimuli compromises the ecological validity of the paradigm.

Identifying the presence of potential confounding variables in the current study, undoubtedly constrains the extent to which the research questions can be fully and accurately addressed. Tighter methodological control offers one solution to minimising potential confounds, though possibly at the expense of ecological validity. The current study therefore, perhaps highlights the technical intricacies involved in successfully implementing the change blindness experimental paradigm to explore attentional bias in clinical conditions.

*4.2.4 Suitability of Psychometric Tool.*

30% of the sample used in the current study scored above the threshold recommended for identifying health anxiety on the SHAI (Salkovskis, Rimes, Warwick and Clark, 2002). The scale proved to be quick and easy to administer and entirely appropriate given the exploratory nature of the study. Despite using a non-clinical sample, it was anticipated that there would be both health anxious and non-health anxious individuals, some of whom would be time constrained. A brief, validated, psychometric tool, sensitive to normal levels of health concern and health anxiety therefore appeared to satisfy research requirements, without any obvious great costs to the participants. It is possible however, that evidence for an attentional bias towards

health/illness-related stimuli might have been found, if another psychometric tool had been administered.

Several alternative, validated scales exist such as the Whiteley Index (Pilowsky, 1967), the Illness Attitude Scale (Kellner, 1986) etc. That said, the fact that a number of alternative measures exists suggests a lack of clarity about the construct of health anxiety and also many alternative measures were developed for use with a clinical population.

The SHAI however, was derived from the longer Health Anxiety Inventory (HAI) (Warwick and Salkovskis, 1990). The additional quantitative data contained within the HAI might therefore produce a different distribution of scores, which in turn might reveal an attentional bias. Given that the HAI is also a validated psychometric tool, sensitive to normal levels of health concern through to hypochondriasis, it would seem to be an appropriate alternative to the SHAI for extending the current exploratory research.

It should be noted however, that previous research studies using the change blindness paradigm to explore attentional bias towards substance-related stimuli in alcohol and cannabis users, compared reaction times with a behavioural measure of alcohol and substance consumption. The behavioural measure was used to define the level of alcohol and substance use. The current study compared reaction times with a cognitive measure of health anxiety. Although alcohol and cannabis consumption is perhaps a useful measure in identifying an attentional bias towards substance-related stimuli, it is possible that a cognitive measure might not have been adequate. On the other hand, it is possible that a behavioural measure of health anxiety might be a more useful measure in identifying an attentional bias towards health/illness-related stimuli. Unfortunately however, although the Illness Behaviour Questionnaire (Pilowsky and

Spence, 1975) has been used in the past to measure 'abnormal illness behaviour', the scale was not developed specifically for behaviours associated with health anxiety (Salkovskis et al., 2002). Given that a cognitive behavioural conceptualisation clearly differentiates between the cognitive and behavioural elements of health anxiety, there appears to be some scope perhaps for the development of a reliable and valid behavioural measure to supplement the existing cognitive measures.

### 4.3 *Clinical Utility of the Change Blindness Paradigm*

One of the aims of the current study was to evaluate the clinical utility of the change blindness paradigm. When undertaking research, a range of methods need to be available to clinical psychologists, from which they must select the most appropriate in answering their research question (Barker et al., 2002). Clearly, the change blindness paradigm does not rely on self-report and as such, it appears to be well suited to the investigation of attentional bias. Furthermore, the experimental nature of the paradigm, affords the researcher some degree of control, thereby minimising the influence of extraneous variables.

Adapting the change blindness paradigm to explore health anxiety involved developing the appropriate photographic stimuli and importing the stimuli into the E-Prime version 1.1 software application. Implementing the paradigm proved to be relatively straightforward and task completion took less than ten minutes, including completing the SHAI. The paradigm therefore proved to have practical utility in that it was a convenient research method for the researcher, without imposing an unacceptable burden on participants.

In addition to evaluation of the practical utility of the change blindness paradigm, another essential aspect to consider is the incremental value of the research findings in contributing to existing knowledge of the development and maintenance of

health anxiety. Clinical psychology research should go beyond a symptom-based, diagnostic approach to understanding clinical conditions and therefore examining the role of psychological phenomena such as attention in contributing to the development and maintenance of health anxiety is important. The limitations of previous experimental methods such as the visual dot probe, degraded word and Stroop tasks and the improved ecological validity of the change blindness paradigm, arguably guarantees the incremental value of any research findings.

In order to have incremental value however, the findings must be derived from a paradigm with internal and external validity, as well as ecological validity. Internal validity refers to the extent to which changes in the dependent variable can be attributed to the independent variable (Barker et al., 2002). External validity refers to the extent to which the findings can be generalised to other individuals, settings and over time (Barker et al., 2002).

Clearly, the results of the exploratory analyses revealing the presence of a potential confounding variable constrains the extent to which it is possible to attribute reaction times and preference for certain stimuli to a specific stimulus category (i.e. health/illness-related or neutral). Similarly, in the absence of additional verbal confirmation it was not known whether the identified change detected was indeed the actual item of central interest (Rensink, 2002). Given that there were two health/illness-related items within the photographs, only one of which was omitted in the changed stimuli, it is possible for example, that health anxious individuals actually spent more time attending to the other health/illness item than anything else but this was clearly not captured by purely asking them to identify the missing item. These issues therefore cast some doubt on the internal validity of the change blindness paradigm.

Similarly, although the change blindness paradigm is considered to have higher ecological validity than alternative experimental paradigms, the extent to which attentional allocation during the task reflects attentional allocation during everyday interaction with the visual world, can only be speculated. When interacting with the real world, for example, cognition and behaviour is derived from parallel information processing across several sensory modalities and is often situation specific. Examination of visual attentional bias in isolation, using a spot-the-difference type computerised task, somewhat compromises the external validity of the change blindness paradigm. Operationalising the psychological construct of attentional bias by identifying a reliable indicator such as reaction times, affords the paradigm some internal validity. If, however, attentional allocation within the experimental task is not reflective of attentional allocation to external stimuli in the real world, the findings are unlikely to add incremental value to existing research.

In summary then, when evaluating the clinical utility of the change blindness paradigm, the current study produced mixed findings. The paradigm appears to have practical utility and can be administered without causing unnecessary inconvenience to participants. Conversely, the technicality involved in eliminating confounding variables within photographic stimuli, should not be underestimated and requires knowledge of information processing within the visual system. Similarly, the extent to which internal and external validity of the paradigm is compromised, constrains the incremental value of new research findings.

### *4.4 Strengths and Limitations of Current Study*

#### *4.4.1 Strengths.*

In order to conduct the current research, it was necessary to develop an integrated theoretical framework, bringing together elements of the coherence theory of

visual attentional processing, with a cognitive behavioural explanation of health anxiety. Previous research focusing on the management of somatisation in primary care has emphasised the need to develop more comprehensive, non-blaming, tangible explanations (Shilte, Portegijs, Blankenstein and Knottnerus, 2000; Kroenke, Sptizer, Degruy and Swindle, 1998), which expose potential psychological elements (Taylor and Mann, 1999). Although the current study did not find evidence of an attentional bias, the integrated framework might prove to be a helpful biopsychosocial conceptualisation of health anxiety for both health professionals and health anxious individuals. Indeed, lack of understanding and diagnostic uncertainty generates frustration for both doctors and patients (Khan, Khan, Harezlak, Tu and Kroenke, 2003). Furthermore, the integrated framework encapsulates attentional allocation as a psychological process underpinning health anxiety, which might be helpful in normalising the condition, rather than labelling it as a disorder and subsequently facilitate acceptance of psychological, rather than medical, intervention.

Additionally, 30% of participants in the sample were classified as very health anxious, according to the SHAI scoring criteria. The current study therefore highlights the importance of the dissemination of biopsychosocial formulations of health anxiety within the wider, non-clinical population. Moreover, the current study also highlights the necessity of conducting research using non-clinical populations, to enable findings to be extrapolated to the wider population, many of whom do not access health services.

Evaluation of the change blindness paradigm also revealed the methodological strengths and weaknesses of the approach, in terms of its clinical utility. After receiving a brief explanation of the research task, the majority of individuals approached were willing to participate in the study. The short duration and simplicity of the task appeared to be important, attractive factors when recruiting participants. Furthermore,

during testing many people commented about how enjoyable they had found the task and everyone provided contact details to receive follow-up information. This highlights the potential value of using convenient, experimental methods within psychological research.

That said, the current study revealed the technical intricacies in implementing the change blindness paradigm and internal/external validity issues, which on balance, at present may compromise its clinical utility as a research tool for clinical psychologists.

*4.4.2 Limitations.*

Although it is possible to implement the change blindness paradigm outside the laboratory setting using a laptop computer, the separate response button mechanism proved to be far from ideal. To recap, participants were instructed to depress the response button at the start of the task and not to release the button until a change had been detected. On those occasions where participants unintentionally released the button prior to detecting a change, spurious data were produced which had to be eliminated from further analysis. Appropriate modification of the equipment could resolve this issue, however clearly, this would require additional technical expertise.

Similarly, a further limitation of the current study was the extent to which colour, size, shape and familiarity of the target items within the photographic stimuli might have served as confounding variables. Although the perceptual features of the items within each photograph were matched as much as possible and the photographs were symmetrically balanced, superficial knowledge visual processing, can make it difficult to judge the appropriateness of the photographic stimuli. The current study therefore highlights the necessity of clinical psychologists working collaboratively with

other professionals with a greater depth of knowledge of visual processing, when implementing the change blindness paradigm as a research tool.

Simons and Levin (1997) however, raise an important point following previous research showing that changes can be made to items of central interest, without actually being detected. Participants in the current study were not directly asked to recall any specific items they had noticed within the photographs. Perhaps if they had been asked this question, it would have been possible to determine whether any of these were target items but not the ones they had identified as the changed stimulus. Clearly such questioning might be helpful in evaluating the internal validity of the change blindness paradigm.

## Section 5: Conclusion

In the current non-clinical sample, no evidence was found for an attentional bias towards health/illness-related stimuli, as the level of health anxiety increased. These findings challenge the validity of the integrated formulation proposed earlier. It is possible however, that attending a gym is an adaptive coping mechanism which moderates health worries and anxiety levels. According to Moos and Schaefer's (1987, cited by Ogden, 2000) self-regulatory model when individuals feel anxious because of a perceived threat of illness, they are likely to engage in coping behaviours, in an attempt to manage the threat. Coping behaviours however can be adaptive or maladaptive and as such might influence the extent to which health anxiety is experienced as a transitory or chronic condition. Robbins and Kirmayer (1996) support the notion that whilst health anxiety can often be a chronic condition, for a subset of health anxious individuals, health anxiety is only transient. It is therefore possible that engaging in regular exercise might represent an adaptive coping behaviour moderating health anxiety which is thus purely a transient experience. Conversely, reassurance or information seeking might represent a maladaptive coping behaviour unlikely to moderate health anxiety, which therefore becomes persistent. Consequently, the current sample differed from samples used in previous research using the change blindness paradigm in the sense that other samples included individuals who were and were not engaging in adaptive health behaviours (Jones et al., 2002; Jones et al., 2006). Hence, although 30% of the current sample was classified as being very heath anxious, the homogeneity of the sample, in terms of their engagement in an adaptive coping behaviour, might constrain the extent to which it was representative of the general health anxious population.

In terms of evaluating the clinical utility of the change blindness paradigm, the findings of the current study suggest further research is required. It is important to acknowledge for example, that the paradigm focuses purely on a single visual perceptual task, as opposed to a wider more natural range of perceptual processing, which presumably occurs across different sensory modalities, during interaction with the real world. The extent to which the paradigm has external validity as a clinical research tool is therefore unclear.

Furthermore, the current study has highlighted areas where there seems to be scope for modifying the change blindness paradigm. In particular, prior to developing the photographic stimuli, it might be prudent to run a pilot study whereby individuals could be asked to rate target items in terms of how familiar they are and how similar in colour, size and shape they perceive them to be. A pilot study might thus be helpful in minimising the effects of confounding variables.

A further modification worthy of consideration is the extent to which simple versus more complex photographic stimuli might increase the sensitivity of the change blindness paradigm as a method of examining attentional bias. Photographic stimuli in the current study were relatively simple, focusing on one object and its contents. It is possible however, that photographs of more complex visual scenes might yield a different set of results.

In conclusion, the change blindness paradigm has been shown to have practical value as a research tool for clinical psychologists. Clearly however, further work has yet to be done in order to ensure that it has internal and external validity as a method of examining attentional bias in clinical conditions.

## Section 6: References


Abramowitz, J. S., Schwartz, A & Whiteside, S. P (2002). A contemporary and conceptual model of hypochondriasis. *Mayo Clinic Proceedings,* 77, 1323-1330.

Abramowitz, J. S., Deacon, B. J & Valentiner (2007). The short health anxiety inventory: psychometric properties and construct validity in a non-clinical sample. *Cognitive Therapy Research,* 31, 871-883.

American Psychiatric Association, (2002) Diagnostic *and Statistical Manual of Mental Disorders.* American Psychiatric Association.

Barker, C., Pistrang, N & Eliott, R (2002). *Research Methods in Clinical Psychology.* John Wiley & Sons Ltd.

Brown, H. D., Kosslyn, S. M., Delamater, B., Fama, J & Barksy, A. J (1999). Perceptual and memory biases for health-related information in hypochondriacal individuals. *Journal of Psychosomatic Research,* 47(1), 67-78.

Clark-Carter, D (1997). *Doing Psychological Research from Design to Report*. Psychology Press Ltd.

Cohen, J (1992). Quantitative methods in psychology: A power primer. *Psychological Bulletin,* 112(1), 155-159.

Department of Health (2008). *Improving access to psychological therapies commissioning toolkit.* Retrieved January 2010 from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_084065

Dijksterhuis, A & Smith, D. K (2002). Affective habituation: subliminal exposure to extreme stimuli decreases their extremity. *Emotion*, 2(3), 203-214.

Fink, P & Rosendal, M (2008). Recent developments in the understanding and management of functional somatic symptoms in primary care. *Current Opinion in Psychiatry*, 21, 182-188.

Hall, J & Llweleyn, S (2006). *What is Clinical Psychology?* Oxford University Press.

Hinton, P. R (1995). *Statistics Explained.* Routledge.

Jones, B. C., Jones, B. T., Blundell, L & Bruce, G (2002). Social users of alcohol and cannabis who detect substance-related changes in a change blindness paradigm report higher levels of use than those detecting substance neutral changes. *Psychopharmacology*, 165, 93-96.

Jones, B. T., Jones, B. C., Smith, H & Copley, N (2003). A flicker paradigm for inducing change blindness reveals alcohol and information processing biases in social users. *Addiction*, 98, 235-244.

Jones, B. T., Bruce, G., Livingstone, S & Reed, E (2006). Alcohol-related attentional bias in problem drinkers with the flicker change blindness paradigm. *Psychology of Addictive Behaviours.* 20(2), 171-177.

Karademas, E. C, Christopoulou, S., Dimostheni, A & Pavlu, F (2008). Health anxiety and cognitive interference: evidence from the application of a modified Stroop task in two studies. *Personality and Individual Differences,* 44, 1138-1150.

Karoly, P & Lecci, L (1993). Hypochondria and somatisation in college women: a personal projects analysis. *Health Psychology,* 12(2), 103-109.

Kellner, R (1986). *Somatisation and Hypochondriasis.* Praeger.

Khan, A. A., Khan, A., Harezlak, J., Wanzhu, M. S & Kroenke, K (2003). Somatic symptoms in primary care: aetiology and outcome. *Psychosomatics,* 44(6), 471-478.

Lecci, L & Cohen, D (2002). Perceptual consequences of an illness concern induction and its relation to hypochondriacal tendencies. *Health Psychology*, 21(2), 147-156.

Lecci, L & Cohen, D (2007). Altered processing of health-threat words as a function of hypochondriacal tendencies and experimentally manipulated control beliefs. *Cognition and Emotion,* 21(1), 211-224.

Lees, A., Mogg, K & Bradley, B. P (2005). Health anxiety, anxiety sensitivity and attentional biases for pictorial and linguistic health-threat cues. *Cognition and Emotion,* 19(3), 453-462.

London School of Economics (2006). *The depression report: a new deal for depression and anxiety disorders.* The Centre for Economic Performance's Mental Health Policy Group.

Morgan, G. A., Griego, O. V & Gloeckner, G. W (2001). *SPSS for Windows: An Introduction to Use and Interpretation in Research.* Lawrence Erlbaum Associates Inc.

Noyes, R. Jr., Stuart, S., Langbehn, D. R., Happel, R. L., Longley, S. L & Yagla, S. J (2002). Childhood antecedents of hypochondriasis. *Psychosomatics,* 43, 282-289.

Ogden, J (2000). *Health Psychology: A Textbook.* Open University Press.

Owens, K. M. B., Asmundson, G. J. G., Hadjistavropoulos, T & Owens, T. J (2004). Attentional bias toward illness-threat in individuals with elevated health anxiety. *Cognitive Therapy and Research,* 28(1), 57-66.

Pilowsky, I (1967). Dimensions of hypochondriasis. *British Journal of Psychiatry,* 113, 89-93.

Pilowsky, I & Spence, N. D (1975). Patterns of illness behaviour in patients with intractable pain. *Journal of Psychosomatic Research,* 19, 279-287.

Rensink, R. A (2000). Seeing, sensing and scrutinising. *Vision Research*, 40, 1469-1487.

Rensink, R. A (2002). Change detection. *Annual Review of Psychology*, 53, 245-277.

Rizzo, M., Sparks, J., McEvoy, S., Kellison, I., Vecera, S. & Viamonte, S (2009). Change blindness, ageing and cognition. *Journal of Clinical and Experimental Neuropsychology*, 31(2), 245-256.

Robbins**,** J. M & Kirmayer, L. J (1996). Transient and persistent hypochondriacal worry in primary care. *Psychological Medicine*, 26(3), 575-589.

Salkovskis, P. M., Rimes, K. A., Warwick, H. M. C & Clark, D. M (2002). The health anxiety inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. *Psychological Medicine*, 32, 843-853.

Shilte, A. F., Portegijs, P. J. M., Blankenstein, A. H & Knottnerus, J. A (2000). Somatisation in primary care: clinical judgment and standardised measurement compared. *Social Psychiatry Epidemiology*, 35, 276-282.

Simons, D. J & Levin, D. T (1997). Change blindness. *Trends in Cognitive Sciences*, 1(7), 261-267.

Snyder & Nussbaum, 1998. *Clinical Neuropsychology: A Pocket Handbook for Assessment.* American Psychological Association.

Taylor, R. E & Mann, A. H (1999). Somatisation in primary care. *Journal of Psychosomatic Research,* 47(1), 61-66.

Van den Heuval, O. A. Veltman, D. J., Groenewegen, H. J., Witter, M. P., Merkelbach, J., Cath, D. C., Van Balkom, A. J. L. M., Van Oppen, P & Van Dyck, R (2005). Disorder specific neuroanatomical correlates of attentional bias in obsessive compulsive disorder, panic disorder and hypochondriasis. *Archives of General Psychiatry,* 62, 922-933.

Warwick, H. M. C & Salkovskis, P. M (1990). Hypochondriasis. *Behaviour Research Therapy,* 28(2), 105-117.

Williams, J. M. G., Watts, F. N., Macleod, C & Mathews, A (1999). *Cognitive Psychology and Emotional Disorders.* John Wiley & Sons Ltd.

Williams, P (2004). The psychopathology of self-assessed health: a cognitive approach to health anxiety and hypochondriasis. *Cognitive Therapy and Research,* 28(5), 629-644.

Witthoft, M. Rist, F & Bailer, J (2008). Enhanced early emotional intrusion effects and proportional habituation of threat response for symptom and illness words in college students with elevated health anxiety. *Cognitive Therapy Research,* 32, 818-842.

## Section 7: Appendices

### Appendix A

Tables showing health related ratings of target items in photographic stimuli

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Paracetamol | 5 | 5 | 5 | 5 | 5 |
| Cold/flu remedy | 4 | 5 | 5 | 5 | 5 |
| Elastic bandage | 4 | 5 | 5 | 5 | 5 |
| First aid kit | 4 | 5 | 5 | 5 | 5 |
| Diarrhoea relief | 5 | 5 | 5 | 5 | 4 |
| Plasters | 4 | 5 | 5 | 5 | 5 |
| Mean | 4.33 | 5 | 5 | 5 | 4.83 |

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| shower gel | 1 | 1 | 1 | 1 | 1 |
| four cheese | 1 | 1 | 2 | 1 | 1 |
| mackerel | 1 | 1 | 1 | 1 | 1 |
| mobile phone | 1 | 1 | 1 | 1 | 1 |
| bubble bath | 1 | 1 | 1 | 1 | 1 |
| crisps | 1 | 1 | 1 | 1 | 1 |
| Mean | 1 | 1 | 1.17 | 1 | 1 |

* Five students were asked how health related they would rate the target items using the following scale:

1 = not at all

2 = not much

3 = somewhat

4 = much

5 = very much

**Appendix B**

## **Health Anxiety Inventory** (short version)

Each question is this section consists of a group of four statements. Please read each group of statements carefully and then select the one which best describes your feelings, over the past six months. Identify the statement by ringing the letter next to it, i.e. if you think that statement (a) is correct, ring statement (a) ; it may be that more than one statement applies, in which case, please ring any that are applicable.

1. (a) I do not worry about my health.
   (b) I occasionally worry about my health.
   (c) I spend much of my time worrying about my health.
   (d) I spend most of my time worrying about my health.

2. (a) I notice aches/pains less than most other people (of my age).
   (b) I notice aches/pains as much as most other people (of my age).
   (c) I notice aches/pains more than most other people (of my age).
   (d) I am aware of aches/pains in my body all the time.

3. (a) As a rule I am not aware of bodily sensations or changes.
   (b) Sometimes I am aware of bodily sensations or changes.
   (c) I am often aware of bodily sensations or changes.
   (d) I am constantly aware of bodily sensations or changes.
4. (a) Resisting thoughts of illness is never a problem.

   (b) Most of the time I can resist thoughts of illness.
   (c) I try to resist thoughts of illness but am often unable to do so.
   (d) Thoughts of illness are so strong that I no longer even try to resist them.

5. (a) As a rule I am not afraid that I have a serious illness.
   (b) I am sometimes afraid that I have a serious illness.
   (c) I am often afraid that I have a serious illness.
   (d) I am always afraid that I have a serious illness.

6. (a) I do not have images (mental pictures) of myself being ill.
   (b) I occasionally have images of myself being ill.
   (c) I frequently have images of myself being ill.
   (d) I constantly have images of myself being ill.

7. (a) I do not have any difficulty taking my mind off thoughts about my health.
   (b) I sometimes have difficulty taking my mind off thoughts about my health.
   (c) I often have difficulty in taking my mind off thoughts about my health.
   (d) Nothing can take my mind off thoughts about my health.

8. (a) I am lastingly relieved if my doctor tells me there is nothing wrong.

(b) I am initially relieved but the worries sometimes return later.
(c) I am initially relieved but the worries always return later.
(d) I am not relieved if my doctor tells me there is nothing wrong.

9. (a) If I hear about an illness I never think I have it myself.
(b) If I hear about an illness I sometimes think I have it myself.
(c) If I hear about an illness I often think I have it myself.
(d) If I hear about an illness I always think I have it myself.

10. (a) If I have a bodily sensation or change I rarely wonder what it means.
(b) If I have a bodily sensation or change I often wonder what it means.
(c) If I have a bodily sensation or change I always wonder what it means.
(d) If I have a bodily sensation or change I must know what it means.

11. (a) I usually feel at very low risk for developing a serious illness.
(b) I usually feel at fairly low risk for developing a serious illness.
(c) I usually feel at moderate risk for developing a serious illness.
(d) I usually feel at high risk for developing a serious illness.

12. (a) I never think I have a serious illness.
(b) I sometimes think I have a serious illness.
(c) I often think I have a serious illness.
(d) I usually think that I am seriously ill.

13. (a) If I notice an unexplained bodily sensation I don't find it difficult to think about other things.
(b) If I notice an unexplained bodily sensation I sometimes find it difficult to think about other things.
(c) If I notice an unexplained bodily sensation I often find it difficult to think about other things.
(d) If I notice an unexplained bodily sensation I always find it difficult to think about other things.

14. (a) My family/friends would say I do not worry enough about my health.
(b) My family/friends would say I have a normal attitude to my health.
(c) My family/friends would say I worry too much about my health.
(d) My family/friends would say I am a hypochondriac.

For the following questions, please think about what it might be like if you had a serious illness of a type which particularly concerns you (such as heart disease, cancer, multiple sclerosis and so on). Obviously you cannot know for definite what it would be like but please give your best estimate of what you think might happen, basing your estimate on what you know about yourself and serious illness in general.

15. (a) If I had a serious illness I would still be able to enjoy things in my life quite a lot.
(b) If I had a serious illness I would still be able to enjoy things in my life a little.

(c) If I had a serious illness I would be almost completely unable to enjoy things in my life.
(d) If I had a serious illness I would be completely unable to enjoy life at all.

16. (a) If I developed a serious illness there is a good chance that modern medicine would be able to cure me.
(b) If I developed a serious illness there is a moderate chance that modern medicine would be able to cure me.
(c) If I developed a serious illness there is a very small chance that modern medicine would be able to cure me.
(d) If I developed a serious illness there is no chance that modern medicine would be able to cure me.

17. (a) A serious illness would ruin some aspects of my life.
(b) A serious illness would ruin many aspects of my life.
(c) A serious illness would ruin almost every aspect of my life.
(d) A serious illness would ruin every aspect of my life.

18. (a) If I had a serious illness I would not feel that I had lost my dignity.
(b) If I had a serious illness I would feel that I had lost a little of my dignity.
(c) If I had a serious illness I would feel that I had lost quite a lot of my dignity.
(d) If I had a serious illness I would feel that I had totally lost my dignity.

**Appendix C**

# Participant Information Sheet

## A study of the effects of exercise on concentration levels

**What is the purpose of the study?**

This study is to be conducted as part of a Doctorate in Clinical Psychology within the University of Leicester, Department of Clinical Psychology. The purpose of the study is to look at the effects of exercise on concentration levels. Concentration levels will be measured by performance on a computerised spot the difference type task. The aim is to determine whether people who have engaged in exercise, perform better on the computerised task, compared to those who have not exercised.

It is hoped that the results of the study will be used in health promotion programmes, providing further support for the benefits of engaging in regular exercise.

**What will be involved if I take part in the study?**

If you decide to participate in the study, first of all you will be asked to sign a consent form, of which you will receive a copy. Once signed, your task will be to look at various pairs of photographs on a computer screen and press a button each time you notice a change to one of the photographs. Following the computer task, you will also be asked to complete a health-related questionnaire consisting of 18 questions. It should not take any longer than 20 minutes for you to complete the whole task.

**What are the possible risks and benefits?**

There are no known risks to taking part in the study and there might be no immediate or direct benefits to you. The research however, will help health professionals gain a better understanding of the potential psychological benefits of exercise. The information could then be submitted for publication and used to inform future health promotion programmes.

**Will information obtained in the study be confidential?**

Any information collected will remain confidential, in accordance with the data protection act (1998). To protect your privacy, the following measures will be taken to ensure that only the researcher will have access to your personal identity:

- Your name will not appear on any questionnaire or electronic database. You will be allocated a number which will act as an identifier
- Your name will not be used in the analysis or write-up of the study

- Your questionnaire and data will be kept in the researchers home in a locked cabinet
- All confidential information will be destroyed after three years

**Who has reviewed the study?**

The study has been reviewed and approved by the University of Leicester, School of Psychology Ethics Committee

**What if I am harmed by the study?**

There are no specific compensation arrangements should you be harmed by the study, however you may have grounds for legal action

**What happens if I do not wish to participate in this study or wish to withdraw from the study?**

If you do not wish to participate in this study or wish to withdraw from the study, you may do so, at any time, without justifying your decision, by contacting the researcher using the contact details below. Once the research has been submitted for publication however, it will no longer be possible to exclude your data and therefore should you wish to withdraw, you should contact the researcher before 1st March 2010

**Who can I contact for further information or if I have a query?**

The researcher can be contacted for further information or queries about the study:

Debbie Hanson
University of Leicester
Department of Clinical Psychology
Leicester
LE1 7LT
Tel: 0116 223 1639
Email: dh128@le.ac.uk

**Appendix D**

# Participant Consent Form

## BACKGROUND INFORMATION

**Title and researchers.** The title of this research is: 'The effects of exercise on concentration levels.' My name is Debbie Hanson from the University of Leicester, Department of Clinical Psychology.

**Reason for the research.** I am researching the possible psychological benefits of exercise and am collecting data from members of the general public attending a private health club to enable me to determine whether exercise can improve concentration levels.

**Details of participation.** Your task is a computerised spot-the-difference type task. It involves looking at alternating photos on a computer to see if you can spot any visual changes and the completion of a short health questionnaire to determine your views about health. This should not take more than about 20 minutes. Please feel free to ask questions now if you have any.

## CONSENT STATEMENT

1. I understand that my participation is voluntary and that I may withdraw from the research at any time before 1st March 2010, without giving any reason.

2. I am aware of what my participation will involve.

3. I understand that there are no known risks involved in the participation of this study.

4. All questions that I have about the research have been satisfactorily answered.

I agree to participate.

Participant's signature: _____

Participant's name (please print): _____

Date: _____

## Appendix E

To: **D HANSON**

Subject: Ethical Application Ref: **dh128-e1d0**

*(Please quote this ref on all correspondence)*

---

25/10/2009 16:02:00

**Psychology**

Project Title: **Attentional bias for health/illness-related stimuli in health anxious individuals**

Thank you for submitting your application which has been considered.

This study has been given ethical approval, subject to any conditions quoted in the attached notes.

Any significant departure from the programme of research as outlined in the application for research ethics approval (such as changes in methodological approach, large delays in commencement of research, additional forms of data collection or major expansions in sample size) must be reported to your Departmental Research Ethics Officer.

Approval is given on the understanding that the University Research Ethics Code of Practice and other research ethics guidelines and protocols will be compiled with

- http://www2.le.ac.uk/institution/committees/research-ethics/code-of-practice

- http://www.le.ac.uk/safety/

## Appendix F

**SPSS Raw Data**

| Partic | Ave Health RTs | Ave Neutral RTs | shai | No. health changes | No. neutral changes | % health | % neutral | Clin or non clin | Age | M/F |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3207 | 4464 | 22 | 4 | 2 | 66.6 | 33.3 | 2 | 48 | m |
| 2 | 9886 | 4024 | 21 | 2 | 4 | 33.3 | 66.6 | 2 | 56 | m |
| 3 | | 3548 | 6 | 0 | 6 | 0 | 100 | 1 | 48 | f |
| 4 | | 5188 | 11 | 0 | 3 | 0 | 100 | 1 | 30 | m |
| 5 | 6792 | 2799 | 11 | 3 | 2 | 60 | 40 | 1 | 49 | m |
| 6 | 5375 | 5233 | 3 | 4 | 2 | 66.6 | 33.3 | 1 | 43 | f |
| 7 | 12428 | 4725 | 15 | 2 | 3 | 40 | 60 | 2 | 40 | f |
| 8 | 4169 | 4079 | 8 | 3 | 3 | 50 | 50 | 1 | 23 | f |
| 9 | 2814 | 4251 | 18 | 3 | 3 | 50 | 50 | 2 | 18 | m |
| 10 | 3344 | 4242 | 4 | 3 | 3 | 50 | 50 | 1 | 19 | m |
| 11 | 12781 | 6170 | 5 | 1 | 4 | 20 | 80 | 1 | 48 | f |
| 12 | 3775 | 2737 | 10 | 4 | 2 | 66.6 | 33.3 | 1 | 44 | m |
| 13 | 2895 | 8288 | 12 | 1 | 5 | 16.7 | 83.3 | 1 | 50 | m |
| 14 | 6611 | 3513 | 17 | 3 | 3 | 50 | 50 | 2 | 50 | f |
| 15 | 13977 | 9300 | 10 | 4 | 2 | 66.6 | 33.3 | 1 | 41 | f |
| 16 | 4737 | 5778 | 7 | 5 | 1 | 83.3 | 16.7 | 1 | 38 | f |
| 17 | 6629 | 4928 | 29 | 2 | 4 | 33.3 | 66.6 | 2 | 48 | f |
| 18 | 4718 | 3899 | 15 | 2 | 4 | 33.3 | 66.6 | 2 | 36 | f |
| 19 | 3720 | 7545 | 15 | 3 | 3 | 50 | 50 | 2 | 49 | m |
| 20 | 6149 | 4634 | 10 | 3 | 3 | 50 | 50 | 1 | 49 | m |
| 21 | 5169 | 3055 | 10 | 3 | 3 | 50 | 50 | 1 | 21 | m |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 4134 | 6864 | 8 | 3 | 2 | 60 | 40 | 1 | 44 | f |
| 23 | 5144 | 8792 | 8 | 3 | 3 | 50 | 50 | 1 | 45 | m |
| 24 | 2036 | 4786 | 11 | 1 | 5 | 16.7 | 83.3 | 1 | 37 | f |
| 25 | 2868 | 4979 | 6 | 2 | 4 | 33.3 | 66.6 | 1 | 41 | m |
| 26 | 3590 | 3081 | 0 | 4 | 1 | 80 | 20 | 1 | 27 | m |
| 27 | 2035 | 4264 | 16 | 1 | 4 | 20 | 80 | 2 | 37 | f |
| 28 | 3142 | 5135 | 11 | 3 | 3 | 50 | 50 | 1 | 45 | m |
| 29 | 2281 | 4351 | 7 | 1 | 5 | 20 | 80 | 1 | 23 | f |
| 30 | 4904 | 6842 | 14 | 1 | 5 | 20 | 80 | 1 | 37 | f |
| 31 | 5264 | 6421 | 13 | 2 | 4 | 33.3 | 66.6 | 1 | 47 | f |
| 32 | 6478 | 3949 | 13 | 1 | 4 | 20 | 80 | 1 | 30 | f |
| 33 | 7193 | 2799 | 7 | 1 | 5 | 20 | 80 | 1 | 35 | m |
| 34 | 13441 | 8627 | 10 | 1 | 5 | 20 | 80 | 1 | 42 | f |
| 35 | 2070 | 3187 | 4 | 2 | 4 | 33.3 | 66.6 | 1 | 30 | m |
| 36 | 7234 | 10865 | 15 | 2 | 4 | 33.3 | 66.6 | 2 | 59 | f |
| 37 | 5852 | 2662 | 6 | 2 | 4 | 33.3 | 66.6 | 1 | 33 | f |
| 38 | 6364 | 6899 | 5 | 2 | 4 | 33.3 | 66.6 | 1 | 39 | m |
| 39 | 6276 | 3558 | 5 | 1 | 5 | 20 | 80 | 1 | 50 | m |
| 40 | 5893 | 4563 | 9 | 2 | 3 | 40 | 60 | 1 | 57 | f |
| 41 | 4506 | 4565 | 15 | 2 | 4 | 33.3 | 66.6 | 2 | 46 | f |
| 42 | 4069 | 3464 | 20 | 3 | 3 | 50 | 50 | 2 | 35 | f |
| 43 | 4065 | 4818 | 7 | 2 | 4 | 33.3 | 66.6 | 1 | 41 | f |
| 44 | 11119 | 3820 | 22 | 4 | 2 | 66.6 | 33.3 | 2 | 63 | m |
| 45 | 8851 | 4454 | 18 | 2 | 4 | 33.3 | 66.6 | 43 | 43 | f |
| 46 | 3994 | 6509 | 12 | 3 | 3 | 50 | 50 | 48 | 48 | f |
| 47 | 4102 | 4095 | 7 | 1 | 4 | 20 | 80 | 59 | 59 | f |
| 48 | 4486 | 5299 | 15 | 4 | 2 | 66.6 | 33.3 | 44 | 44 | f |
| 49 | 3672 | 3543 | 31 | 2 | 4 | 33.3 | 66.6 | 30 | 30 | f |
| 50 | 5242 | 4284 | 15 | 2 | 4 | 33.3 | 66.6 | 27 | 27 | f |
| 51 | 3136 | 3407 | 8 | 3 | 3 | 50 | 50 | 36 | 36 | f |
| 52 | 4554 | 2874 | 6 | 3 | 3 | 50 | 50 | 41 | 41 | f |
| 53 | 4638 | 4057 | 31 | 2 | 4 | 33.3 | 66.6 | 47 | 47 | m |
| 54 | 15561 | 6960 | 10 | 3 | 3 | 50 | 50 | 58 | 58 | m |
| 55 | 3390 | 6655 | 18 | 1 | 5 | 16.7 | 83.3 | 55 | 55 | f |
| 56 | 3658 | 4187 | 16 | 1 | 5 | 16.7 | 83.3 | 57 | 57 | m |
| 57 | 4381 | 4966 | 15 | 2 | 4 | 33.3 | 66.6 | 59 | 59 | f |
| 58 | 5833 | 5219 | 5 | 2 | 4 | 33.3 | 66.6 | 43 | 43 | m |
| 59 | 5746 | 3987 | 8 | 2 | 4 | 33.3 | 66.6 | 36 | 36 | f |
| 60 | 4585 | 3579 | 12 | 4 | 2 | 66.6 | 33.3 | 30 | 30 | m |
| 61 | 2995 | 4250 | 8 | 2 | 4 | 33.3 | 66.6 | 34 | 34 | f |
| 62 | | 3975 | 26 | 0 | 5 | 0 | 100 | 51 | 51 | f |
| 63 | 12322 | 11510 | 10 | 2 | 4 | 33.3 | 66.6 | 87 | 87 | m |
| 64 | 6915 | 4321 | 10 | 4 | 2 | 66.6 | 33.3 | 42 | 42 | f |
| 65 | 3242 | 4045 | 12 | 1 | 5 | 16.7 | 83.3 | 61 | 61 | m |
| 66 | | 8146 | 13 | 0 | 6 | 0 | 100 | 61 | 61 | f |
| 67 | 2565 | 3565 | 10 | 2 | 4 | 33.3 | 66.6 | 19 | 19 | m |
| 68 | 6307 | 3319 | 6 | 2 | 4 | 33.3 | 66.6 | 51 | 51 | m |
| 69 | 4171 | 3953 | 8 | 2 | 4 | 33.3 | 66.6 | 18 | 18 | m |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 2345 | 3202 | 11 | 2 | 4 | 33.3 | 66.6 | 29 | 29 | f |
| 71 | 11536 | 12737 | 2 | 3 | 3 | 50 | 50 | 68 | 68 | m |
| 72 | 6340 | 3413 | 9 | 3 | 3 | 50 | 50 | 37 | 37 | m |
| 73 | 2814 | 5250 | 6 | 1 | 4 | 20 | 80 | 41 | 41 | f |
| 74 | 3806 | 5952 | 24 | 1 | 3 | 25 | 75 | 49 | 49 | f |
| 75 | 5276 | 8000 | 7 | 4 | 2 | 66.6 | 33.3 | 38 | 38 | f |
| 76 | 3023 | 6423 | 13 | 1 | 5 | 16.7 | 83.3 | 39 | 39 | m |
| 77 | 3795 | 3982 | 7 | 3 | 3 | 50 | 50 | 41 | 41 | m |

## Appendix G

**SPSS Output Data**

**Research Strand One**

1 – Gender and SHAI scores

**Group Statistics**

| | maleorfemale | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| shaiscore | 1 | 34 | 10.6765 | 6.40417 | 1.09831 |
| | 2 | 43 | 12.4884 | 6.41565 | .97838 |

Mann Whitney – gender and SHAI scores

**Ranks**

| | maleorfemale | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| shaiscore | 1 | 34 | 35.22 | 1197.50 |
| | 2 | 43 | 41.99 | 1805.50 |
| | Total | 77 | | |

**Test Statistics**[a]

| | shaiscore |
|---|---|
| Mann-Whitney U | 602.500 |
| Wilcoxon W | 1197.500 |
| Z | -1.322 |
| Asymp. Sig. (2-tailed) | .186 |

a. Grouping Variable: maleorfemale

## 2 - Age and SHAI scores

**Statistics**

| | | shaiscore | age |
|---|---|---|---|
| N | Valid | 77 | 77 |
| | Missing | 0 | 0 |
| Mean | | 11.6883 | 42.4675 |
| Median | | 10.0000 | 42.0000 |
| Std. Deviation | | 6.43236 | 12.48007 |
| Skewness | | 1.107 | .387 |
| Std. Error of Skewness | | .274 | .274 |
| Kurtosis | | 1.323 | 1.195 |
| Std. Error of Kurtosis | | .541 | .541 |
| Minimum | | .00 | 18.00 |
| Maximum | | 31.00 | 87.00 |
| Percentiles | 50 | 10.0000 | 42.0000 |

## Correlation age and SHAI scores

**Correlations**

| | shaiscore | age |
|---|---|---|

| | | | | |
|---|---|---|---|---|
| Spearman's rho | shaiscore | Correlation Coefficient | 1.000 | .213* |
| | | Sig. (1-tailed) | . | .031 |
| | | N | 77 | 77 |
| | age | Correlation Coefficient | .213* | 1.000 |
| | | Sig. (1-tailed) | .031 | . |
| | | N | 77 | 77 |

*. Correlation is significant at the 0.05 level (1-tailed).

3 – Reaction times in detecting health and neutral changes and SHAI scores

**Statistics**

| | | Average H reaction times(ms) | Average N reaction times (ms) | SHAI Score |
|---|---|---|---|---|
| N | Valid | 73 | 77 | 77 |
| | Missing | 4 | 0 | 0 |
| | Mean | 5512.5342 | 5088.4286 | 11.6883 |
| | Std. Deviation | 3069.45721 | 2065.79233 | 6.43236 |
| | Skewness | 1.592 | 1.621 | 1.107 |
| | Std. Error of Skewness | .281 | .274 | .274 |
| | Range | 13526.00 | 10075.00 | 31.00 |

Correlations between average reaction times for health & neutral changes and SHAI scores

**Correlations**

| | | | Average reaction times(ms) | Average reaction times (ms) | SHAI Score |
|---|---|---|---|---|---|
| Spearman's rho | Average reaction times(ms) | Correlation Coefficient | 1.000 | .159 | -.019 |
| | | Sig. (1-tailed) | . | .089 | .437 |
| | | N | 73 | 73 | 73 |
| | Average reaction times (ms) | Correlation Coefficient | .159 | 1.000 | .054 |
| | | Sig. (1-tailed) | .089 | . | .321 |
| | | N | 73 | 77 | 77 |
| | SHAI Score | Correlation Coefficient | -.019 | .054 | 1.000 |
| | | Sig. (1-tailed) | .437 | .321 | . |
| | | N | 73 | 77 | 77 |

4 – Number of health & neutral changes and SHAI scores

**Statistics**

| | | Number of health/illness-related changes | Number of neutral changes |
|---|---|---|---|
| N | Valid | 77 | 77 |
| | Missing | 0 | 0 |
| | Mean | 2.2208 | 3.5714 |
| | Median | 2.0000 | 4.0000 |
| | Std. Deviation | 1.13118 | 1.08128 |
| | Skewness | .110 | -.157 |
| | Std. Error of Skewness | .274 | .274 |
| | Minimum | .00 | 1.00 |
| | Maximum | 5.00 | 6.00 |

Correlations between number of health & neutral changes and SHAI scores

**Correlations**

| | | | SHAI Score | Number of health/illness-related changes | Number of neutral changes |
|---|---|---|---|---|---|
| Spearman's rho | SHAI Score | Correlation Coefficient | 1.000 | -.108 | .085 |
| | | Sig. (1-tailed) | . | .175 | .231 |
| | | N | 77 | 77 | 77 |
| | Number of health/illness-related changes | Correlation Coefficient | -.108 | 1.000 | -.888** |
| | | Sig. (1-tailed) | .175 | . | .000 |
| | | N | 77 | 77 | 77 |
| | Number of neutral changes | Correlation Coefficient | .085 | -.888** | 1.000 |
| | | Sig. (1-tailed) | .231 | .000 | . |
| | | N | 77 | 77 | 77 |

**. Correlation is significant at the 0.01 level (1-tailed).

5 – Number of health changes detected after division of sample into health anxious and non-health anxious

**Group Statistics**

| | clinornonclin | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| nohrc | 1 | 54 | 2.2407 | 1.18058 | .16066 |
| | 2 | 23 | 2.1739 | 1.02922 | .21461 |

T test – number of health and health anxious or non health anxious

**Independent Samples Test**

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 95% Confidence Interval of the Difference | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| nohrc | Equal variances assumed | 1.777 | .187 | .236 | 75 | .814 | .06683 | .28342 | -.49777 | .63143 |
| | Equal variances not assumed | | | .249 | 47.390 | .804 | .06683 | .26808 | -.47236 | .60602 |

6 – Percentage of health changes after division of sample into health anxious and non-health anxious

**Group Statistics**

| | clinornonclin | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| percenthrc | 1 | 54 | 38.6278 | 19.86682 | 2.70353 |
| | 2 | 23 | 37.0087 | 16.61948 | 3.46540 |

T test of differences between health anxious and non health anxious and percentage of health changes

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| percenthrc | Equal variances assumed | 2.246 | .138 | .343 | 75 | .733 | 1.61908 | 4.72386 | -7.79132 | 11.02949 |
| | Equal variances not assumed | | | .368 | 49.342 | .714 | 1.61908 | 4.39523 | -7.21192 | 10.45009 |

**Research Strand Two**

7 – Detections of target stimuli

**Statistics**

| | | bandage | fourcheese | paracetamol | mackerel | antidiarrhoea | phone | crisps | firststaid | bublebath | plasters | coldflu | showergel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | Valid | 72 | 72 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 73 | 73 |
| | Missing | 5 | 5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 |
| | Mean | .6389 | .3611 | .2000 | .8000 | .5333 | .4667 | .8400 | .1600 | .6133 | .3867 | .3699 | .6301 |

Binomial bandage vs four cheese

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| bandage | Group 1 | 1.00 | 46 | .64 | .50 | .024[a] |
| | Group 2 | .00 | 26 | .36 | | |
| | Total | | 72 | 1.00 | | |
| fourcheese | Group 1 | .00 | 46 | .64 | .50 | .024[a] |
| | Group 2 | 1.00 | 26 | .36 | | |
| | Total | | 72 | 1.00 | | |

a. Based on Z Approximation.

Binomial first aid vs crisps

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| crisps | Group 1 | 1.00 | 63 | .84 | .50 | .000[a] |
| | Group 2 | .00 | 12 | .16 | | |
| | Total | | 75 | 1.00 | | |
| firststaid | Group 1 | .00 | 63 | .84 | .50 | .000[a] |
| | Group 2 | 1.00 | 12 | .16 | | |
| | Total | | 75 | 1.00 | | |

a. Based on Z Approximation.

Binomial mackerel vs paracetamol

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| paracetamol | Group 1 | 1.00 | 15 | .20 | .50 | .000[a] |
| | Group 2 | .00 | 60 | .80 | | |
| | Total | | 75 | 1.00 | | |
| mackerel | Group 1 | .00 | 15 | .20 | .50 | .000[a] |
| | Group 2 | 1.00 | 60 | .80 | | |
| | Total | | 75 | 1.00 | | |

a. Based on Z Approximation.

Binomial phone vs anti-diarrhoea

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| antidiarrhoea | Group 1 | 1.00 | 40 | .53 | .50 | .644[a] |
| | Group 2 | .00 | 35 | .47 | | |
| | Total | | 75 | 1.00 | | |
| phone | Group 1 | .00 | 40 | .53 | .50 | .644[a] |
| | Group 2 | 1.00 | 35 | .47 | | |
| | Total | | 75 | 1.00 | | |

a. Based on Z Approximation.

Binomial plasters vs bubble bath

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| bubblebath | Group 1 | 1.00 | 46 | .61 | .50 | .064[a] |
| | Group 2 | .00 | 29 | .39 | | |
| | Total | | 75 | 1.00 | | |
| plasters | Group 1 | .00 | 46 | .61 | .50 | .064[a] |
| | Group 2 | 1.00 | 29 | .39 | | |
| | Total | | 75 | 1.00 | | |

a. Based on Z Approximation.

Binomial shower gel vs cold/flu

**Binomial Test**

| | | Category | N | Observed Prop. | Test Prop. | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| coldflu | Group 1 | 1.00 | 27 | .37 | .50 | .034[a] |
| | Group 2 | .00 | 46 | .63 | | |
| | Total | | 73 | 1.00 | | |
| showergel | Group 1 | .00 | 27 | .37 | .50 | .034[a] |
| | Group 2 | 1.00 | 46 | .63 | | |
| | Total | | 73 | 1.00 | | |

a. Based on Z Approximation.

## Appendix H

### Change Blindness Paradigm Instructions

On the screen, you will see a picture of some objects. The picture will begin to flicker and your task is to identify the object which changes when the picture flickers.

First there will be a practice to make sure you follow the instructions. Please ask the experimenter if you have any questions.

First of all, you will see a short preview of the picture: then a cross will appear on the screen.

When the cross appears, PLEASE PRESS AND HOLD THE RESPONSE BUTTON DOWN

As soon as you identify the changing object, RELEASE THE BUTTON. The screen will freeze and you will be asked to point to the object you have identified as changing.

DO NOT RELEASE THE BUTTON UNTIL YOU HAVE IDENTIFIED THE CHANGING OBJECT

Please watch the cross until the flickering picture appears

PRESS THE RESPONSE BUTTON TO START

You are about to see the picture preview.

PRESS AND HOLD RESPONSE BUTTON TO START

This is now the main experiment.  Here are the instructions again.

(Instructions repeated)

That is the end of the test.  Thank you for taking part.

## Part Three

## Critical Appraisal

## Section 1: Critical Appraisal

### *1.1 Choice of Research Topic*

Shortly after beginning clinical psychology training, I remember being introduced to the research element of the course and attending a research fair to identify potential areas of interest. I recall being surprised that the research fair had taken place at such an early stage of training, however I came into contact with a neuropsychologist, with whom I was able to discuss an idea I had in the area of brain injury.

Having worked with brain injured individuals, I developed an awareness of the impact of sustaining permanent damage to the brain, both to the victim and to their

relatives/families. Consequently, I rapidly recognised the value of systemic, psychological approaches, in contributing to rehabilitation interventions.

My original research idea had been to explore the extent to which GPs were able to recognise the presence of post-concussion syndrome, following mild brain-injury. Unfortunately however, despite receiving favourable feedback from my academic tutors, after months of trying to develop a well-designed project with the help of tutors and neuropsychologists, I was unable to transform my idea into an appropriately sized project, given the time available to complete the research. I was therefore faced with the challenge of identifying an alternative project, initiating mixed feelings of anxiety and disappointment.

Given the remaining limited timescale for completing the research, I realised that I would have to carefully consider alternative ideas and therefore when an academic tutor suggested undertaking the current research using a non-clinical population, my anxiety began to subside somewhat. Having some knowledge of the change blindness paradigm, from my undergraduate degree, I became enthusiastic about engaging with the research, rather than feeling forced to engage with a project I found uninteresting (Barker, Pistrang and Elliott, 2002). Furthermore, during training, I had worked with a client with chronic health anxiety, which I discovered had often created a barrier to social participation in employment and leisure activities and had been a huge source of frustration during GP consultations. My client did however, have concurrent physical health difficulties, providing the impetus for recruiting a non-clinical sample for the current research, whereby health anxiety was less likely to be confounded by actual physical health conditions (Abramowitz, Deacon and Valentiner, 2007).

### *1.2 Research Setting and Sample*

The study took place in a private health club and as such, was only dependent on gaining ethical approval from the University of Leicester School of Psychology Ethics Committee. The process of gaining ethical approval was very straightforward, which was invaluable in strengthening my hope and determination in completing the project within the remaining five months.

Likewise, gaining permission to conduct the study within the health club and recruiting participants also proved to be straightforward. The health club manager and the participants were very supportive of the research project, with several individuals openly expressing their positive opinion about the value of research studies. Consequently, data collection proved to be a smooth process.

The willingness of participants in engaging in the study and providing contact details raised my awareness of the importance of disseminating clinical research findings within the wider non-clinical population. Not only was health anxiety present in the current sample but even in the absence of health anxiety, the current sample are embedded within social systems, a proportion of whom will be clinically health anxious. Research findings derived from studies using clinical samples are perhaps more inaccessible to the wider non-clinical population, preventing them from developing their understanding of clinical phenomena, in which they may have a genuine interest.

Undoubtedly, implementing the change blindness paradigm within the health club was helpful in recruiting participants, however there were a few occasions where I had arranged to collect data but was unable to do so due to the lounge being too busy. As the change blindness paradigm requires a certain level of concentration, it perhaps would have been better to have requested a separate room in which to conduct the

research, however this might also have influenced the health club manager's decision in supporting the project.

*1.3 Research Design*

The idea of implementing the change blindness paradigm to explore attentional bias in health anxiety was suggested to me by an academic tutor. My decision to administer the SHAI was based on thoughts about balancing my need for information, with the costs to participants in engaging in the study.

Given the recent recommendation in relation to applying more modern, ecologically valid, experimental methods to explore hypochondriasis and health anxiety (Fink, 2008), from a positivist epistemological stance, the chosen methodology appeared to have merit.

Several participants however, commented about finding the response options for questions on the SHAI too restrictive, explaining that their responses would probably be different on other occasions. This perhaps highlights the limitations in using a single, brief, objective, cognitive measure as a stable indicator of level of health anxiety and brings into question the validity of the construct of health anxiety.

Additionally eliminating the presence of confounding variables within the change blindness photographic stimuli is an extremely difficult task. I vaguely recall my previous academic supervisor during my undergraduate degree, having implemented the change blindness paradigm as a research methodology. Despite having a wealth of knowledge and experience, he too had encountered confounding variables after implementing the paradigm. This in turn, reinforces my scepticism of the clinical utility of the paradigm, as it stands.

*1.4 Analysis and Write-up*

Statistical analysis of the data was by far the most anxiety provoking aspect of my project. During my undergraduate degree, I found statistics modules particularly challenging and with the exception of my undergraduate dissertation, I have not been required to further demonstrate my competence in statistical analysis.

During the second year of training, statistics clinics held by the Trent Research Design Service Unit (Trent RDSU), for NHS employees undertaking NHS research projects were discontinued, fuelling my anxiety. Fortunately though, once I had clearly identified my research questions, I was able to refresh my knowledge of the statistics I thought I would need to apply and my confidence slowly began to re-emerge.

In addition to correlational analyses, given that I did not find a correlation between health anxiety and attentional bias towards health/illness-related stimuli, I applied alternative statistical analyses to further explore the data. Some of these involved the division of my sample into health anxious and non-health anxious categories, which inadvertently might have reduced the power of the statistical analyses.

In choosing a non-clinical population, I had no preconceptions about the proportion of health anxious individuals I might discover. In reality, I discovered that 30% of my sample could be classified as being very health anxious. On reflection therefore, I am aware that had my sample been larger, there is a chance that my results might have been very different, which constrains the extent to which conclusions can be drawn from the current study.

Writing up the research was time consuming and I found the quality of my work varied according to the length of time I was able to remain completely focussed. I have a personal preference for breaking down large tasks into small manageable chunks and although I spent time developing action plans, in dividing my time between placement and research, I found it difficult to keep track of my progress at times. Taking fewer but

longer stretches of research leave was therefore particularly useful for me, as opposed to taking more regular but shorter breaks.

*1.5 Supervision*

Having two supervisors throughout the research process was invaluable. My academic supervisor and I met approximately once a month since the start of my third year of training.

During the earlier meetings, prior to gaining ethical approval, I recall feeling particularly anxious about the limited amount of time I had to complete my project, following my original set back. I felt frustrated and wanted to regain a sense of control. Having an opportunity to discuss my concerns was therefore especially useful in containing my anxiety. Furthermore, I found myself wondering how my experience might be similar to that of clients with whom I was working and in turn, for whom I felt a great deal of empathy.

Following ethical approval, I began to feel more in control of the task I was facing and I was able to present evidence of real progress during later supervision meetings. Feedback was always delivered sensitively and constructively, leaving me feeling motivated to continue with my efforts. I was grateful for my supervisor's critical appraisal of my work and I greatly appreciated her prompt feedback.

My field supervisor had specific knowledge and experience of the change blindness paradigm and seemed to have a gift for making potentially complex phenomena fairly simple. Despite his level of experience, he was able to convey information to me in a helpful, coherent way and he always found time to meet with me, upon my request. We met approximately five or six times in total over the whole research period.

I found my field supervisor to be extremely helpful in practically setting up my research. He assisted me in the installation of the change blindness paradigm on the laptop and in assessing the suitability of my photographic stimuli.

The collaborative nature of supervision, compensated for the sense of isolation I felt at times, whilst working alone on my project. In addition to providing me with an opportunity to refine my research skills, the research project was the final part of my formal assessment and thus having invested so much time and effort in my training, the quality of my research was of extreme importance to me. As a relatively inexperienced, lone researcher, I therefore viewed supervision as a mechanism for quality assurance, with which I engaged to the best of my ability.

*1.6 Contextual Issues*

I found the completion of my thesis whilst simultaneously working on placement personally demanding. During the final placement, I found it difficult to fully immerse myself in my clinical role, as my project would compete for attention. In turn, this has raised my awareness of the difficulties clinical psychologists might face in attempting to successfully integrate disparate roles within their work.

Completion of my thesis also impacted on my decisions about when I should apply for clinical psychologist positions. I was acutely aware that in order to qualify, my research had to satisfy academic criteria. I therefore felt constrained by this when contemplating applying for jobs. As vacancies arose within areas of clinical interest however, I completed applications, which in turn reminded me of my competence in other areas.

Overall however, the most difficult aspect I had to manage whilst undertaking the research project was the impact I felt it might have on my family. I had planned to spend some time collecting data during my annual leave over Christmas. The bad

weather conditions however made it difficult for people to attend the gym and I therefore found myself spending many more days there than I had anticipated.

Over the subsequent four months, my work/home life imbalance persisted. My intense focus on my research led to me becoming increasingly more domestically incapacitated. Very rarely however, did anyone complain and to my surprise, there were no catastrophic consequences. Inevitably though, I am aware that the temporary destabilisation of my family, with my absence, must have at times been difficult both emotionally and practically. Each time I gave priority to my research, I found myself feeling a strong sense of resentment about having so little control over my own personal time.

Reflective practice seminars however proved to be a particularly helpful mechanism for maintaining my psychological wellbeing. I found the support of the two facilitators and my peers enormously helpful, though on occasions I also felt psychologically uncomfortable listening to other trainees relay their experiences. Reflective practice helped normalise the impact of the intensity of research process, neutralising any pathological interpretations I owned.

A final protective mechanism was my concrete plans to spend quality time with my parents, husband, family and friends, after completion of my thesis, as they were most definitely my pillars of strength throughout the whole process.

### *1.7 Development of Research Knowledge and Practice*

I began my journey along the research process with strong feelings of trepidation, borne out of an awareness of my inexperience. Two years later, I now have a much deeper understanding of the research process and despite still feeling relatively inexperienced, I feel proud of my achievement.

I can completely understand why many clinical psychologists never engage with research post-qualifying, however paradoxically my experience has left me with a desire to re-engage with the process at some point in the not too distant future.

I anticipate undertaking research collaboratively feeling much less challenging and as I recall conversations I have had during my training about ideas for research, I feel optimistic about becoming involved.

Having only conducted quantitative research, I would welcome the opportunity to develop my knowledge and skills by undertaking a qualitative project. Exposure to qualitative approaches during training has enabled me to develop an appreciation of such approaches in contributing something equally valuable but different to that which is captured by quantitative approaches.

*1.8 Timescale*

Given my early setback with my original research idea, I was forced to amend the timescale of my research. On refection, I feel I perhaps spent too long pursuing my original idea. In doing so, I felt I placed myself under pressure, generating anxiety, which possibly impacted on my ability to think creatively.

Fortunately I did not experience any difficulties in obtaining ethical approval for my subsequent research proposal and likewise, there were no difficulties in recruitment of participants for my study.

In order to meet the deadline for completion of the thesis however, I had to dedicate long periods of time to study, which I believe increased the intensity of the task. Consequently, if I were to engage in future research, I would place greater emphasis on managing the time allocated more effectively.

*1.9 Conclusion*

On reflection, I now appreciate the benefit of introducing trainee clinical psychologists to the research process at a very early stage of training. Timely planning and preparation is essential in the development of manageable research projects, as is regular supervision.

I am currently awaiting feedback following completion of my research, which I am hoping will reveal my strengths and limitations and ultimately facilitate my learning. I am hopeful however, that I will have demonstrated sufficient competence in undertaking this project, to enable me to feel confident in my ability to undertake further research.

## Section 2: References

Abramowitz, J. S., Deacon, B. J & Valentiner (2007). The short health anxiety inventory: psychometric properties and construct validity in a non-clinical sample. *Cognitive Therapy Research*, 31, 871-883.

Barker, C., Pistrang, N & Elliott, R (2002). *Research Methods in Clinical Psychology*. John Wiley & Sons Ltd.

Fink, P & Rosendal, M (2008). Recent developments in the understanding and management of functional somatic symptoms in primary care. *Current Opinion in Psychiatry*, 21, 182-188.