

**IMPLICIT ASSOCIATION TASK AS MEASURE OF THREAT-RELATED
INFORMATION PROCESSING IN SOCIAL PHOBIA AND PANIC
DISORDER**

DIONY ELBERS



**Thesis submitted in compliance with the requirements for the Masters degree
in Research Psychology in the Department of Psychology
At Stellenbosch University**

Supervisor: Dr Charl Nortje

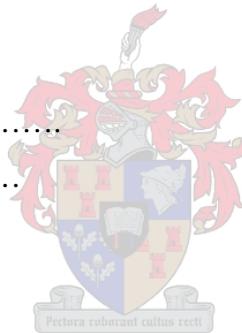
April 2005

DECLARATION

I, the undersigned, declare that the work contained in this thesis is my own original work and has not previously, in its entirety or in part, been submitted at any university for a degree.

.....
.....

D.M. Elbers



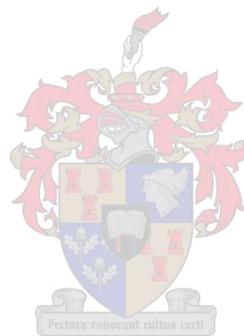
Date

ABSTRACT

The main objective of the study was to adapt the Implicit Association Task (IAT) to assess implicit self-relevant fear associations in individuals suffering from social phobia and panic disorder. This involved the development of computer-based word stimuli classification tasks in which participants were expected to classify individually presented words belonging to one of four word categories, namely self-related 'me' words, other-related 'not-me' words, threat-related words (physical or social threat) and corresponding safety-related words. Two response keys on the computer were to be used, each representing two word categories during a specific trial (e.g., the one representing 'me' and 'threat', and the other 'not-me' and 'safety' words). The demanded task was to classify the presented words as quickly and accurately as possible. This resulted in the construction of the Physical Threat Implicit Association Task (PIAT) and the Social Threat Implicit Association Task (SIAT). Both IAT versions were administered to a group of 17 participants diagnosed with social phobia, 17 diagnosed with panic disorder, and 17 'normal' controls. Fear-domain specific self-threat association biases were expected for the social phobics on the SIAT, for the panickers on the PIAT, as well as significant differences with the performances of the control group on the IAT tasks. A secondary objective of the study was to investigate the relationships between the IATs and performances on a variety of self-report scales, namely the Social Phobia Inventory, the Panic Disorder Severity Scale, the State-Trait Anxiety Inventory, and the Beck Depression Inventory-II.

In contrast to what was expected, the results of both the PIAT and SIAT did not demonstrate a facilitation of the classification task during trials when 'me' and 'threat' words were allocated to one category (i.e., response key), and 'not-me' and 'safety' to the other. On the contrary, all three participant groups demonstrated significant effects in the opposite direction. Furthermore, the differences between the groups on both IATs were insignificant. With the exception of a significant, negative correlation between the results on the SIAT and the Social Phobia Inventory for the social phobia group, all the other IAT and

self-report scale correlations were insignificant. The results were explained in terms of a newly proposed ‘two-forces’ cognitive theory. It was speculated that the IAT effects might have been the result of two opposing forces operating at different stages of the information processing system. This is namely (a) a disruption of performance by attention diversion during an early pre-attentive stage of processing, versus (b) a facilitation of the classification task by implicit association during later elaborative stages of processing, with the former apparently making the major contribution to the final IAT effect. This may be a phenomenon unique to anxiety disorders. The implications for future research of the findings and the newly proposed theory were also discussed.



OPSOMMING

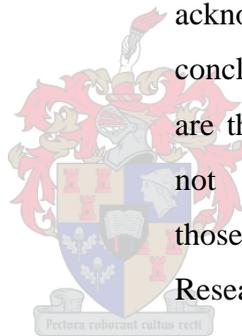
Die hoofdoel van die studie was die ontwikkeling van 'n aangepaste weergawe van die Implisiete Assosiasietaak (IAT) ten einde implisiete self-relevante vrees-assosiasies te meet by individue wat ly aan sosiale fobie en paniekversteuring. Dit het die ontwikkeling van rekenaargebaseerde woordstimuli-klassifikasietake behels waar daar van deelnemers verwag is om individueel-vertoonde woorde te klassifiseer wat aan een van vier woordkategorieë behoort het, namely self-verbandhoudende 'ek' woorde, ander-verbandhoudende 'nie-ek-nie' woorde, bedreiging-verbandhoudende woorde (fisiese of sosiale bedreiging) en ooreenstemmende veiligheid-verbandhoudende woorde. Twee responsleutels op die rekenaar moes gebruik word, elkeen verteenwoordigend van twee woordkategorieë gedurende 'n spesifieke toetsgeleentheid (bv., die een verteenwoordigend van 'ek' en 'bedreiging', en die ander van 'nie-ek-nie' en 'veiligheid' woorde). Die vereiste taak was om die vertoonde woorde so vinnig en akkuraat as moontlik te klassifiseer. Dit het gelei tot die konstruksie van die Fisiese Bedreiging Assosiasietaak (FIAT) en die Sosiale Bedreiging Assosiasietaak (SIAT). Beide IAT weergawes is toegepas op 'n groep van 17 deelnemers gediagnoseer met sosiale fobie, 17 gediagnoseer met paniekversteuring, en 17 'normale' kontrole-deelnemers. Vrees-domein spesifieke self-bedreiging assosiasie sydigthede is verwag vir dié met sosiale fobie op die SIAT, vir die paniekversteurdes op die FIAT, sowel as betekenisvolle verskille met die prestasies van die kontrolegroep op die IAT take. 'n Sekondêre doelwit van die studie was om die verbande tussen die IAT's en prestasies op verskeie selfrapporteringskale te ondersoek, naamlik die Sosialefobievraelys, die Paniekversteuring-intensiteitskaal, die Staat-Trek Angsvraelys, en die Beck Depressievraelys-II.

In teenstelling met wat verwag is, het die FIAT en SIAT nie fassilitasie van die klassifikasietak vertoon nie gedurende toetsgeleenthede wanneer 'ek' en 'bedreiging' woorde toegeken is aan een kategorie (i.e., responsleutel), en 'nie-ek-nie' en 'veiligheid' aan die ander. Intendeel, al drie deelnemersgroepe het beduidende effekte in die teenoorgestelde rigting gedemonstreer. Die verskille

tussen die groepe op beide IAT's was verder ook nie beduidend nie. Met uitsondering van 'n betekenisvolle, negatiewe korrelasie tussen die resultate op die SIAT en die Sosialefobievraelys vir die sosialefobiegroep, was al die ander IAT en selfrapporteringskaal korrelasies onbeduidend. Die resultate is verklaar in terme van 'n nuutvoorgestelde 'twee-kragte' kognitiewe teorie. Daar is gespekuleer dat die IAT effekte die resultaat kon gewees het van twee opponerende kragte wat tydens verkillende fases van die informasieprosesseringstelsel aktief was. Dit is naamlik (a) 'n benadeling van prestasie deur aandagsafleiding gedurende 'n vroeë vooraandagsfase van prosessering, versus (b) 'n fassilitasie van die klassifikasietaak deur implisiete assosiasie gedurende die later uitgebreide stadiums van prosessering, met eersgenoemde wat waarskynlik die grootste bydrae tot die finale IAT effek gemaak het. Dit mag 'n verskynsel wees wat dalk uniek aan die angsversteurings is. Die implikasies vir toekomstige navorsing van die bevindings en die nuutvoorgestelde teorie, is ook bespreek.



Financial assistance from the Human Science Research Council for this research is hereby acknowledged. Opinions given or conclusions reached in this work are those of the author and should not necessarily be regarded as those of the Human Science Research Council.

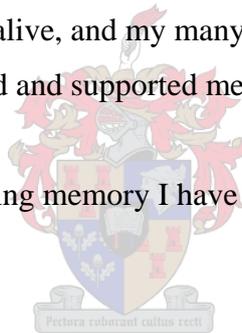


ACKNOWLEDGMENTS

I would like to express my sincere gratitude and appreciation to:

- Dr Charl Nortje, for his encouragement, patience and dedication in his professional and sincere approach to my work;
- Professor Dan Stein, head of research department at the Medical Research Council (MRC) unit, Tygerberg Hospital for introducing me to this research opportunity, providing me with the original IAT, as well as crediting me with entrance into his vast data base of previous patients;
- My research colleague, Christine Lochner, clinical psychologist and assistant researcher at the MRC, for her friendly and pleasant research initiative, motivation and guidance throughout the duration of compilation of this thesis, including the screening and diagnoses of potential patients;
- My research colleague, Pieter du Toit, a clinical and research psychologist at the MRC unit of Cognition and Brain Sciences, Cambridge, for his contribution to the research project;
- Professor Kidd and Heike Schmidt for their expertise regarding statistical analyses;
- Marianna Le Roux, senior research assistant at the department of psychology, Stellenbosch University, for her kind and generous guidance and advice;
- Zane Wilson and her staff from the Unit of Stress and Anxiety Disorders in Johannesburg for their assistance in patient recruitment and location premises;

- Dr Carfford, clinical psychiatrist for his assistance in patient recruitment;
- Marcelle Wilkinson for her assistance and positive feedback in editing under pressure of time;
- The participants included or not, that generously donated their time and personal insight into furthering the research into anxiety disorders;
- The so called 'normal' people, who offered their time and effort to make this research project possible;
- My loving boyfriend, Charles Lalieu, for his consistent support, encouragement and patience, Rozanne Terblanche for emotional strength, my brother Jos for being alive, and my many friends who have each in their own way encouraged and supported me;
- My parents, in whose loving memory I have strived to reach my dreams.



Dedicated with all the love in the
world, to the memory of my late
Moeder and Vader

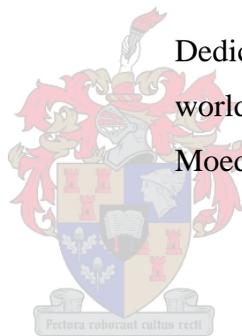


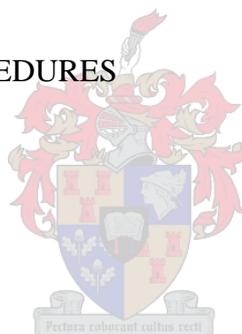
TABLE OF CONTENTS

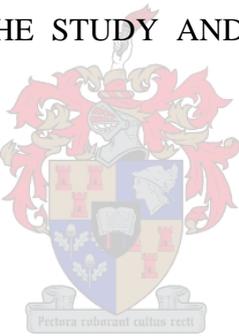
Abstract		iii
Opsomming		v
Acknowledgments		viii
List of Tables		xvi
List of Figures		xvi
1	INTRODUCTION	1
2	PANIC DISORDER AND SOCIAL PHOBIA	7
2.2.	PANIC DISORDER	7
2.2.1.	Definition and diagnosis	7
2.2.2.	Panic disorder subtypes	9
2.2.3.	Prevalence and course	9
2.2.4.	Comorbidity and differential diagnosis	10
2.3.	SOCIAL PHOBIA	10
2.3.1.	Definition and diagnosis	10
2.3.2.	Social Phobia subtypes	12
2.3.3.	Prevalence and course	12
2.3.4.	Comorbidity and differential diagnosis in social phobia	13
2.4.	DEFINITIONS OF FEAR, ANXIETY, AND PHOBIA	14
2.4.1.	Fear	14
2.4.2.	Anxiety	14
2.4.3.	Phobia	14
2.5.	CONCLUSION	15
3	ANXIETY DISORDERS FROM A COGNITIVE PERSPECTIVE	16
3.1.	COGNITIVE THEORIES OF ANXIETY AND ANXIETY DISORDERS	16
3.1.1.	Beck's Schema theory	17
3.1.2.	Bower's Network theory	19
3.1.3.	Lang's Bio-informational model	20
3.2.	COGNITION AND EMOTION: DIRECTION OF THE RELATIONSHIP	22
3.3.	CONCEPTS OF COGNITIVE THEORY	23
3.3.1.	Levels and stages of information processing	24
3.3.2.	Automatic activation	27
3.3.3.	Accessibility and strength of association	28

3.4.	INFORMATION PROCESSING BIASES	29
3.4.1.	Attention bias	30
3.4.2.	Interpretation bias	31
3.4.3.	Memory bias	32
3.4.4.	Automatic thoughts	33
3.4.5.	Automatic associations	34
3.5.	CONCLUSION	34
4	THE MEASUREMENT OF IMPLICIT COGNITION	37
4.1.	BACKGROUND AND CONCEPTUAL DESIGN	37
4.2.	IMPORTANT CONCEPTS RELATED TO THE ASSESSMENT OF IMPLICIT COGNITION	38
4.2.1	Indirect measurement	38
4.2.2.	Automatic activation	39
4.2.3.	Response latency	39
4.2.4.	Levels of awareness	40
4.2.5.	Priming	41
4.2.6.	Facilitation versus interference	44
4.2.7.	Cognitive constraint and capacity limitations	45
4.3.	DIFFERENT TECHNIQUES AND PARADIGMS USED IN ASSESSING THE INFLUENCE OF ANXIETY ON UNDERLYING INFORMATION PROCESSES	47
4.3.1.	The Visual Dot Probe	47
4.3.1.1.	The Dot Probe and information processing	48
4.3.1.2.	The Dot Probe and domain specificity	48
4.3.1.3.	State versus trait anxiety	49
4.3.2.	The Emotional Stroop task	50
4.3.2.1.	The original Stroop task	50
4.3.2.2.	Modified versions of the Stroop	51
4.3.2.3.	The Emotional Stroop and information processing in anxiety	51
4.3.2.4.	Stroop sensitivity to processing levels	53
4.3.2.5.	Causes and correlates of Emotional Stroop interference	54
4.3.2.6.	Mechanisms underlying the Stroop	56
4.3.3.	The Implicit Association task (IAT)	59
4.3.3.1.	Conceptual description	59
4.3.3.2.	Uses and purposes	61
4.3.3.3.	Mechanisms underlying the IAT	61
4.4.	CONCLUSION	62
5	IMPLICIT ASSOCIATION TASK	64
5.1	THE INITIAL IAT PROCEDURE	64
5.2.	EXTENSION OF THE IAT TO OTHER DOMAINS OF RESEARCH	66

5.3.	EXTENSION OF THE IAT TO THE STUDY OF DISORDER IN CLINICAL POPULATIONS	67
5.4.	IMPLICIT ASSOCIATION TASK FOR ASSESSING ANXIETY	68
5.5.	OTHER VERSIONS OF THE IAT	72
5.6.	ADVANTAGES AND LIMITATIONS OF THE IAT	74
5.7.	PROPERTIES OF THE IAT	75
5.7.1.	Procedural variables of the IAT	76
5.7.2.	Internal consistency	76
5.7.3.	Test-retest reliability	77
5.7.4.	Convergent and predictive validity	77
5.7.5.	IAT versus explicit measures	78
5.8.	NEW ALGORITHM	80
5.9.	CONCLUSION	82
6	AIMS, OBJECTIVES AND HYPOTHESES	84
6.1.	AIMS AND OBJECTIVES OF THE PRESENT STUDY	84
6.2.	THE HYPOTHESES EXAMINED IN THE PRESENT STUDY	85
6.2.1.	Reliability study	86
6.2.2.	Investigations into the validity of the PIAT and SIAT	86
6.3.	CONCLUSION	90
7	METHOD	92
7.1.	INTRODUCTION	92
7.2.	DESIGN	92
7.3.	PARTICIPANTS	93
7.3.1.	Clinical participants	93
7.3.1.1.	Inclusion criteria	94
7.3.1.2.	Exclusion criteria	94
7.3.2.	Control participants	94
7.3.3.	Demographic characteristics of participants	95
7.3.3.1.	Age	95
7.3.3.2.	Gender	95
7.3.3.3.	Language	95
7.3.3.4.	Intellectual functioning	95
7.4.	MEASUREMENTS	96
7.4.1.	Implicit Association task	96

7.4.1.1.	The computer hardware and software	96
7.4.1.2.	Concepts and categories	96
7.4.1.3.	Stimulus words	97
7.4.1.4.	Trials and blocks	99
7.4.1.5.	IAT procedure	105
7.4.1.6.	Calculations of the IAT effects	108
7.4.1.7.	Participant responses on the PIAT and SIAT	108
7.4.2.	The Panic Disorder Severity Scale (PDSS; Shear et al., 1997)	109
7.4.3.	Beck Depression Inventory (BDI-II; Beck et al., 1996)	110
7.4.4.	The Social Phobia Inventory (SPIN; Conner et al., 2000)	111
7.4.5.	State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983)	112
7.4.6.	National Adult Reading Test (NART; Nelson, 1982)	113
7.4.7.	Structured Clinical Interview (for DSM-IV) (SCID-I; First et al., 1996)	115
7.4.8.	MINI-International Neuropsychiatric Interview (MINI; Sheehan et al., 1997)	115
7.5.	ASPECTS OF TEST CONSTRUCTION THEORY	116
7.6.	PROCEDURES	117
7.7.	STATISTICAL PROCEDURES	119
7.8.	CONCLUSION	120
8	RESULTS	122
8.1.	INTRODUCTION	122
8.2.	DESCRIPTIVE STATISTICS	122
8.2.1.	PIAT	122
8.2.2.	SIAT	123
8.2.3.	Trait anxiety	123
8.2.4.	State anxiety	124
8.2.5.	Social phobia	124
8.2.6.	Panic disorder	125
8.2.7.	Depression	125
8.3.	RELIABILITY	126
8.4.	VALIDITY AND HYPOTHESIS TESTING	127
8.4.1.	Results of the t-tests to investigate Hypotheses 1, 2, 3, 5, and 7	127
8.4.2.	Results of Paired Sample t-tests to investigate Hypotheses 4 and 6	128
8.4.3.	Results of the Independent Samples t-test to investigate Hypotheses 8a and 8b	129
8.4.4.	Results of the Pearson's Product Moment Correlations to investigate Hypothesis 9 and 10	130
8.5.	SUMMARY	134



9	DISCUSSION	135
9.1.	INTRODUCTION	135
9.2.	METHOD AS A SOURCE OF ERROR VARIANCE	136
9.3.	RELIABILITY	137
9.4.	VALIDITY AND THE RESULTS OF HYPOTHESIS TESTING	138
9.4.1.	Performance of the two clinical groups on their ‘own’ (domain-specific) IAT tasks (i.e., results related to Hypotheses 1 and 2)	139
9.4.2.	Performance of the two clinical groups on ‘each others’ (not domain-specific) IAT tasks (i.e., results of Hypotheses 3 and 5)	151
9.4.3.	Performance of each of the two clinical groups on the two IAT’s (i.e., results related to Hypotheses 4 and 6)	152
9.4.4.	Performance of the control group on the IAT tasks and a comparison with the performance of the two clinical groups (i.e., results related to Hypotheses 7 and 8)	155
9.4.5.	Correlations between performance on the two IAT tasks and self-report questionnaires (i.e., results related to Hypotheses 9 and 10)	156
9.5.	LIMITATIONS OF THE STUDY AND SUGGESTIONS OR FUTURE RESEARCH	158
9.6.	CONCLUSION	161
10	CONCLUSION	163
	REFERENCES	168
		
APPENDICES		
APPENDIX A	The blocks in the initial Association task using the target concepts of insect and flower, and the valence attribute of pleasant and unpleasant	188
APPENDIX B	A comparison of the old, new (as developed by Greenwald, Nosek, and Banaji, 2003) and currently adapted algorithm	191
APPENDIX C	Brief summary of the study conducted by Nosek et al. (2003) regarding methodological issues	194
APPENDIX D	PIAT and SIAT safety and threat words	196
APPENDIX E	Distribution of SIAT and PIAT effects for panic disorder, social phobia, and control group	198
APPENDIX F	Results of the Kolmogorov-Smirnov test to see if the effects are normally distributed	200

LIST OF TABLES

Table 7.1	Schematic Presentation of the Blocks, Task Instructions and Number of Trials that are Used in the Current Adapted Version of the Implicit Association Task, with Examples of Correct Responses as Indicated by the Appearance of a Black Dot	100
Table 8.1	Descriptive Statistics for the PIAT Effects	122
Table 8.2	Descriptive Statistics for the SIAT Effects	123
Table 8.3	Descriptive Statistics for the Trait-Anxiety Inventory Scores	123
Table 8.4	Descriptive Statistics for the State-Anxiety Inventory Scores	124
Table 8.5	Descriptive Statistics for the Scores Social Phobia Inventory Scores	124
Table 8.6	Descriptive Statistics for Scores the Panic Disorder Severity Scale Scores	125
Table 8.7	Descriptive Statistics for the Beck Depression Inventory-II Scores	126
Table 8.8	Summary Statistics for Difference-Scores IAT Effects	127
Table 8.9	Comparison of SIAT and PIAT Effects for Two Clinical Groups With A Wilcoxon-Test	129
Table 8.10	Comparison of Control Group and the Two Clinical groups on IAT Effects	130
Table 8.11	Correlations between PIAT Effects and Other Measures for the Panic Disorder Group	131
Table 8.12	Correlations between SIAT Effects and Other Measures for the Social Phobia Group	133

LIST OF FIGURES

Figure 1	Expected and observed correlations between IAT effects, the SPIN and other self-report measures.	158
-----------------	--	-----

CHAPTER ONE

INTRODUCTION

Cognitive models of anxiety and fear contend that maladaptive cognitive structures (or schemas) guide information processing so that anxious people are more prone to attend to potentially threatening stimuli, interpret ambiguous information in a threat-related light, and recall threat-consistent information (Beck, 1976; Beck, Emery, & Greenberg, 1985). These cognitive biases contribute substantially to an interpretation of a world that is riddled with threat and are thus believed to maintain anxiety and perpetuate anxious symptoms by keeping threat-related cues salient. Where past research was primarily concerned with the investigation into conscious cognitive content in emotional disorders with the use of explicit measures (Argyle, 1988; Hibbert, 1984), apparent shortcomings in these measures resulted in current research interest that is more concerned with the investigation of underlying or implicit cognitive processes involved in emotional disorders that operate outside the individual's conscious awareness or control (Hope, Rapee, Heimberg, & Dombeck, 1990). Greenwald and Banaji (1995) define implicit cognition as those cognitive representations (schemas) of past experience that operate independently of conscious thought or introspection.

There is a rich theoretical literature pertaining to the automatic and non-conscious nature of fear and anxiety and the role of maladaptive fear schemas in the development and maintenance of anxiety disorders. Biases exist in different information processing systems such as interpretation, attention, memory and associations, and are speculated to occur in different emotional disorders at different information processing stages (Williams, Watts, MacLeod, & Mathews, 1988). Information processing biases that are both explicit as well as implicit have consistently been demonstrated for people with clinical anxiety, especially pertaining to processes of attention, interpretation, and judgment. Where explicit refers to the role of conscious and strategic processes or biases, implicit refers to processes or biases that are beyond awareness and control, and as such

is often assimilated with that which is unconscious. Although research pertaining to implicit processes contributes substantially to the advances in the study of automatic fear processing in the anxiety disorders, one area that has received little attention, and also resulted in inconclusive findings, is the role of automatic or implicit associations in memory (Williams et al., 1988).

The recently developed Implicit Association Task¹ (IAT; Greenwald, McGhee & Schwartz, 1998) has demonstrated promise for assessing memory-based cognitive structures referred to in schema theories. This task assesses automatic associations in the sense that these evaluations occur outside of conscious control and sometimes even awareness, and thus share many of the qualities attributed to schemas. The IAT attempts to measure the strength of associations between concepts (e.g., 'self' and 'pleasant'), and in the process provide a measurement of a construct such as 'self-esteem', by comparing response latency speeds on a computer classification task. In this task words are to be classified into one of two group categories and each category is a correct destination for examples of a specific word pair (e.g., 'me' + 'pleasant' and 'not-me' + 'unpleasant', or 'me' + 'unpleasant' and 'not-me' + 'pleasant'). In this way participants are required to classify stimuli representing four concepts (e.g., 'me', 'not-me', 'pleasant', 'unpleasant') with the use of just two response keys.

The underlying assumption of the IAT is that if two concepts are strongly associated (e.g., 'me' + 'pleasant'), the sorting task will be easier (facilitated) when associated concepts share the same response key than when they share different response keys. In this way the IAT has been adapted to assess several constructs such as social prejudice (Dasgupta, McGhee, Greenwald, & Banaji, 2000; Rudman, Greenwald, Mellot, & Schwartz, 1999), homo- versus heterosexual orientation (Banse, Seise, & Zerbes, 2001), self-esteem and self-concept (Greenwald & Farnham, 2000), fearful associations in snake and spider phobia (Teachman, Gregg, & Woody, 2001), self-relevant fear

¹ While some researchers use the word 'test', the present researcher, in line with Gemar et al. (2000), will refer to the Implicit Association 'task'.

associations in clinical depression (Gemar, Segal, Segrati, & Kennedy, 2000), and others (see Fazio & Olson, 2003 for a review).

Using approximately the same rationale as Egloff and Schmukle (2002) in an anxiety-focused study, the current study has adapted the IAT to provide a measure of self-relevant fear associations in the memory of people suffering from either social phobia or panic disorder consistent with cognitive models of fear and anxiety. In the current study, categories such as self ('me') and other ('not-me') and domain-specific threat (e.g., 'embarrassed') and safety words (e.g., 'relaxed') pertinent to the main concerns of people with social phobia and panic disorder were used. In its adaption, the Physical Threat Implicit Association Task (PIAT) and Social Threat Implicit Association Task (SIAT) were developed to measure the strength with which self-related constructs are associated with anxiety-related constructs as opposed to their association with calmness-related constructs. In the process the present researcher expected that, for example, the word 'choke' would be strongly associated with the self-referential thoughts of a person with panic disorder (reflected by performance on the PIAT), and alternatively that, for example, the word 'embarrassed' would be strongly associated with the self-referential thoughts of a social phobic (reflected by performance on the SIAT).



Based on previous research, it is plausible to expect that the strength of threat-related associations may determine the extent to which maladaptive thought patterns or biased associations (schemas) govern information processing, hence guiding interpretations of an external and internal nature in a consistent manner and thus, possibly, contributing to the maintenance of the pathology. The present researcher expected that people with social phobia would find it easier to classify 'social threat' and 'me' constructs when they share the same response key, while people with panic disorder would find it easier to respond quickly and correctly to combinations in which 'physical threat' and 'me' constructs share the same key. In other words, the researcher expected shorter response latencies in a classification task for clinical samples with anxiety disorders in which threat-related concepts shared the same response key as self-related constructs. If the expected results were to be demonstrated it would not only support the

validity of these newly developed tasks, but would further provide evidence for the role of theoretically proposed schematic structures in clinical anxiety (Beck et al., 1985). The expected results will confirm the existence of a strong and coherent association network (Bower, 1981) consisting of domain-specific fears and self-related threat elements (Segal, 1988) that is believed to be integral to the information processing present in social phobia and panic disorder (Beck et al., 1985). In this way the IAT may prove to assist in the identification of certain underlying fear-based emotions and cognitive vulnerabilities that are not consciously accessible to the person with the anxiety disorder.

To the best of our knowledge, the present research represented the first attempt in which the IAT had been adapted to measure the strength of threat related associations in subjects with panic disorder and social phobia specifically. As social phobia and panic disorder are two of the most prevalent of the anxiety disorders, it was believed that the present research would provide valuable insight into these disorders and open venues for further research. The fact that social phobia and panic disorder are both anxiety disorders would provide a challenge for the discriminative sensitivity and validity of the IAT. Furthermore, if the research was able to demonstrate the sensitivity of the IAT for underlying thought processes and automatic associations in sufferers of social phobia and panic disorder, it could be a valuable instrument for further research. Based on this, the IAT may prove to be a beneficial tool for examining association processes that may be risk factors for clients to develop an anxiety disorder or a relapse after treatment (Teachman et al., 2001). The current research may then also contribute to the development of adapted IAT tasks to be used for research with other clinical populations.

The assessment and identification of biased, automatic schema-specific associations, which trigger anxiety and assist in the maintenance of the pathogenesis, is of great relevance in the understanding and treatment of the anxiety disorders. A greater understanding of the role of implicit cognition in anxiety provides impetus for corrective treatment procedures, especially from a cognitive perspective, which may not only contribute to advances in accuracy of the assessment of maladaptive cognition and

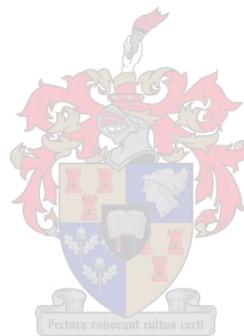
judgement, but also contributes to the eventual success of treatment and the overall ability to estimate relapse risk and vulnerability factors (Teachman & Woody, 2001).

The purpose of the present study was therefore to explore the utility of the adapted PIAT and SIAT in the investigation of underlying threat-associations in panic disorder and social phobia respectively. For these reasons a quantitative, quasi-experimental, within-subjects design, was used.

There are ten chapters in the thesis. Chapter Two provides an outline of the core diagnostic criteria, concerns, and fears characteristic of panic disorder and social phobia as specified by the contemporary *Diagnostic and statistical manual of mental disorders (4th ed., text-revision) (DSM-IV-TR, 2000)*. In Chapter Three, the reader is introduced to a cognitive perspective of anxiety disorders in general, and panic disorder and social phobia in particular, as this forms the basic theoretical framework for the present research. In this chapter the reader is provided with an outline of the main views of several of the most prominent cognitive theorists as well as a selected overview of related literature and research pertaining to the cognitive processes that are believed to underlie panic disorder and social phobia. To investigate the relationship between anxiety disorders and implicit association, an indirect measurement paradigm was used. For this reason, Chapter Four sets the context for understanding the concepts and paradigms that are related to the measurement of implicit cognition. An understanding of these paradigms and constructs are crucial to understand the development and mechanisms of the adapted IAT, which is the exclusive focus of Chapter Five. Chapter Five offers the reader an insight into the purposes, background, adaptations, limitations, and psychometric qualities of the IAT, with special relevance to its use in anxiety disorders. All of these chapters constitute the bulk of the literature study of the current study.

In Chapter Six, the main aims and hypotheses related to the current study are formulated. In Chapter Seven the methods employed in the present study are described. Chapter Seven also includes an overview of the other measurements (in addition to the adapted IAT) that were used in the present study, as well as a description of how the IAT

was adapted to investigate implicit threat associations in social phobia and panic disorder. The sampling strategies, the data collection methods, and data analysis techniques are discussed. Chapter Eight documents the results, whereas in Chapter Nine the results are discussed in light of prior literature and research, with consideration of the implications of the present study for further research. It concludes with a discussion of the limitations of the present research and recommendations for future research are made. And finally, Chapter Ten contains a general conclusion for the present research.



CHAPTER TWO

PANIC DISORDER AND SOCIAL PHOBIA

The purpose of the present study is to develop a task which measures fear-based association processes that are characteristic of individuals with social phobia and panic disorder. Participants were recruited on the basis of a diagnosis of either social phobia, panic disorder, or to be members of a 'normal' control group. This chapter will describe some of the diagnostic criteria and symptoms related to two of the most prevalent anxiety disorders, namely panic disorder and social phobia.

2.2. PANIC DISORDER

The *DSM-IV-TR* (2000) distinguishes between panic disorder, which has 'diagnostic criteria' and is codeable as a disorder, and panic attacks which have criteria but is not a codeable disorder. Panic attacks can occur as a symptom in a variety of mental disorders other than panic disorder (e.g., social and specific phobias, depression, and post-traumatic stress disorder) and medical conditions (e.g., substance withdrawal). The presence of panic attacks therefore does not necessitate a diagnosis of panic disorder. However, the primary symptom for the diagnosis of panic disorder is the occurrence of spontaneous and unexpected panic attacks.

2.2.1. Definition and Diagnosis

A panic attack can be defined as a discrete period of intense fear or discomfort, which is accompanied by at least 4 panic-related criteria (listed below). The symptoms of a panic attack are usually experienced as having an abrupt onset and mostly reaching a peak within 10 minutes (very rarely do they extend for hours). A person may experience varying degrees of intensity during, and frequency of panic attacks, as well as varying degrees of apprehension or anxiety between such attacks. The *DSM-IV-TR* (2000) lists the characteristic symptoms for panic attacks as follows:

1. palpitations, pounding heart, or accelerated heart rate
2. sweating
3. trembling or shaking

4. sensations of shortness of breath or smothering
5. feeling of choking
6. chest pain or discomfort
7. nausea or abdominal distress, feeling unsteady, light-headed, dizzy or faint
8. derealization (feelings of unreality) or depersonalization (being detached from oneself)
9. fear of losing control or going crazy
10. fear of dying
11. paresthesias (numbness or tingling sensations)
12. chills or hot flushes

There are several types of panic attacks. Unexpected panic attacks are characterised by the unexpected 'out of the blue' appearance that are not associated with any situational stimuli. Unexpected panic attacks may also occur nocturnally while someone is sleeping, or just as they are about to fall asleep, and are not precipitated by dreams. These nocturnal panic attacks occur in about 69% of people with panic disorder (Mellman & Uhde, 1989). Not all panic attacks are unexpected. In social phobia and specific phobia, for instance, panic attacks usually follow a cued or specific stimulus. Another type of panic attack, the situationally predisposed panic attack, falls somewhere between the distinctions of expected or unexpected panic attacks. Such panic attacks may or may not occur when a person is exposed to a specific trigger, or they may occur immediately after exposure to the trigger, or after a substantial delay after exposure (Sadock & Sadock, 2003).

Panic disorder is defined by the *DSM-IV-TR* (2000) as the occurrence of recurrent, unexpected panic (anxiety) attacks of which at least one of the attacks has been followed by at least a month of one or more of the following:

1. persistent concern about the onset of another panic attack,
2. apprehension about the possible implications or consequences of such attacks in terms of mental or physical health, and

3. a significant change in behaviour as a result of having these attacks (such as avoiding driving or an inability to sleep).

Although the *DSM-IV-TR* (2000) requires the presence of unexpected panic attacks for a diagnosis of panic disorder, it also allows for the experience of expected or situationally predisposed panic attacks. Panic attacks in people with panic disorder are known to vary in frequency and intensity, from a few attacks per month to a series of full-scale attacks in one week separated by months or weeks (*DSM-IV-TR*, 2000). Limited symptom attacks (in which less than 4 of the 13 previously mentioned symptoms are experienced) are also common among people with panic disorder, although most have experienced full-scale attacks at some point during the course of the disorder (*DSM-IV-TR*, 2000).

2.2.2. Panic Disorder Subtypes

The *DSM-IV-TR* (2000) contains the diagnostic criteria for two types of panic disorder. One type includes the presence of agoraphobia while the other diagnosis excludes it. Agoraphobia can be defined as the fear related to specific places or situations from which escape might be impossible, or at least may result in possible embarrassment in the instance of an unexpected panic attack (*DSM-IV-TR*, 2000). Not all agoraphobics have panic attacks or can be diagnosed with panic disorder, and not all people with panic disorder have agoraphobia. It is common, however, for a person with panic disorder to develop agoraphobic avoidance of places that may become associated with panic, and this avoidance may result in a highly restricted lifestyle (Wells, 1999). As such agoraphobia can be the most debilitating and disabling of the phobias. Although agoraphobia in itself is not a codeable disorder, the *DSM-IV-TR* (2000) does specify diagnostic criteria for agoraphobia without a history of panic disorder

2.2.3. Prevalence and Course

According to epidemiological studies, panic disorder is reported to have a lifetime prevalence of 1.5 to 5 %, and panic attacks have a lifetime prevalence rate of 3 to 5.6 % (Sadock & Sadock, 2003). It is speculated that panic disorder has a bimodal age of onset peaking between the ages of 15 and 19, and again between 25 and 30 years (Ballenger &

Fyer, 1996). Panic disorder is diagnosed more than twice as often in women as in men (Kessler et al., 1994).

2.2.4. Comorbidity and Differential Diagnosis

Ninety-one percent of people with panic disorder have at least one other psychiatric disorder (Sadock & Sadock, 2003). According to the DSM-IV-TR (2000) major depressive disorder is common in 10% to 15% of people with panic disorder, with major depressive disorder preceding the onset of panic in about one third of these people. Comorbidity with other anxiety disorders is also likely. Social phobia is commonly reported in 15%-30% of individuals with panic disorder (*DSM-IV-TR*, 2000). Obsessive compulsive disorder is common in 8%-10%, specific phobia in 10%-20%, and generalised anxiety disorder in 25% (*DSM-IV-TR*, 2000; Taylor, 2000). The onset of substance-related disorders is also common among people with panic disorder, who are exposed to self-medication and symptom alleviation through alcohol, drugs, and medication (Taylor, 2000). Panic disorder should not be diagnosed if the attacks are a result of a general medical condition such as hyperthyroidism, hyperparathyroidism, seizure disorders, cardiac conditions, or any other medical conditions that may result in occasional panic or panic-related symptoms (*DSM-IV-TR*, 2000). Panic attacks arising from these conditions, need to be treated with appropriate approaches (Taylor, 2000).

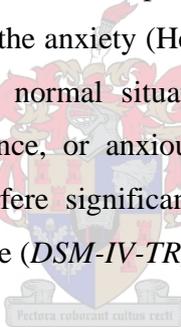
2.3. SOCIAL PHOBIA

2.3.1. Definition and Diagnosis:

Social phobia is defined in the *DSM-IV-TR* (2000) as a clear and persistent fear of social or performance situations in which embarrassment or scrutiny may occur. The social phobic individual fears that he or she may act in a way (or show anxiety-related signs) that may cause embarrassment or humiliation. The fears of people with social phobia range from specific situations such as writing in public, to any interpersonal situations in which they may potentially be subjected to critical evaluation (Heimberg et al., 1995; Nortje, 1999). There are also others for whom the primary concern of embarrassment stems from the idea of a possible unexplainable flight from threatening

situations (Heimberg et al., 1995). Common examples of social phobia include fears of speaking or performing in public, using public restrooms, eating in public (which may include eating at home with family or acquaintances), being in test situations, meeting people in authority, being introduced to people, using the telephone, having visitors at home or being watched while doing something (Heimberg et al., 1995; Liebowitz, Holt, Heimberg, & Hope, 1992).

Characteristic of a phobia is that the persistent and irrational fear is often accompanied by a compelling desire to avoid such situations otherwise it would be endured with a great amount of distress and anxiety (*DSM-IV-TR*, 2000). Social phobic individuals may go to great lengths to avoid anxiety-provoking situations. This phobic avoidance (e.g., of being looked at, of people, and of social situations) forms the greatest source of impairment for the person with social phobia as it results in actual performance deficits that enhance and perpetuate the anxiety (Heimberg et al. 1995). Although phobic reactions are exaggerated fears of normal situations, diagnosis of social phobia is warranted only if the fear, avoidance, or anxious apprehension of encountering the situation is severe enough to interfere significantly with the person's daily routine, occupational functioning or social life (*DSM-IV-TR*, 2000).



People with social phobia are also commonly aware of the excessive or unreasonable element of their fear and avoidance behaviours. Nevertheless, exposure to the feared situation, or even the anticipation thereof (anticipation anxiety), invariably provokes the immediate onset of anxiety. The *DSM-IV-TR* (2000) acknowledges that this anxiety is commonly associated with panic attacks. Unlike the unexpected attacks which characterise panic disorder, the attacks in social phobia mostly take the form of situationally bound or situationally predisposed panic attacks which are usually related to fear of social or performance situations (*DSM-IV-TR*, 2000; Heimberg et al., 1995).

Although several anxiety symptoms often experienced by social phobics such as sweating, a racing heart, trembling hands and speech, are also common among several of the other anxiety disorders, symptoms more peculiar to social phobia include blushing,

averting the gaze of others, muscle twitching, and anxiety about scrutiny (Sadock & Sadock, 2000). Typical panic symptoms, such as dizziness and dyspnea, are less common in social phobia. Also, a person with social phobia will be aware from the outset that their anxiety is related to fears of social performance, and thus, they rarely have the fears of dying that are common among people with panic (Heimberg, Liebowitz, Hope, & Schneier, 1995). A wide range of other symptoms and related problems often accompany social anxiety. These may include depression, tension headaches, interpersonal difficulties, and substance abuse (Carsons & Butcher, 1992; Rapee & Heimberg, 1997).

2.3.2. Social Phobia Subtypes

The DSM-IV-TR (2000) specifies the diagnostic criteria for social phobia, with an additional specification of a generalised subtype. Generalised social phobia refers to the fear of most social situations. By implication, a not-generalised subtype would refer to the more specific types of social phobia (e.g., fear of urinating in public restrooms, or a fear of writing in public). On the other hand, Heimberg et al. (1995) distinguish between more than one subtype. People with 'discrete' social phobia predominantly fear performance-related situations (such as reading, speaking, writing in front of an audience). The 'generalised' social phobic suffers the same fears, but these are also extended to fears relating to social interactions such as talking to people in authority, informal conversations or attending social gatherings. Other subtypes include 'circumscribed', 'limited', 'performance' and 'non-generalised' social phobia (see Heimberg et al., 1995).

2.3.3. Prevalence and Course

It is believed that social phobia has its onset in late childhood or early adolescence (DSM-IV-TR, 2000). According to epidemiological data, social phobia is a chronic disorder, which can severely disrupt many aspects of an individual's life (e.g., school, work, and interrelationships) over many years. According to the DSM-IV-TR (2000) approximately 3% to 13% of the normal population may develop social phobia at some point during their lives. Social phobia has a 12-month prevalence of 8% and a lifetime prevalence of 13% (Williams, Mathews, & MacLeod, 1996). Recent community based

studies have found that most people with social phobia do not seek treatment (Schneier, Johnson, Hornig, Liebowitz, & Weisman, 1992), and an even larger selection of people with social fears (such as public speaking) do not classify for the diagnosis of social phobia, as their symptoms do not result in any severe life impairment, or can be avoided to the extent that no significant changes in life-style occur (Heimberg et al., 1995).

2.3.4. Comorbidity and Differential Diagnosis in Social Phobia

According to a study by Schneier, Johnson, Hornig, Liebowitz, and Weissman (1992) 69% of social phobic people suffer from a comorbid lifetime mental illness, with social phobia being the initial onset disorder in 77% of this population. Comorbid disorders with the highest lifetime prevalence were found to be simple phobia (59%), agoraphobia (45%), alcohol abuse (19%), major depression (17%) and drug or alcohol abuse (13%) (Schneier et al., 1992). Although clinicians must consider differential diagnoses such as panic disorder, major depression, agoraphobia, avoidant personality disorder, and even in some cases schizophrenia, differentiation among some of these disorders remains a common challenge (Sadock & Sadock, 2003). 'Secondary social phobia' is the term coined by Liebowitz, Gorman, Fyer and Klein (1985) which arises when social phobic symptoms are a secondary result of a comorbid psychiatric or medical illness. For example, a person with Parkinson's disorder, which is initially unrelated to social phobia, may begin avoiding social situations, as they are afraid of being embarrassed about others noticing their tremors. The DSM-IV-TR (2000) classifies such conditions as an "anxiety disorder, not otherwise specified". Also important for diagnosis is that the fear or anxiety is not a result of the direct physiological effects of substance abuse or a general medical condition, and that it is not better accounted for by another mental disorder, such as panic disorder, separation anxiety disorder, anorexia nervosa, or a differentiated form of normal fear and shyness. Usually, if another medical condition is present the fear or avoidance is found not to be limited to social concerns and thus distinct from social phobia (DSM-IV-TR, 2000).

2.4. DEFINITIONS OF FEAR, ANXIETY AND PHOBIA

2.4.1. Fear

Fear refers to the appraisal that something negative or threatening may happen (appraisal of danger). The appraisal of potential danger (which is either realistic or irrational) is thus a cognitive process, as opposed to an emotional reaction (Heimberg et al., 1995).

2.4.2. Anxiety

Anxiety stems from the Greek word 'anxius' (Beck et al., 1985), which can be defined as a tense emotional state (characterised by subjective feelings of unpleasantness, nervousness, and tension), which is often associated with physical manifestations such as an increased heart rate, shortness of breath, and sweaty palms (Heimberg et al., 1995). Anxiety is related to the uncomfortable feeling evoked once the fear is stimulated, and as it is a feeling (or emotion), it cannot be labelled as realistic or unrealistic (Beck et al., 1985). The cause for anxiety and anxiety-related symptoms differ in social phobia and panic disorder. While the onset of anxiety in social phobia is restricted to social evaluative situations, anxiety in people with panic disorder is mostly related to situations or symptoms which may be indicative of a panic attack (Heimberg et al., 1995).

2.4.3. Phobia

When fear or anxiety become thoroughly associated with a situation or an object, a phobia may result, by which the mere presence of the threat-associated situation or object may elicit a fear response pattern (Carson & Butcher, 1992). In this sense a phobia is "a persistent and disproportionate fear of some specific object or situation that presents little or no actual danger to a person" (Carson & Butcher, 1992, p. 185). The word 'phobia' is derived from the Greek word 'phobos', which means 'flight' (Beck et al., 1985). A phobia can be a fear of a variety of objects or situations such as social events, thunderstorms or enclosed spaces. A phobia evokes anxiety when an individual is exposed to (or imagines) the phobic situation, and is accompanied by an intense desire to avoid the feared situation, this being common to both people with social phobia and panic disorder (Beck et al., 1985). Once in the phobic situation, the person fears the

consequences (e.g., panickers: choking, suffocating; social phobics: making a fool of themselves), resulting in anxiety that may culminate in a panic attack. The crucial element of a phobia is that it involves a high estimation of risk for a relatively non-threatening situation (Beck et al., 1985).

2.5. CONCLUSION

Panic disorder and social phobia are two of the most common anxiety disorders. Until quite recently, there was no official diagnosis for panic disorder and social phobia, therefore leaving many affected people with large medical bills and unsatisfactory explanations for their perceived anxiety. The symptoms of these disorders are often severe and debilitating, resulting in severe life interference with the sufferer's functioning and substantial impairment in his/ her quality of life. It is for this reason that the current study's focus on these two disorders is regarded as socially relevant.

Although certain anxiety symptoms are common in all anxiety disorders there are certain symptoms that are more pronounced in, and typical of, social phobia (such as blushing, averting from eye contact) and panic disorder (such as dizziness and dyspnea) (Heimberg et al., 1995). While the fears of people with panic disorder are primarily related to the misinterpretation of physical sensations and mental concerns, the predominant fears characteristic of individuals with social phobia are related to social situations and an overestimation of its potential for embarrassment and negative social evaluation (Heimberg et al., 1995). The fact that threat-related misinterpretations (of social cues in social phobia and physical cues in panickers) are characteristic of anxiety disorders implies, to some extent, that cognitive components are involved in the development and maintenance of these disorders. This opens the way the next chapter, which focuses primarily on the cognitive processes related to anxiety disorders.

CHAPTER THREE

ANXIETY DISORDERS FROM A COGNITIVE PERSPECTIVE

Cognition, in its broadest sense, refers to all the processes and mechanisms that are involved in, and contribute to thinking, as well as the content or products of these thinking processes, in other words, the thoughts themselves (Wells, 1999). As anxiety is primarily an emotional reaction to a cognitive appraisal of some impending danger, a strong cognitive component is implied in anxiety disorders. For this reason the present researcher has selected the cognitive approach as a suitable framework for understanding the anxiety disorders and for the explanation of the data obtained from the current study.

This chapter starts with an introduction to the cognitive theory of anxiety, with consideration to the views of some prominent cognitive theorists on anxiety disorders. It then proceeds to outline some of the theoretical cognitive constructs, followed by an overview of the crucial cognitive or information processing biases that are believed to underlie pathological anxiety, with specific reference to social phobia and panic disorder. In so doing, this chapter will furnish the reader with a theoretical overview of the cognitive processes underlying anxiety as well as pointing out the inconsistencies in literature that have provided the impetus for the current study.

3.1. COGNITIVE THEORIES OF ANXIETY AND ANXIETY DISORDERS

Cognitive models of anxiety disorders see man as a complex information-processing system (Wells, 1999). On initially encountering internal or external stimuli, the stimuli are first subject to a process of cognitive appraisal so as to determine whether or not they are threatening (Spielberger, 1966). Cognitive models on anxiety posit that anxiety-related disorders are characterised by threat-related misinterpretation of such cues, which in turn gives rise to and exacerbates problematic responses and emotional dysfunction (Wells, 1997). Faulty cognitive appraisals are believed to be based on various kinds of cognitive or information processing biases (in memory, judgement, and attention, for instance) that are sensitive to threat-related information (Lundh, Wikström, Westerlund, & Öst, 1999). These faulty biases form the basis for the origin and

maintenance of the anxiety experience (Williams et al., 1996), and the underlying premise of all cognitive theories (Lundh et al., 1999).

Several writers have proposed specific ideas contributing to the development and premises of the cognitive approach. As the present research project is concerned with interactional relationships between anxiety and the processing of information, attention will now be given to some of the relevant influential views in the cognitive field on emotional disorders. These theories and models will provide the underpinnings for the relevant research that is discussed and referred to at several points throughout this thesis as well as a basis to understand the results of the present study.

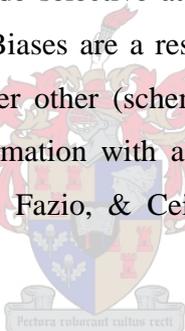
3.1.1. Beck's Schema Theory

One of the most influential cognitive theorists, Aaron Beck (1967), drew on the concept of schema as a way of understanding cognitive processes that people use to make sense of the world. Schemas can be defined as cognitive structures relating to subjective, previously learned or experienced information (Beck et al., 1985; Pearson, 1982), which screen, code, and evaluate stimuli within an idiosyncratic range, so as to enable a person to categorise and interpret situations in a meaningful way (Teachman & Woody, 2004). These structures are analogous to interconnected associations in memory (Teachman & Woody, 2003). A related construct is Markus's (1977, 1990) self-schema concept, which evidently contains self-related information, hence dominating consciousness and forming the core of the self.

According to Beck's theory (Beck et al., 1985), anxiety disorders are characterised by rigid and inflexible schemas involving themes of personal vulnerability and danger (Beck, Rush, Shaw, & Emery, 1979). Beck asserts that key cognitive differences between anxiety disorders are based on the content of biases in prominent schemas (Williams Watts, Macleod, & Mathews, 1997). Beck contends that the self-schemas of people with social phobia involve vulnerability to negative social outcomes (in Trower & Gilbert, 1989), and beliefs about rejection, loss of social stature and ridicule from others (Beck et al., 1985). Panic-related schemas are more specifically concerned with the possibility of

physical threat (Beck, 1988). Panic-related self-schemas comprise elements of personal harm and vulnerability (Beck et al., 1985) and beliefs associated with impending death, insanity or loss of control (Beck, 1988). Anxious people with self-schemas referring to a particular domain of interest (such as social humiliation for a social phobic or potential heart failure in panickers) consider these domains to be of critical personal importance. For this reason, they will maintain an enduring investment and commitment to particular self-referent domains (Markus, 1990). This investment to self-relevant domain-specific information is directly related to the current investigation into the strength of self-relevant threat associations as peculiar to people with panic disorder and social phobia.

Content or domain specific schemas introduce biases throughout all aspects of information processing cycle (Mogg, Bradley, Williams, & Mathews, 1993; see Section 3.3), for example, biases which guide selective attention, interpretation, judgment, and subsequent behavioural responses. Biases are a result of schema-consistent information having a competitive advantage over other (schema-inconsistent) information, as it is easier to assimilate congruent information with already existing knowledge structures (Neisser, 1976; Pace, 1988; Smith, Fazio, & Ceika, 1996; Taylor & Crocker, 1981; Williams et al., 1997).



Information processing biases are assumed to represent measurable consequences of the underlying schemas in anxiety disorders (Teachman & Woody, 2004). Outstanding reviews have for instance been published by MacLeod and Rutherford (1988), Mathews and MacLeod (1994), and McNally (1996). A downfall of the theoretical schema construct, however, lies in the fact that it has not been clearly enough defined (Williams et al., 1997). This vagueness has posed a challenge for the testing of this model (Fiske & Taylor, 1991). For example, while some paradigms (such as self-report questionnaires) have supported Beck's theory in terms of the content of specific schemas, these measures have been unable to tap into the more underlying associations in memory which more closely resemble the schema construct (this will be dealt with exclusively in Chapter Four). Although Beck's (1981) theory refers to the various cognitive processes affected by anxiety, not much emphasis is placed on the more underlying information processes

such as those alluded to in the current thesis. For this reason one needs to consider a model that is more explicit in its dealings with processes such as selective attention, encoding and retrieval.

3.1.2. Bower's Network Theory

Another important and well-researched theory is Bower's Associative Network Theory (Bower, 1981, 1985, 1987; Williams, Watts, Macleod, & Mathews, 1997). This theory focuses on the principle of associative networks. According to Bower (1981), events as well as emotions are represented in long-term memory in terms of associative pathways between various concepts or nodes. According to this theory, each emotional state or concept is represented by its own corresponding node, which is simultaneously connected and interrelated with other nodes sharing affectively congruent information, within an associative network of nodes (Bower, 1981). The strongest associative links exist between the most affectively congruent nodes (MacLeod & Rutherford, 1992) as these nodes share similar interrelated pathways. Given the properties of semantic networks (in particular, the spreading of activation; Bower, 1981), one can expect that when a certain emotion node is activated, the chances for activation of other similar and strongly associated nodes containing affectively congruent information becomes more likely. This is because congruent nodes share associated pathways which require the least effort for pathway activation (Williams et al., 1997). Conversely, the chances for activation of affectively incongruent emotions become less probable as incongruent concepts require activation through different pathways than those currently activated.

Based on the spreading of activation to associatively congruent constructs, Bower (1981, 1987) hypothesises that the activation of any particular state of emotion will become associated with biases in the processing of information. This is because preference will be given to the encoding or activation of emotionally congruent stimuli, at the cost of other competing but inconsistent information. Assuming that highly activated nodes attract the most attention, one can also predict that information congruent with a certain mood, which requires less effort to be activated, is capable of attracting the most

attention, giving rise to attentional bias (Power & Dalgleish, 1997). In this way, people with emotional disorders are not only prone to making associations that are particular to and in line with the activated fears characteristic of their disorder, but every time these associations are made they are reinforced so as to establish well used pathways of so called 'least resistance' (Buzan & Buzan, 2002; Power & Dalgleish, 1997). Well-established pathways will be preferentially activated before other competing but less-established pathways (Buzan & Buzan, 2002). As the current research focuses on threat-based associations it could be expected that people with anxiety disorders have more established and well-practiced anxiety-based pathways which, consequentially, are more likely to be activated in mood-consistent situations than other incongruent or less established pathways.

On an experimental level, Bower's (1987) theory has consistently been used in generating research concerning mood congruent memory (Williams et al., 1997). For instance, learning is biased toward mood-congruent material at encoding, and memory is biased toward material that is mood-congruent at retrieval (Williams et al., 1997). Furthermore, if mood at recall is congruent with mood at encoding, recall will be facilitated as the search is biased along the same associative pathways (Williams et al., 1997). However, research relevant to Bower's model has not always maintained unswerving support, as Bower (1987) has acknowledged. For example, memory-related studies on anxious people have produced inconsistent findings regarding the effect of anxiety on memory among various anxiety disorders (see Section 3.3.3). This inconsistency is difficult to account for in terms of Bower's (1987) model. Such findings may be better accounted for by a model that distinguishes between different processing levels.

3.1.3. Lang's Bio-informational Model

Lang's Bio-informational model (Lang, 1977, 1979; Lang, Levin, Miller, & Kozak, 1983) is a theory related to emotive imagery in which anxiety is perceived as consisting of three response systems.

According to Lang's (Lang et al., 1983) theory, emotional information is contained within associative networks in long term memory. The difference between this theory and other network theories lies in the fact that according to Lang's bio-informational theory emotions are connected to motor programs and subcortical motivation units (Foa & Kozak, 1986). According to Lang et al. (1983) fear and emotion is multifaceted, consisting of behavioural, physiological, and cognitive components, each of which involve measurable outflow. Fear and anxiety can thus be assessed as propositions in terms of language behaviour (such as verbal reports, concerning the content of fear-based thoughts), motor acts (such as avoidance behaviour), and physiological events (such as anxiety-related physiological arousal involving the sympathetic nervous system) (Lang et al., 1983). The most intense emotions are characterised by a strong coherence between responses of all three data sources (such as a phobia network) (Foa & Kozak, 1986). The coherence of a network depends on the associative strength between the response units or propositions, which determines the probability of the network being activated as a unit (Lang et al., 1983). Strongly coherent networks require fewer input propositions for activation with a greater likelihood of consistent response patterns across varied contexts of stimulation (Lang et al., 1983). With the availability of sufficient information in the network memory that matches the concepts of the emotional network, context-specific or response dispositions become activated and result in a variety of response phenomena, which are known as emotion (Foa & Kozak, 1986).

Usually, however, the effect of anxiety on the three emotional response systems seem to be loosely coupled (Lang et al., 1983). Lang's research (Lang, 1979; Lang et al., 1983) was guided by conclusions based on imagery and exposure, by which it became apparent that associative network structures, mediating phobic behaviour, differ among various clinical populations. In this sense, fear is not a unitary state (Foa & Kozak, 1986). Apart from the dissociation (a term that will commonly be referred to throughout this thesis) between response units, Lang et al. (1983) noted that fear response patterns differ (on an idiosyncratic basis) for different fear-related stimuli, or for the same stimuli under different conditions (e.g., imagery versus exposure) (Lang et al., 1983). For instance,

when faced with fear, one person would flee from a situation displaying a large increase in automatic arousal (behavioural and physiological propositions), yet disclaiming the experience of fear in any measures of self-report (language proposition). When faced with the same fear, another individual might be quick to report fear, yet not display any overt avoidance behaviour and also maintain lower levels of automatic arousal. Similarly, this may explain why changes in the cognitive content (a state-anxiety variable) for a person with an anxiety disorder, while in remission, does not necessitate change on the more enduring predispositions or trait-variables (Segal, 1988). Such a multi-system approach not only clarified the various response levels on which fear could be assessed, but also allowed for the development of various customized treatments which can be implemented on a variety of different levels (Foa & Kozak, 1986).

3.2. COGNITION AND EMOTION: DIRECTION OF THE RELATIONSHIP

Research on the relationship between emotion and cognition tends to focus on either the effect of emotion and emotional disorders (i.e., related to anxiety and depression) on cognitive processes, or on the role of cognitive processes in the development of emotional disturbance (Williams et al., 1997), with arguments that emotion can potentially operate independently of cognition (Rachman, 1981; Zajonc, 1984). According to Williams et al. (1997) work on the effects of emotion on cognitive functioning can introduce 'emotion' at three different points, namely (1) the materials used (e.g., emotional versus neutral stimuli), (2) the participants involved (e.g., 'normal' participants differing with regard to their temporary state of emotional arousal, or 'clinically disordered' participants with more chronic emotional vulnerability, arousal and preoccupations versus 'normal' participants), and (3) where there is an interaction between the emotional content of materials and the emotional state or preoccupations of participants. The present study falls within this latter category where experimental materials of relevance to participants with particular emotional disorders (i.e., panic disorder and social phobia) were used and the responses of 'normal' controls, social phobics and panickers were investigated and compared.

Clinical theorists (including Beck et al., 1985) have often emphasised that there is a reciprocal relationship between cognition and mood, in which mood is affected by cognition as well as vice versa. It should, however, be noted that within Beck's schema theory, cognitive constructs such as schemas and automatic thoughts are hypothesised to play a central, mediating role in the maintenance of anxiety and anxiety disorders. It is beyond the scope of the present research to investigate the direction of the relationship between cognition and emotion. Although it will strictly be more accurate to address the relationship between cognition and emotion in a neutral, non-committal way (i.e., by referring throughout the present study to the "relationship" or "association" between cognitive variables and anxiety), there were instances where exceptions on this premise were thought to be the appropriate approach/formulation. As previously reported and according to the model of Williams et al. (1997), the present investigation could be classified within a category of paradigms where the effect of emotion (i.e., anxiety/anxiety disorder) on cognition are investigated. On the other hand, the centrality of cognitive factors within the pathogenesis of emotional disorders according to major cognitive theories (e.g., Beck et al., 1985), is thought to justify phrases such as "the effect of biased information processing on anxiety". Because the existence of a reciprocal effecting relationship between anxiety and cognition are advocated within these theories (and is also a premise of the present study) it was decided not to "force neutrality", with regard to statements about the direction of the relationship between cognition and emotion, strictly into all arguments and formulations.

3.3. CONCEPTS OF COGNITIVE THEORY

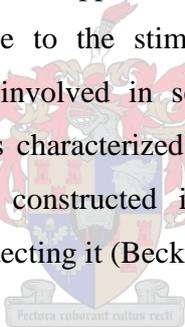
The following section is an extension of the above mentioned cognitive approach in which a more detailed focus will be allocated to the constructs of and the relationship between anxiety and information processing. This literature is given explicit attention as it forms the groundwork for understanding the principles involved in the measurement of cognitive processes that are discussed in Chapter Four, which is the primary concern of the current thesis.

3.3.1. Levels and Stages of Information Processing

Recently, many researchers have demonstrated that individuals process information about themselves and their environment not only consciously (i.e. in a controlled, explicit manner) but also unconsciously (i.e. on an implicit, automatic level that is beyond conscious awareness) (Epstein, 1994; Fazio, 1990; Greenwald et al., 2002). Although Beck (Beck et al., 1985) and Bower (1979) hypothesised that anxiety is associated with the selective processing of threat related stimuli that is mediated by automatic processes (i.e., beyond volitional control or conscious awareness), neither go as far as making any distinctions between various levels of cognition that might occur on a more tacit level outside of conscious awareness (Williams et al., 1997).

Implicit processes can be distinguished from explicit processes. While explicit processes refer to cognitive processes (such as memory, judgment, attention, association) of which the individual is consciously aware (Greenwald & Banaji, 1995), implicit processes are beyond the conscious awareness of the individual (see Greenwald and Banaji's definition of implicit cognition in Chapter One). In this respect, Fazio and Olson (2003) warn that there is no evidence of implicit processes residing wholly beyond the conscious awareness of the individual, and thus no guarantee of implicit and explicit processes operating as entirely independent constructs. Therefore, when implicit processes are referred to throughout the present research (including implicit association as assessed in the present research) they should be considered to be the result of inquiries that do not depend on direct or conscious retrieval strategies (these inquiries are discussed in Chapter Four). Nevertheless, implicit information processes are believed to represent the more spontaneous forms of behaviour (Dovidio, Kawakami, Johnson, Johnson & Howard, 1997) and are likened (although some theorists distinguish between them) with the concepts 'unintentional', 'automatic' and 'unconscious'. Explicit processes on the other hand, are open to introspection and can be changed or implemented at will (Devine, 1989). An awareness of explicit processes is therefore not necessarily informative of the effects of implicit information processes which the perceiver is not necessarily aware of (Stangor, 1988).

On one hand anxiety is believed to exert a differential effect on unconscious (or implicit) and conscious (explicit) processing levels, where, as mentioned, change on one such level does not imply change on another (Beck & Clark, 1997; Fazio et al., 1986; Segal, 1988). On the other hand cognition is believed to be involved in the development and maintenance of pathology (see Section 3.3). Beck and Clark (1997) have proposed a three-stage model to explain the role of implicit versus explicit cognition in the development and maintenance of pathological anxiety which can be likened to Graf and Mandler's (1984) distinction between early and late processing. In stage one there is a rapid recognition or detection of threat or danger when information is initially encoded in the system. These early stages in information processing involve processes such as attention and encoding, which are believed to be primarily automatic. Stage two involves the recognition or initial appraisal of such threat so as to facilitate efforts related to the fight or flight response. Although this appraisal is considered automatic in that it is involuntary, rapid, and in response to the stimulus, there is a certain amount of elaborative or strategic processes involved in semantic analysis of the threatening stimulus. And finally, stage three is characterized by secondary processes of semantic elaboration in which meaning is constructed in an effortful manner around the information as opposed to simply detecting it (Beck & Clark, 1997), which is the realm of explicit cognition.



It has been speculated that different disorders such as depression and anxiety may be associated with different types of processing biases (Foa & Kozak, 1986; Teachman et al., 2001; Teachman & Woody, 2004; Williams et al., 1997). Although researchers such as Beck (1976) have considered differences in cognitive content (such as the themes of loss in depression versus themes of danger in anxiety) few researchers have investigated these differences in terms of biased information processing in attention, judgment, or different kinds of memory that exist on an unconscious or implicit level (Teachman & Woody, 2004). In line with the models proposed by Beck and Clark (1997) and Graf and Mandler (1984), Williams, Watts, MacLeod, and Mathews (1988) have proposed a model accounting for the different processing biases that are characteristic of different disorders. According to this model anxiety related biases operate at an automatic pre-attentive level,

such that processing resources are automatically drawn to the detection of negative or threat-related information, even before such information has entered conscious awareness (Mathews & MacLeod, 1986). It is suggested that these early stages of information processing play a critical role in pathological anxiety (Williams et al., 1988). In depression on the other hand, biases are more common in later strategic or controlled processes such as elaboration, recall and memory (Williams et al., 1988). These conclusions have been confirmed by several studies which have demonstrated biases in the early stages of information processing (such as attention; see Mathews, 1990) in people with anxiety, as opposed to people with depression. Similarly, biases in the later stages of information processing as characteristically demonstrated in depression (Dagleish & Watts, 1990; MacLeod, 1990; Wells, 1999; Williams et al., 1988), has not been demonstrated as convincingly for people with other anxiety disorders (Dagleish & Watts, 1990; Williams et al., 1988), especially social phobia (Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994).

Based on these accounts, it is clear to see that there is a reciprocal relationship between emotion and cognition. Furthermore, different disorders are characterised by biases at different information processing stages (i.e., attention in anxiety, and memory in depression) which may occur on an implicit or explicit level. Distinguishing between various processing levels may aid in the conceptualisation of the association between cognition and anxiety. Disparate findings in cognitive research may sometimes be the result of processes operating at different levels of participant awareness which have not been specifically controlled for. This is often evidenced in the form of dissociated results obtained from implicit versus explicit paradigms attempting to measure the same construct. This corresponds with Lang's (Lang et al., 1983) theory which argues that fear is not a unitary state, but rather that the effects thereof may appear inconsistently within the three individual response systems. This response discordance may, for example, manifest itself as a situation where an individual does not report fear or experience arousal and yet, keeps on avoiding certain stimuli and situations.

Of particular interest in the present research is the association between fear/anxiety and implicit cognitive processes in people with anxiety disorders. This relationship (regardless of its causal direction) is hypothesised to play a distinctive, yet crucial role in pathological anxiety. As it involves implicit processes, the effects often go unnoticed to people suffering from such disorders.

3.3.2. Automatic Activation

Based on the notion of learned response, if a reaction to a social situation (also behavioural response, thought, or emotion) is repeated often enough, its mental representation (schema) should eventually become automatically associated with that situation (or behaviour, thought, or emotion), and thus automatically activated when the presence of such an object, event or its associated features (symbolic equivalent) are encountered (Chaiken & Bargh, 1993; Bargh, 1989; Bargh, Chen, & Burrows, 1996; Berkowitz, 1984). The automatization of mental pathways thus requires considerable frequency as well as consistency of pathway activation. Pathways capable of automatic activation are more likely to gain precedence over the activation of other pathways that are not so well established (Bargh et al., 1992; Fisk & Schneider, 1984).

Research has constantly demonstrated that information processes are capable of being activated automatically on encountering a fear-associated situation, resulting in an unconscious bias in attention to the processing of threat-related cues within clinical populations (Bargh, Chaiken, Govender & Pratto, 1992; Dreesen, Arntz, Hendriks, Keun, & van den Hout, 1999; DeBono & Snyder, 1995; Fazio et al., 1986; MacLeod, Mathews, & Tata, 1986; Mahone, Bruch, & Heimberg, 1993; Mathews & Macleod, 1986; Mogg, Mathews, & Eysenck, 1992; Stopa & Clark, 1993; Trower & Gilbert, 1989). Although automatic activation provides some support for Beck's (1981) notion of biased or schema-congruent processing, such processes may represent nothing more than the activation of accessible well-learned associations, which influence subsequent information processes in consistent manners (Fazio, Sanbonmatsu, Powell, & Kardes, 1986). Although processes may become automatised to the extent that they occur without the conscious awareness of the individual, such processes do not necessarily imply that

they are implicit or beyond all conscious awareness (Fazio & Olson, 2003). The distinction between automatic and implicit processes becomes clear in the assessment of such processes, which will be discussed in Chapter Four.

3.3.3. Accessibility and Strength of Association

The likelihood of a schema being activated automatically is a function of how accessible it is in memory, in other words, the ease with which such information can be retrieved (Fazio, 1986). According to Higgins and King (quoted in Krosnick, 1989), schema accessibility is a function of the schema's previous frequency of use (which may result in an almost permanent state of activation), its salience to the person (Kawakami, Dion, & Dovidio, 1998), and lastly, how extensively the schema is linked with other schemas in an associative network (i.e., associative strength) (Fazio, 1989; Fazio et al., 1986). The most significant schemas adhere to all three criteria of accessibility, which makes them chronically accessible and more consequential for the processing of information.

It is believed that the units or elements which comprise the self-schema of a person are not randomly distributed throughout the memory system, but rather are connected and interrelated with each other in varying strengths of association (Segal & Ingram, 1994). Emotional disorders may be associated with low integration (association) of self-schema elements in positive domains, while containing a high integration of self-schema elements in negative domains (Markus, 1990). If one can assume that negative self-referential information is schematically represented in a highly interconnected fashion (Bower, 1981), then it can also be assumed that exposing an individual to any of such specific schema-related elements, will, by virtue of its interconnectedness, increase the accessibility of other elements related to the schema (Collin & Loftus, 1975). This is often referred to as 'priming' or the 'spreading of activation' hypothesis. This corresponds with Lang's description of emotional disorders as being characterised by strong associations between response propositions (see Section 3.1.3). Hence, in the event that one such element is activated, it will foster associative links with other similar negative self-referential material, increasing the probability that the entire self-schema

will become activated (Higgins & Bargh, 1987; Mandler, 1982; Markus, 1990; Segal, 1988).

Fazio (1986) found a strong correlation between the accessibility of a schema and the extent to which the individual perceives only information that is congruent therewith (schema-congruent biases). In this way, differences in interpretation and perception of environmental information are believed to result from differences in the chronic accessibility of relevant schemas (Bargh et al., 1988). By accessing anxiety-based structures in clinical settings, using suitable assessment paradigms, cognitive researchers attempt to demonstrate evidence of information processing biases that are believed to underlie anxiety.

3.4. INFORMATION PROCESSING BIASES

Mood-congruent processing biases in anxiety disorders are believed to operate throughout all aspects of the information processing cycle (Beck, 1976; Beck et al., 1985; Beck et al., 1979; Mogg et al., 1993). This includes higher order cognitive processes that involve interpretation, judgement, integration, recall and memory, and the more basic levels of perception, attention and categorization (Fazio & Dunton, 1997). Biases have been demonstrated to influence the information processing of people with anxiety disorders in such a way as to make such people more attentive to potentially threatening cues (MacLeod et al., 1986; Mahone, et al., 1993; Mogg et al., 1992; Trower & Gilbert, 1989). They are more likely to interpret ambiguous information in a threat-related way (Stopa & Clark, 2000), and are more prone to recall information that is akin with their fear-related schemas (Bargh, Lombardi, & Higgins, 1988; Beck, 1976; Beck et al., 1985; Beck et al., 1979; Cloitre, Cancienne, Heimberg, Holt, & Liebowitz, 1995; Mathews, Mogg, Kentish, & Eysenck, 1995; Rapee et al., 1994). Other information processes affected by such biases are those of judgment (Clark & Wells, 1995; Mansell & Clark, 1999), recognition (Lundh & Öst, 1996), and decision-making (Cloitre, Heimberg, Holt, & Liebowitz, 1992). Further evidence of processing biases can be obtained from several reviews (MacLeod & Rutherford, 1998; Mathews & MacLeod, 1994; McNally, 1995).

As mentioned, biases involve different kinds of information processes (such as biases in memory, judgement, recognition, interpretation, association) which may occur on implicit versus explicit levels of cognition. Researches have applied various constructs to describe these processes, including the concept of a memory structure called schema (Beck, 1976; Beck et al., 1985). Although the causal effect of anxiety on some of these cognitive processes has to some extent been conceptualized and assessed (e.g., with assessment paradigms which will be discussed in Chapter Four), these effects were not regarded as only the result of anxiety but also as playing a causal role in the development and maintenance of anxiety and anxiety disorders.

Based upon their central role in the anxiety disorders, along with the wealth of research relating to it, the effect of anxiety on several of information processes shall now be discussed, with specific reference to social phobia and panic disorder.

3.4.1. Attention Bias

People with anxiety are hypervigilant for detecting threat-relevant information (Eysenck, 1992), which has been demonstrated to be preferentially processed, even on an automatic or implicit level (Lundh et al., 1999; MacLeod & Rutherford, 1998; Mathews & MacLeod, 1986). Salience to the detection of threat only becomes pathological when guided by maladaptive fear-based schemas through which all information, even ambiguous stimuli, is classified as dangerous because of its association with elements in the pathological schema (Teachman & Woody, 2004). To this extent people with anxiety disorders experience the activation of fear response patterns even when objective danger is absent (Teachman & Woody, 2004). When people with anxiety disorders encounter a situation (in social phobia) or sensation (as in panic disorder) which they perceive as threatening, an anxiety-based schema becomes activated, which results in biases in subsequent information processing. Attention immediately becomes shifted to the detection of potential threat to the extent that even ambiguous material is misperceived as a sign of danger (Wells, 1999).

Research related to attention and encoding processing biases have recently undergone substantial progress. It has constantly been demonstrated that cognitive information processes (involving schemas) are capable of being activated automatically resulting in biases in attention among clinically anxious (as opposed to normal) people during the processing of threat-related cues (Bargh et al., 1992; DeBono & Snyder, 1995; Dreesen et al., 1999; Fazio et al., 1986; MacLeod et al., 1986; Mahone et al., 1993; Mathews & Macleod, 1986; Mogg et al., 1992; Trower & Gilbert, 1989). Perceptual biases in attention have been demonstrated in studies providing evidence that people with social phobia allocate salience for social threat words while not for physical threat words (Beck et al., 1985; Hope et al., 1990; Lucock & Salkovskis, 1988; Mattia, Heimberg, & Hope, 1993). Similar studies have indicated that people with panic disorder direct their attention towards words related to panic and those denoting fear, catastrophes and bodily sensations, albeit not for social threat words (Hope et al., 1990; Lundh et al., 1999; McNally, 1990). In addition, these biases are believed to be mediated by automatic pre-attentive processes of which the person is largely unaware (Beck et al., 1985; Williams et al., 1988, 1997) and to precede the conscious misinterpretations of ambiguous somatic cues in social phobia and panic disorder, thereby enhancing the general level of anxiety (Harvey, Richards, Dziadosz, & Swindell, 1993). This suggests an implicit (of which the person is unaware) relationship between the individual's schemas and schema-congruent information processing biases.

3.4.2. Interpretation Bias

As with attention, maladaptive interpretations are founded on distorted biases that are consistent with fear-based schemas. Anxiety-based interpretations play a role in the maintenance of dysfunctional beliefs and assumptions and are particularly characteristic of people with social phobia and panic disorder whose schemas involve a view of the world as a dangerous place (Teachman & Woody, 2004). Research has consistently demonstrated the tendency to misinterpret ambiguous internal and external signals as threat-related (Beck et al., 1985; Clark 1986, 1993; Clark & Ehlers, 1993; Harvey et al., 1993; Moore & Zebb, 1999; Ottaviani & Beck, 1987; Rachman, Lapotka, & Levitt, 1988). Research has demonstrated that people with panic disorder show interpretation

biases for ambiguous bodily sensations but not for general or social threat (Clark et al., 1988). Furthermore, the misinterpretation of physical sensations was demonstrated to be more peculiar of panic disorder than social phobia (McNally, 1990). People with social phobia are especially affected by their biased interpretations as they are renowned for judging themselves much harsher than their observers do (Stopa & Clark, 1993). People with social phobia have demonstrated misinterpretation biases for ambiguous autonomic responses related to embarrassment or tension, as these signals activate fears of failure or diminished performance (McNally, 1990). Other possible interpretation biases in the anxiety disorders may involve catastrophising about a situation, dwelling on negative outcomes, magnifying, overestimating, or generalising inappropriate fear-based conclusions, and personalising negative information (see Beck, 1967; Beck et al., 1979).

3.4.3. Memory Bias

Explicit memory bias refers to conscious or strategic memory processes such as recall and recognition (Williams et al., 1997). On the other hand, implicit memory bias refers to the traces of emotional influences on memory that are not within the confines of conscious recall (Teachman & Woody, 2004). Processing biases as found in attention, encoding, interpretation or judgment have not been demonstrated to have consistent effects with regard to memory. In other words, memory biases for schema-related information have not reliably been demonstrated, especially not in individuals with elevated levels of anxiety (Dalglish & Watts, 1990; Amir, McNally, Riemann, & Clements, 1996b; Cloitre, Shear, Cancienne, & Zeitlin, 1994; Lundh et al., 1999; Wells, 1999). Some researchers have found evidence of implicit memory bias in anxiety disorder (MacLeod & Rutherford, 1998), including a better recall in panic disorder for information related to bodily threat (Amir et al., 1996b; Becker, Rink, Margraf, 1994; Cloitre & Liebowitz, 1991; Cloitre et al., 1994; McNally, Foa, & Donnell, 1989). However, these findings were not consistent in research regarding social phobia (Rapee et al., 1994) and generalised anxiety disorder (Cloitre et al., 1995; Mathews, Mogg, May, & Eysenck, 1989; Mogg, Mathews, & Weinman, 1987). Furthermore, while researchers demonstrated an implicit memory bias for threat words in people with generalized anxiety disorder, this bias was not found on an explicit level (Mathews et al., 1989, MacLeod & McLaughlin,

1995; MacLeod & Rutherford, 1998). Although evidence for explicit memory bias in anxiety was demonstrated by several researchers (Becker et al., 1994; Cloitre et al., 1994), other studies failed to produce similar evidence (Mogg et al., 1987). Besides such contentious findings, clinicians often encounter anxious clients who appear to have a better recall for threat-related events. Nevertheless current research findings are too vague or confusing to draw any firm conclusions regarding the presence of implicit bias in memory among high trait anxious or even clinically anxious individuals (Daggleish & Watts, 1990; Russo, Fox, & Bowles, 1999).

3.4.4. Automatic Thoughts

Automatic thoughts reflect another product of anxiety-based schemas (Teachman & Woody, 2004). If a person has the tendency to attend to threatening stimuli, interpret even ambiguous information as dangerous, and is potentially prone to remember threat-consistent information, then it could be expected that such a person experiences negative thoughts accompanied by subjective anxiety (Teachman & Woody, 2004). As discussed earlier, thoughts are automatic in that they happen spontaneously, outside the realm of consciousness, and in response to a given stimulus (Beck & Clark, 1997). To the extent that they are not entirely free from strategic processing, automatic thoughts are a combined product of implicit and explicit processing (Teachman & Woody, 2004).

Negative automatic thoughts often take the form of unquestionable beliefs and assumptions about the self and the world (Wells, 1999). Common examples of negative automatic thoughts in people with panic disorder and social phobia often take the form of unconditional self-statements, such as “I am not capable of dealing with this danger”, “I am inferior”, “Something really bad is about to happen to me” or contingencies between events in the form of “If (my heart starts racing)...then (I know I am going to have a heart attack and die).” As these thoughts occur almost spontaneously, they feel uncontrollable and often remain unchallenged, resulting in the person experiencing difficulties in establishing whether symptoms are real or dangerous (Beck, 1976). Because of these thoughts, anxious people believe that they are constantly surrounded by threat, which consequentially increases overall levels of anxiety (Clark & Wells, in

Heimberg et al., 1995). Along these lines, McNally (1995) asserts that the inability to terminate such automatic fear-based ideation may be the key to pathological anxiety.

3.4.5. Automatic Associations

Automatic associations in memory reflect another aspect of schematic processing. Automatic associations refer to the strength with which two concepts are interconnected and associated in memory and as such, share some of the qualities attributed to schemas (Teachman & Woody, 2001). To this extent, and based on Bower's (1981) spreading of activation theory, one can expect that the presence of a fear-related schema object, if associated strongly enough in memory, should be sufficient in the activation of the entire (or at least part of the) anxiety schema within memory (Teachman & Woody, 2004). Associations are regarded as automatic in the sense that they occur outside of conscious awareness and beyond voluntary control although it has been found that associations can be fostered through repetitive learning processes (Teachman & Woody, 2004). Automatic associations guide higher cognitive processes (such as interpretation and memory), which contribute to subjective anxiety and avoidance behaviour. The repetition of associative judgments, although not made consciously, systematically reinforces the strength of association and results in the creation of a pattern of associative learning that perpetuates the cycle (Banaji, Hardin, & Rothman, 1993). Because of this perpetual reinforcement, the schema is likely to remain stable over time and consistently used in evaluation and interpretation (Fazio, & Dunton, 1997).

The influence of anxiety on various information processes such as attention, interpretation and memory, has become a common purpose of investigation (Williams et al., 1997). However, research into biases such as association in memory is relatively new and has as yet received little attention, thus motivating the current study's inquiry into the implicit fear-based associations in people with anxiety disorders.

3.5. CONCLUSION

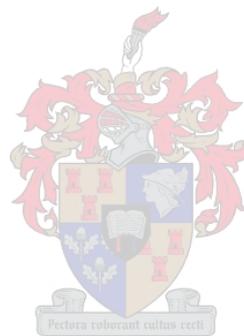
Cognitive theorists on emotional disorders argue for a strong cognitive component in the initiation and preservation of anxiety and anxiety disorders. Such theorists believe anxiety disorders, such as social phobia and panic disorder, to be characterized by typical

dysfunctional beliefs and maladaptive cognitive structures (such as schemas) concerning themes of danger and vulnerability. These inappropriate beliefs and structures are not only regarded as the result of anxiety, but are also believed to play a pivotal role in the development and maintenance of the neurosis as they are responsible for the creation of a distorted perception of reality, facilitating inaccurate expectations, wrong interpretations, and rendering inflexible, inappropriate manners of responding. Cognitive distortions and biases in social phobia are concerned with social-evaluative situations in which the person is confronted by a situation involving one or more people (Beck et al, 1985; Lucock & Salkovskis, 1988). On the other hand, cognitive distortions and biases in panic disorder are mostly related to physical concerns in which ambiguous information is interpreted as a sign of impending physical harm, such as having a heart attack or losing control of a situation.

Once a fear-based schema becomes activated it is responsible for the introduction of biases in the processing of subsequent information. Information processing biases exist for all aspects of information processing, including higher order cognitive processes such as interpretation, judgement, integration, memory, as well as the more basic levels such as attention and categorisation (Beck, 1976; Beck et al., 1985; Beck et al., 1979; Fazio & Dunton, 1997; Mogg et al., 1993). As the biases of people with anxiety disorder are based on anxiety-based schemas, they contribute the perception of a world that is riddled with danger and threat.

Information processing biases have been demonstrated to occur on explicit as well as an implicit level, thus influencing perception and behaviour outside the conscious awareness of the individual. This suggests an implicit relationship between one's schemas and schema-congruent information processing biases. Anxiety does not necessarily affect implicit and explicit processing levels simultaneously, and change on one level does not necessitate change on another. The differential effects of anxiety commonly appear as dissociations concerning the results obtained from implicit versus explicit inquires. Such dissociations also exist between various information processes among people with different emotional disorders, as well as within the same disorder.

Although the effect of anxiety on several explicit processes have been thoroughly investigated, research has only recently been concerned with the investigation into implicit or underlying processes, which more closely resemble the fear-based schemas hypothesised to underlie anxiety. Implicit biases in attention have consistently been demonstrated in people with anxiety disorders. Research into memory-based biases has been less conclusive. Although an implicit memory bias in depression has been demonstrated (Williams et al., 1997), these conclusions have not consistently been forthcoming in people with anxiety. One area specifically, that has lacked research attention, is the role of automatic associations in memory. It is for this reason that the current research could make an innovative and valuable contribution in cognitive research of anxiety disorders.



CHAPTER FOUR

THE MEASUREMENT OF IMPLICIT COGNITION

Information processing biases which are believed to underlie psychic pathology are assumed to represent measurable consequences of the theoretical schema construct (Teachman & Woody, 2004). Researchers have looked for evidence of information processing biases with the use of various assessment paradigms that test predictions derived from cognitive models of anxiety (Teachman & Woody, 2004). However, as mentioned in Chapter Three, the schema concept has been difficult to operationalise and define (Fiske & Taylor, 1991), thus posing a challenge for the testing of cognitive theories (Teachman & Woody, 2004). As the assessment of underlying information processes in anxiety is the primary aim of the current research, the focus in this chapter will be allocated to concepts and paradigms involved in the measurement of implicit cognition. Several examples of contemporary indirect measurement paradigms will also be provided.

4.1. BACKGROUND AND CONCEPTUAL DESCRIPTION

Past research, which primarily concerned itself with (conscious) cognitive content, mostly made use of direct (explicit) measures such as interviews (Hibbert, 1984), questionnaires (Argyle, 1988, Harvey et al., 1993), self-statement inventories (Dodge, Hope, Heimberg, Becker, 1988; Glass, Merluzzi, Biever, & Larsen, 1982; Halford & Foddy, 1982), and thought-listing paradigms (Heimberg, Accera, & Holstein, 1985; Mahone et al., 1993). Although such measures usually demonstrate good reliability and can be economically and objectively administered, the validity of such measures are compromised as participants are consciously able to mask their responses in which ever direction they desire (Greenwald et al., 2002; Rosenberg, 1965). Furthermore, with its focus on verbalised and conscious aspects of cognition, explicit measures have been criticised for their inability to tap into the unconscious or implicit processes (Hope et al., 1990) that are more reflective of the basic underlying biases in memory structure (Segal, 1988; Teachman et al., 2001). For these reasons, as well as the resurgence of evidence pointing to the role of underlying cognitive processes in anxiety (discussed in Chapter

Three), research over the past few years has renewed its interest in the relationship between anxiety and implicit information processing (Epstein, 1994; Fazio, 1990; Greenwald et al., 2002). This has necessitated the use and development of several innovative indirect measurement paradigms that are not subject to conscious introspection and thus capable of tapping into cognitive domains that are inaccessible to direct measures of self-report (Bargh, 1997; Bosson, Swann, & Pennebaker, 2000; Fazio, Jackson, Dunton, & Williams, 1995; Greenwald & Banaji, 1995; Nisbett & Wilson, 1977). In spite of this growing trend, indirect measures are often criticized for their limited sensitivity to individual differences (Greenwald & Farnham, 2000). Apparent psychometric weaknesses in terms of convergent and discriminant validity, internal consistency and stability of such implicit measures still leave ample room for research (Bosson et al., 2000).

4.2. IMPORTANT CONCEPTS RELATED TO THE ASSESSMENT OF IMPLICIT COGNITION

Evidence of information processing biases rests upon the use of assessment paradigms that take into consideration the predictions derived from cognitive models of anxiety. The following section will outline some of the concepts and assumptions in paradigms that aim to reveal cognitive structure (schema) or processing. These concepts are of particular relevance to the current study, which used a recently developed implicit method to assess the role of automatic association in memory.

4.2.1. Indirect Measurement

Affective and cognitive processes that operate beyond the realm of conscious awareness should, by implication, not be subject to conscious introspection (Nisbett & Wilson, 1977). Measurement paradigms that are free from possible distortions related to introspection are known as indirect measures. The distinction between direct and indirect measures depends on what the subject is told about the purpose of the study (i.e., response factors) and what the researchers choose to infer from the results produced (Fazio et al., 1995; Fazio & Olson, 2003; Greenwald & Banaji, 1995). If for instance, the participant is informed that X is being measured, but the response is used to infer

something about Y, the direct measure of X will act as an indirect measure of Y, when X and Y have some relation that implies that one will influence the other in an implicit manner (Greenwald & Banaji, 1995). The schema associated with Y is thought to operate implicitly when the subject does not notice that Y is influencing the judgment of X (Greenwald & Banaji, 1995). A direct measure of Y (e.g. implicit self-esteem) on the other hand, may provide completely dissimilar results (Greenwald & Banaji, 1995). Such dissociations are commonly found between the results obtained by implicit (indirect) versus explicit (direct) measurement paradigms, which points to the existence of potentially different processing levels that are assessed by these two paradigms (as discussed in Chapter Three). The distinction between implicit versus explicit processes, although relevant, is not entirely crucial to the current study. Of greater significance for the current research, is the investigation into the use of implicit measures that are capable of indirectly assessing underlying or implicit cognitive processes.

4.2.2. Automatic Activation

One of the common assumptions of all methods which aim to measure implicit cognition is the principle regarding automatic activation effect (Bosson et al., 2000). This refers to the fact that associated evaluations are activated automatically on encountering appropriate stimuli. (Automatic activation is discussed in more detail in Section 3.3.2 in Chapter Three.)

4.2.3. Response Latency

Popular among indirect measures (including the currently investigated Implicit Association task) is the use of latency-based experimental paradigms in which response times serve as an indirect measure of unconscious or implicit cognitive processing biases (Cantor & Mischel, 1977; Markus, 1977; Rogers, Kuiper, & Kirker, 1977). Response latency can be defined as the time it takes for the individual to respond to stimuli in tasks requiring cognitive processes and is usually measured in milliseconds. Within this indirect measurement paradigm, the speed of response is used as an indirect measure of some other underlying or implicit concept. Response latencies have been hypothesised to

approximate the extent to which cognitive processes (such as schemas or underlying evaluations) can be automatically retrieved from memory (Fazio et al., 1986; Fazio, Powell & Herr, 1983). For example, if a person consistently responds faster to cognitive tasks in which threat-related concepts (e.g. heart-attack, fatal) are combined with self-related concepts (i.e., 'threat' + 'me') as compared to responses on tasks in which threat-related concepts are combined with other-related concepts (i.e., 'threat' + 'not-me'), then it can be assumed the association between threat and the self is stronger than the association between threat and others. The time it takes for participants to respond is an indication of the strength with which the concepts are semantically related, that is, their associative strength, with faster response latencies indicating a stronger association between the concepts. This allows one to make deductions, in an indirect unobtrusive manner, about underlying, and perhaps even automatic associations. In this way, the current research used a latency-based paradigm which measures the strength of self-relevant fear-based associations in the memory of people with social phobia and panic disorder, to provide an indication of implicit association differences underlying psychic pathology (e.g., Bargh et al., 1992; Roskos-Ewoldsen & Fazio, 1992).

4.2.4. Levels of Awareness

As discussed in Chapter Three, responding quickly to tasks involving cognitive processes does not merely imply the automatic activation of stored evaluations, as fast responses may mean nothing more than well-learned, effortful or controlled processes (Fazio et al., 1986), which exist on a conscious level and are thus not indicative of implicit associations in memory (Lundh et al., 1999). Although previously well learned sets of associations are important for association processes to become automatic, such processes must also be unavoidable or activated without any conscious reflection on the part of the individual if they are to be reflective of implicit cognitive processes (Bargh, Chen, & Burrows, 1996; Greenwald & Banaji, 1995). For this reason, indirect measurement paradigms provide estimates of the participant's attitudes or evaluations without the participants having direct knowledge of what is being assessed (Fazio & Olson, 2003). This level of unawareness is important because it has been demonstrated that any level of conscious awareness (of what is being assessed), if coupled with

intention to alter such attitudes or evaluations and given the opportunity to do so, is sufficient in reversing or eliminating the sought after 'implicit' effect (Bargh et al., 1996; Blair & Banaji, 1996; Greenwald & Banaji, 1995).

This is consistent with Fazio's (Fazio et al., 1995) MODE model which states that the extent to which processes are implicit or explicit will depend on the motivation (M) and opportunity (O) available to deliberate (D). When motivation and opportunity are high (such as when conscious or strategic processes are involved which allow for a certain amount of introspection) responses should be more indicative of explicit or volitional processes. Conversely, under more provocative circumstances (e.g., the participant is unaware of what is being assessed) there will be less chance to deliberate as the motivation and opportunity therefore is not forthcoming, and hence responses should be more indicative of underlying, implicit processes.

There are several ways in which assessment paradigms attempt to tap into implicit processes. However, based on the lack of evidence of implicit versus explicit processes existing as entirely independent constructs (Fazio & Olson, 2003, and mentioned in Chapter Three, paragraph 3.3.1) the extent to which such measures tap exclusively into implicit processes or structures remains a contentious issue that is beyond the scope of the present research. For instance, just because a person is unaware that their negative attitudes toward winter are being assessed does not mean that these people are unaware that they possess such attitudes.

4.2.5. Priming

Crucial to the understanding of implicit research is that only once the relevant schema becomes activated within memory can there be a tendency for biased or schema-congruent information processing to occur (Bargh et al., 1992; Fazio & Williams, 1986; Houston & Fazio, 1989). Therefore, in order to assess the relationship between pathological anxiety and implicit information processing it is necessary to activate the relevant cognitive structures (i.e., anxiety-based schemas) within memory (Bargh et al., 1992; Fazio & Williams, 1986; Houston & Fazio, 1989). Priming procedures are

commonly utilized for this purpose (Bargh et al., 1996; Safran, Segal, Hill & Whiffen, 1990). Priming involves, firstly, the presentation of schema-related features (i.e., semantically or affectively associated information) that enable the activation of the entire schema construct within memory. This then is followed by the assessment of the influence of the activated schema on subsequent information processing (Segal & Ingram, 1994). In this way research has ascertained that when presented with a series of words linked to a particular schema, the activation of that schema will influence the responses of the individual in congruent ways. When a behavioural response to a target stimulus is influenced by a preceding presentation of the same (or a related) stimulus, priming is said to have occurred (Milliken, Lupianez, Debnar, & Abello, 1999).

The research conducted by Fazio, Sanbonmatsu, Dunton, and Williams (1986) was the initial demonstration of how participant responses were facilitated when immediately preceded (primed) by objects of similar valence to the schema-object, as opposed to responses when primed by words of opposite valence. On each trial a schema-related object was presented as the prime. The presentation of this schema-related object was followed by the display of either a positive or negative target evaluation adjective. The participant was required to name, as quickly as possible, the connotation of the target adjective (i.e., is it 'good' or 'bad'), with the latency of response being the dependent measure. So, for instance, the word 'dentist' is primed and is followed by a negative target evaluation (e.g., 'painful'). If the prime word ('dentist') is evaluated negatively by the subject, the presentation of the word 'dentist' may automatically activate a negative evaluation. If the target adjective ('painful') is also negative, then the subject would be able to indicate the connotation of the target adjective relatively quickly. In other words, a congruency between the prime-activated schema and the participant's response to the target-adjective will allow for facilitation of response, that is, shorter response latency (Fazio, Jackson, Dunton, & Williams, 1995). Important in priming, is that how the activated schema influences perception or responses does not depend on the words presented, but on the content of the activated schema (Bargh, Chen, & Burrows, 1996). Neely (1977) contends such facilitation to be indicative of automatic processing. This example presents a classic demonstration of schema-congruent facilitation based on the

automatic activation of the relevant schema on the mere presentation of the schema-related object. Once these cognitive structures are activated within memory, processing advantage is subsequently awarded to evaluative congruent information which is easier to assimilate with already existing or activated cognitive structures. In this way biases are introduced on implicit and explicit levels (Fazio & Olson, 2003).

Priming procedures are commonly used to assess the influence of mood or emotions on subsequent information processing. This is because the presentation of one aspect of mood (i.e., a sad mood induction) is sufficient to facilitate the coming to mind of related affective or non-affective content, such as evaluatively congruent past memories, judgments or feelings which in turn further taint subsequent information processing in a schema-congruent manner (Bower, 1981). The mechanisms behind priming can be explained in terms of Bower's (1981) associative network theory. According to Bower (1981) the initial presentation of schema-related content will potentiate the automatic activation of associated evaluations in the sense that activation spreads to congruent or associated elements comprising the densely associated network or schema. Through its interconnection with other associated elements, the activation of the prime will facilitate responses to targets that are evaluatively congruent, while inhibiting responses to incongruent targets (Fazio & Olson, 2003; see Section 4.3.5.). In this way, the presentation of the initial content will contribute to the re-instantiation of the entire structure (Bower, 1981).

Non-conscious or subliminal priming techniques allow the clearest distinction between implicit and explicit processes (Greenwald & Banaji, 1995). Non-conscious priming paradigms provide an unobtrusive way to measure cognitive processes, in which the priming words are very briefly presented and then quickly masked by a second word, which is then the only word that the individual consciously perceives. The initial priming word, which is unconsciously perceived, is assumed to influence the perceiver's response in a semantically related manner (Perdue, Dovidio, Gurtman, & Tyler, 1990). In this way the presented primes activate cognitive processes or schemas which may facilitate schema-congruent responses without the knowledge or conscious control of the perceiver

(Greenwald & Banaji, 1995). Non-conscious or subliminal priming techniques are commonly used to examine automatic information processes and especially to investigate the strength of association between two concepts existing on an unconscious level (Banaji & Hardin, 1996). In this way they have conveniently been used in investigating the processes which underlie (or are associated with) the core concerns or doubts regarding the self-worth of people with emotional disorders (Segal, Shaw, Vella, & Katz, quoted in Segal & Ingram, 1994).

Although the current study does not use a priming procedure to activate implicit information processes, most of the research conducted into implicit cognition has involved either the use of priming techniques or the Implicit Association Task (to be discussed at a more appropriate point). Furthermore, the current explanation will be of relevance when examples of implicit measurement paradigms are discussed (see Section 4.4.).

4.2.6. Facilitation versus Interference

In assessing the relationship between emotion and cognition, performance on tasks requiring cognitive processes can either be facilitated or inhibited. Both types of responses are indicative of the relationship between emotion and cognition and are thus of relevance to the present study. The tendency to process schema-consistent stimuli may facilitate performance on tasks that benefit from the processing of such information (e.g., Burgess et al., 1981; Foa & McNally, 1986; Williams et al., 1996). This type of processing is common in priming procedures such as the priming example provided in Section 4.2.5. Responses are facilitated when a target is closely paired in time and space with a semantically related prime word (e.g., doctor - nurse) as opposed to a semantically unrelated prime-target pair (e.g., boat - rain) (Blair & Banaji, 1996). This is because associatively congruent prime-target pairs (e.g., doctor – nurse) activate similar constructs within memory and as such do not require the activation of resource consuming or conflicting processes. Facilitated responses (i.e., shorter response latencies) therefore signal congruency between concepts and provide clues about implicit information processes or structures that are activated within memory.

On the other hand, performance on schematic inquiries can also suffer in circumstances in which the preferential processing of schema-consistent material would be disruptive to the requirements of the task (Williams et al., 1996). In priming procedures, for instance, an incongruency between the target (e.g. 'embarrassed') and the prime (e.g. 'pleasant') will automatically activate competing processing pathways. Under these circumstances, more effortful processes are required to allow for task switching and an inhibition of the competing response. In other words, the evaluation activated by the prime readies the participant to respond, but the response suggested by the prime must be inhibited in order to respond accurately to an evaluatively incongruent target (such as a distracter item) (Fazio & Olson, 2003). The interference created by the competing response activation will result in slower response rates so to allow for competing response outputs (see Dijksterhuis & van Knippenberg, 1995; Bargh et al., 1992, Bargh, Chaiken, Raymond, & Hymes, 1996; Fazio et al., 1986; Neely, 1977). In this sense the automatic activation of schema-inconsistent processes, that give rise to response interference, are reflective of the activation of strongly held underlying schemas, which becomes activated at the cost of adequate task completion (Mathew & MacLeod, 1985).

In both instances of facilitation or interference, the process is potentiated by the automatic activation of a prime-associated evaluation. Whatever the effects is on the response (i.e., facilitation or disruption) due to positive versus negative targets, it nonetheless provides information about the evaluation of the prime (Fazio & Olson, 2003). In the current study facilitation and interference processes are seen as an indication of the strength with which threat- and safety-related information is associated with the self. While faster responses imply a stronger association between concepts in memory, longer or delayed responses imply the opposite.

4.2.7. Cognitive Constraint and Capacity Limitations

The operation of cognitive processes seems to depend largely on the availability of cognitive resources (Williams et al., 1997). Cognitive processes, which do not demand a large amount of resources may sometimes be capable of functioning simultaneously

with other processes, for example, drinking coffee while reading (Williams et al., 1997). On the other hand, tasks that require resource-consuming information processes are believed not to be capable of simultaneous executions (such as answering questions in a task with time constraints, while spelling words backwards) (Williams et al., 1997). This is because such executions demand time as well as cognitive abilities to allow for task switching between the various conflicting information processes that are required (Williams et al., 1997).

It is possible to limit available cognitive resources by introducing cognitive constraints in tasks which require information processing. Cognitive constraints can be implemented by manipulating time available for task completion, enhancing the complexity of the task, and increasing the amount of interference by means of distraction (Williams et al., 1997). By implementing task constraints, available cognitive resources become strained due to the competition between various processes required for adequate task completion (e.g., trying to ignore distracter items while simultaneously trying to read words backwards). Such competition necessitates selective processing between tasks that require specific information-processing mechanisms (Williams et al., 1997). It is expected that under such constraining circumstances, responses will largely be a function of automatically activated preferences. This is because, when cognitive resources are limited, processing preference will invariably be allocated to the processing of schema-consistent information which requires fewer cognitive resources, thus allowing more resource capacities for the simultaneous execution of other resources (Blair & Banaji, 1996; Greenwald & Banaji, 1995). Studies by Roskos-Ewoldson and Fazio (1992) have for instance shown that even under conditions of high constraint, schema-related objects remained salient to the subject's attention. When these schema-evoking objects were used as distracter items, the subject's task performance was impaired due to the attention they automatically, albeit unconsciously, allocated to these objects despite instructions that made it functional to ignore those schema-related objects (also see Bargh, Chaiken, Raymond, & Hymes, 1996).

According to the MODE model (Fazio et al., 1995), implementing cognitive constraints will decrease the motivation (M) and opportunity (O) to deliberate (D) and as such responses may become guided by automatic processes that take precedence when available cognitive resources are limited. In this light, facilitated or disrupted responses may reflect an implicit or underlying preference to the processing of schema-congruent information, thus signalling an underlying bias in information processing. In the current study time constraints (i.e., participants must respond as quickly as they can) as well as task complexity is introduced in the reduction of available resources with which to inhibit or control responses. It is assumed that such constraints will leave open the way for unconscious and automatic responses (Blair & Banaji, 1996; Dovidio et al, 1997; Pratto & Bargh, 1991) and thus provide an indication of the implicit processes underlying anxiety.

4.3. DIFFERENT TECHNIQUES AND PARADIGMS USED IN ASSESSING THE INFLUENCE OF ANXIETY ON UNDERLYING INFORMATION PROCESSES

Research into implicit measures within the area of social cognition is only in its infancy. As such the surrounding literature has not matured to the point that firm conclusions can be drawn about issues such as validity and psychometric properties (Fazio & Olson, 2003). Bearing in mind the constructs and assumptions underlying the measurement of implicit cognition (as recently discussed) the following section will briefly exemplify some of the contemporary indirect paradigms that are used in assessing the influence of anxiety on implicit cognition.

4.3.1. The Visual Dot Probe Task

The Visual Dot Probe Task (or Dot Probe) was one of the first latency-based paradigms, with the advantage of being free from the limitations of response biases that was used in assessing the influence of anxiety on attention (Navon & Margalit, 1983). The Dot Probe is an effective task to demonstrate interference as well as facilitation effects as it assesses the effect of threat-related information processing in terms of its potential to facilitate another task (Williams et al., 1997).

4.3.1.1. The Dot Probe and Information Processing in Anxiety

Anxiety-related research utilising the computer-based Dot Probe, requires that participants indicate the location of a dot that appears on a computer screen immediately after the presentation of two words (e.g., a ‘threat’ and ‘neutral’ word), some of which may be threat-related. Attentional bias is reflected by consistently faster responding (i.e., indicating a dot) when the word appears at the same location on the computer screen as a preceding threat word (e.g., the word ‘snake’) (Teachman & Woody, 2004). The reason for the faster responses is presumed to be related to the fact that the threatening word has already drawn the participant’s attention to the location where the dot will appear, and hence the participant would no longer have to search for it. According to Navlon and Margalit (in Williams et al., 1997) this is probably a sensitive measure of visual attention.

Research utilising the Dot Probe has consistently demonstrated selective attention for social and physical threat-consistent information in people with generalised anxiety disorder (compared to the responses of control participants) reflected by faster responses (compared to the responses of control participants) when the dot had replaced a threat word, than when replacing a neutral word (MacLeod et al., 1986). Participants with social phobia demonstrated facilitated responding only when the dot replaced social threat-related stimuli (Asmundson & Stein, 1994). Also, people high in anxiety sensitivity demonstrated faster responses for probes in the location of physical threat-related words (Keogh, Georgiou, & Hunt, 2001). Such results seem to imply that normal controls limit unnecessary anxiety by allocating their pre-attentive processing resources away from any minor threat, while clinically anxious individuals shift their pre-attentive processing resources toward the detection of threat-related material (Williams et al., 1997).

4.3.1.2. The Dot Probe and Domain Specificity

Results from experiments with the Dot Probe have not supported Beck’s (Beck et al., 1985) domain specificity theory (Section 3.1.1. in Chapter Three). Both Asmundson & Stein (1994) and MacLeod et al., (1986) found no changes in facilitation or disruption for threat-related stimuli on the Dot Probe when the responses of groups with predominantly social versus physical-threat-related concerns were compared. In other

words, there was no tendency for either group to attend more specifically to any particular domain-specific threat-words.

In MacLeod's (MacLeod et al., 1986) study, the responses of anxious participants differed from that of the control participants. Where anxious participants were quicker to respond to a dot that had replaced a previous threat-word, the control participants replied significantly faster when the location of the dot appeared to replace a neutral word. Despite these differences, Williams et al. (1997) concluded that anxious people were not necessarily more 'sensitive' to threat-related stimuli than control participants. Rather, controls were picking up threat-related information as early in processing as were the anxious participants. What distinguished the groups were individual differences in the allocation of attention toward threat-related information on a pre-attentive level, as free from response bias (i.e. on an implicit level) (Williams et al., 1997). While anxious participants seemed fixated on the location of threat (reflected by faster responses when the dot replaced a threat word), control participants seemed to direct their attention away from the location of threat (responding faster to the dot that appeared in the location of the neutral word). In fact, Williams and his colleagues assume that this may point to evidence of a decision making mechanism (i.e., attentional bias) in anxiety which operates at a preconscious level of identification that is responsible for the allocation of attention to different parts of the environment.

4.3.1.3. State versus Trait Anxiety

To date, it is still of debate whether schematic processing reflects the effects of mood or currently experienced anxiety (i.e., state anxiety), as predicted by Bower (1981), or whether it is indeed the operation of a cognitive structure reflecting the influence of long-term emotions based on an extensive knowledge base (trait anxiety), as predicted by Beck et al., (1985). The results of several Dot-probe experiments mentioned by Williams et al. (1997) have yielded contrasting evidence. For instance, the Dot-probe results of Mathews and MacLeod (in Williams et al, 1997) and MacLeod et al. (in Williams et al., 1997) demonstrated an interaction of state and trait variables in anxious individuals. Based on these results it was concluded that people with high levels of trait anxiety, such

as those currently suffering from clinical levels of anxiety, are more prone to worry (in terms of higher levels of trait anxiety) and more likely to demonstrate the largest attentional bias (Williams et al., 1997). This is in contrast with the results of Mogg, Mathews, Bird, & MacGregor-Morris (in Williams et al., 1997) who found no main effects or interaction of state anxiety with levels of trait anxiety in a dot-probe study using anxious participants. They concluded that although an increased level of state anxiety was responsible for increased attentional bias, this did not need to be mediated by trait variable or a predisposition to worry.

Nevertheless, these accounts point to the ability of the Dot probe to ascertain individual differences in response to threat-related information on an automatic level, thereby providing evidence of implicit information processing biases (MacLeod et al., 1986).

4.3.2. The Emotional Stroop Task

To date, the modified Stroop Colour-Naming Task is one of the most widely used paradigms in the testing of implicit cognition and the demonstration of the disruptive effects of emotional disorders on subsequent cognitive processes (Holle et al., 1997; Rapee & Heimberg, 1997). The literature that follows will outline some of the main conclusions derived from Stroop-related research in anxiety as well as the mechanisms that are assumed to underlie such biases in the processing of information.

4.3.2.1. The Original Stroop Task

J.R. Stroop developed the Stroop task in 1935, as an attempt to research the interference in the conflicting processes involved in colour-naming and the reading of words. This was based on initial research by James Mckeen Cattell (1986) who demonstrated that it took longer to name objects and colours aloud than it took to read words aloud. To this extent reading processes were assumed to be more automatic in nature than the process of colour-naming (cited in MacLeod, 1991). That one process (i.e., reading) may interfere with other competing processes (i.e., colour-naming), forms the basic premise underlying all modifications of the Stroop Colour-Naming task (MacLeod, 1991). The Stroop effect is calculated as the difference between response

times for conditions in which the participant is required to name the colour of words printed in incongruent colours (e.g., the word green written in the colour red) versus conditions in which the participants is required to name, for instance, the colour of a patch (e.g., blue) (Spieler, Balota, & Faust, 2000).

4.3.2.2. Modified versions of the Stroop

Since the original Stroop experiments, there has been a multitude of research conducted utilizing various modifications of the original task. The modified Stroop that is used in people with emotional disorders became known as the Emotional Stroop task, but will mostly be referred to as the 'Stroop' throughout the current research. Apart from its adaptability to general forms of psychopathology, the original Stroop has been modified for use in numerous anxiety disorders such as generalised anxiety disorder, panic disorder, social phobia, obsessive compulsive disorder, post-traumatic stress disorder and the depressive disorders. A substantial amount of these studies are accounted for in a comprehensive article by Williams et al. (1996). Stroop tasks have been used to measure construct accessibility (Gotlib & McCann, 1984; Williams & Nulty, 1985), the emotional salience of words (Watts, McKenna, Sharrock, & Trezise, 1986), the activation of danger schema (Mathews & MacLeod, 1985), and distraction by emotional stimuli (all mentioned in Williams et al., 1996). Results of Stroop-related studies are commonly used to validate information processing (schema) theories such as Beck's (Beck et al., 1985) in which anxiety schemas facilitate the processing of threat-related cues that are relevant to the concerns of the particular disorder.

4.3.2.3. The Emotional Stroop and Information Processing in Anxiety

Stroop-related investigations into the effect of anxiety, commonly involved monitoring the levels of interference related to the colour-naming of various emotionally relevant threat words (e.g., social threat, physical threat, and spider-related threat) as compared to matched neutral words, for a variety of clinically or non-clinically anxious participants, that are sometimes compared with matched normal controls (Williams et al., 1996). Although participants are required to merely name the colour of the words, greater interference effects (as reflected by longer response latencies) for anxious participants are often observed for threat-related words as opposed to neutral words (e.g. Mathews &

MacLeod, 1985). The mean colour-naming interference for different threat-related words (as opposed to neutral words), is regarded as an indication of attentional bias that is assumed to be the result of the activation of danger-related schemas (Williams et al., 1996).

In this way, research has consistently demonstrated interference effects for clinically diagnosed participants on words that are relevant to the diagnostic concerns of their disorder (Mogg et al., 1989). For instance, Stroop interference effects have been demonstrated in people with panic disorder for words pertaining to physical threat denoting fear, catastrophes and bodily sensations (such as heart attack, panic, fatal, emergency, suffocate) (Ehlers, Margraf, Davies, & Roth, 1988; McNally, Riemann, & Kim, 1990; McNally, Riemann, Louro, Lukach, & Kim, 1992) and in social phobia for words pertaining to social threat (such as 'ridicule' or 'embarrassed') (Asmundson & Stein, 1994; Holle, Heimberg, & Neely, 1997; Hope et al., 1990). Such findings are consistent with Beck's domain-specificity hypothesis (discussed in Chapter Three), in which there is an apparent relationship between the types of threat word that most interfere with colour naming (indicating bias) and the type of worries predominant in the participant. Furthermore, longer response latencies have consistently been found in the colour-naming of self-relevant words (i.e. 'me') as opposed to words that were not self-relevant (i.e. 'not-me') (Hope et al., 1990; Segal & Vella, 1990). Based on such results it is deduced that self-relevant information demands greater amounts of attentional resources (Hope et al., 1990).

The results of the study conducted by Amir et al. (1996a) and replicated by Mathews and Sebastian (1993) demonstrated findings which suggest the sensitivity of Stroop-responses to participants' clinical status. The study was conducted on a group of clinically diagnosed social phobic participants as well as a control group. Stroop words were selected to represent social threat (e.g., 'foolish'), physical threat (e.g., 'coffin'), and neutral words (e.g., 'reported'). Under normal conditions (i.e., without the application of an anxiety induction procedure), results demonstrated an attentional bias for domain specific concerns among participants of the clinically anxious group (compared with the

controls), as reflected by longer response latencies for social-threat words. Interestingly, after a subsequent anxiety induction procedure, evidence of attentional bias for the clinical group was reversed. In other words, social phobic participants demonstrated faster response latencies for social threat words than for neutral words. The control group demonstrated no significant changes in either testing condition. Based on these findings it was concluded that under normal circumstances, social phobic people are prone to attentional biases, especially toward information that is consistent with domain-relevant concerns. However, in the face of threat, social phobic people are able to override the influence of attentional bias. Amir et al. (1996a) attributed this ability to the increased efforts demonstrated by clinically anxious people under conditions of elevated stress. They suggest that clinically anxious participants may have evaluated their performance as based on their emotional evaluation of such trials, instead of what was actually required. Thus, instead of a biased attention to the location of threat that would have accounted for the expected interference effects, elevated stress levels may have resulted in the activation of an anxiety program that facilitates avoidance mechanisms in the face of emotionally relevant threat. These avoidance mechanisms would have enabled a suppression of the processes related to attentional biases (Williams et al., 1996) and thus contributing to the overall facilitated responses. Both Amir et al. (1996a) and Mathews and Sebastian (1993) suggest that clinical status may contribute to avoidance under anxious conditions and that clinical participants will be more adept at this avoidance than non-clinical people. To such an extent it could be argued that Stroop related interference effects may be mediated by clinical levels of anxiety.

4.3.2.4. Stroop Sensitivity to Processing Levels

Results of Stroop-related research in anxiety has generally demonstrated inconsistent results concerning biases in attention and explicit memory (recall and recognition; Williams et al., 1996). This seems to suggest that the cognitive system prioritizes the initial automatic encoding of threat-related information in anxiety, but that this process is independent of the processes involved in the explicit recall from memory of the stimuli (Williams et al., 1996).

However, research concerning attentional bias is not necessarily an indication of the effects of emotion on underlying cognitive processing. In order to investigate the nature of the effects of anxiety on implicit information processing, a subliminal Stroop was developed (by Mogg, Bradley et al., 1993) in which the presentation of stimuli falls below the threshold of conscious awareness and thus has no influence on conscious responses (reported on by Williams et al., 1997). In support of Williams et al. (1988) model (discussed in Chapter Three), studies using the subliminal Stroop have evidenced a pre-attentive bias toward the detection of threat-related information in people with anxiety, which was not demonstrated in people with depression (Mogg, Bradley et al., 1993). In other words, the processing resources of anxious people are automatically drawn toward threatening information. Furthermore, this bias has proven to be independent of conscious strategies. The absence of this bias in depressed people (regardless of the fact that the depressed group demonstrated similar levels of anxiety as the anxious group) supports Williams' (Williams et al., 1988) view that anxiety and depression are characterised by different processing biases. Mogg, Bradley et al. (1993) concluded that anxiety is a motivational state directed toward the detection of potentially threatening information, while depression can be regarded as an amotivational state that reflects hopelessness and despair. In this way, research with the subliminal Stroop task has confirmed the presence of biases on a very early (pre-attentive level) and implicit level of information processing (MacLeod & Hagan, 1992; MacLeod & Rutherford, 1992; Mogg, Kentish, & Bradley, 1993).

4.3.2.5. Causes and Correlates of Emotional Stroop interference

4.3.2.5.1. Stroop and State versus Trait anxiety

While the results from the Mathews and MacLeod (1985) study revealed evidence that state anxiety was the main independent predictor of Stroop related interference, the results from several others studies (MacLeod & Hagan, 1992; MacLeod et al., 1986; MacLeod & Rutherford, 1992; Mogg, Bradley, Millar, & White, 1995; Mogg & Marden, 1990; Mogg et al., 1990; Mogg et al., 1989) suggested a greater correlation between trait anxiety and Stroop-related interference for negative threatening words. Similarly, in the Lundh et al. (1999) study, indexes of the subliminal and supraliminal Stroop interference for panic words did not correlate. Subliminal (not supraliminal) interference correlated

with measures of trait anxiety and depression. Correlation between subliminal Stroop interference and trait anxiety was also found by Mogg, Kentish, et al. (1993). This may suggest that the relatively stable individual differences in anxiety proneness (trait anxiety) is likely to reflect the nature and extent of the danger schemas, while state anxiety is more likely to effect the activation of an anxiety-based schema (Williams et al., 1997). The results of MacLeod and Rutherford (1992) implied an interactive function between the influence of trait and state anxiety, suggesting that that trait variables do require a certain amount of activation by current emotion (state anxiety) or circumstance to demonstrate interference effects.

4.3.2.5.2. Content Relatedness versus Valence Accounts of Stroop-related interference

Stroop-related research has demonstrated that people with anxiety are sensitive to themes that are relevant to their personal concerns (Mathews & Klug, 1993; Riemann & McNally, 1995). On the other hand, research has also demonstrated increased interference effects for negatively valenced information over and above attentional bias to current concerns (Cassiday, McNally, & Zeitlin, 1992; Martin, William, & Clarke., 1991; McNally et al., 1994; Mogg & Marden, 1990). The issue of whether Stroop interference is mediated by emotional valence throws into question theoretical explanations which account for interference as a result of 'danger schema' that is related to the concerns of the disorder (Williams et al., 1997). As with the issue of the influence of state versus trait variables, the debate regarding the influence of relatedness versus valence also remains inconclusive.

Valence versus content relatedness accounts of Stroop effects, have often revealed greater overall interference effects in anxiety-related disorders as a result of the relatedness of the words to anxious concerns, rather than the valence of the words (Mathews & Klug, 1993; McNally et al., 1992; Mogg et al, 1989; Segal & Vella, 1990). Other studies, however suggest that relatedness cannot be isolated from the effects of valence (Segal, Truchon, Horowitz, Gemar and Guirguis, 1995; Pratto & John, 1991). It may thus be concluded that although personal relevance is an important contributor, the greater the interconnectedness of such personally relevant stimuli with negative current

concerns for people with emotional disorders, the more likely it would be to interfere with colour-naming (Cassiday, McNally, & Zeitlin, 1992; McNally et al., 1994; Williams et al., 1997).

4.3.2.5.3. Expertise and Interference Effects

This brings us to the next debate, namely whether interference effects are the result of emotional content (relevance) or whether it is as a result of frequent exposure to emotional material as a result of practice or ‘expertise’ effects. Words that are chosen for the Emotional Stroop are often those which are most relevant to the concerns typical of the disorder and hence are most frequently ruminated over (thus being well associated for that person). Although likely to account for some of the interference effects, the ‘expertise’ hypothesis has not been found to be a sufficient explanation for Stroop related interference in anxiety (Williams et al., 1996; 1997). This conclusion is based on the results of several studies demonstrating a reduced amount of colour-naming disturbance on domain-related threat words in people with anxiety that have again been tested after treatment (in Williams et al., 1996; 1997).

4.3.2.6. *Mechanisms underlying the Stroop.*

While causes and correlates (the previous section) refer to what causes Stroop interference, the mechanisms underlying the Stroop involve assumptions as to what stage of information processing Stroop interference occurs. Beck et al. (1985) and Bower (1981) attributed Stroop-related interference effects to the fact that emotional information is believed to attract disproportionately more processing resources as a result of the activation of specific schema structures representing personal threat (Mogg, et al., 1989). Such explanations would however, not be able to account for the facilitated responses on threat-related stimuli as demonstrated by clinically anxious people in the face of threat (i.e., Amir et al; 1996a; Mathews & Sebastian; 1993) (Section 4.3.2.3.) as well as various other aspects demonstrated in Stroop-related research (see Williams et al., 1996).

Another, possibly more suitable framework to explain conflict (between colour-naming and word reading) in the Stroop is Cohen’s (Cohen, Dunbar, & McClelland,

1990) connectionist model, called the Parallel Distributed Processing (PDP) model, which was expanded on by Williams et al., (1998). This model was developed to account for the Stroop effect. In the Stroop there is conflict between two processes, each related to a specific task demand: colour-naming (the demanded task) and word reading (a competing task). Conflict in the Stroop is modelled in terms of these two pathways (i.e., colour-naming and word reading). Each pathway is composed of different neurological modules described as input units (representing either colour or words), intermediate units, and output units (for the responses to name the colour or read the word). These pathways interact, interfering and facilitating the action of each other. Interference takes place when dissimilar patterns of activation converge on a single point of intersection, at any point in processing after sensory registration has occurred. Attention is a modulator. Attention alters the responsiveness of the processing units in a pathway, with 'task demand units' (one representing the demand to name the colour, the other representing the demand to read the word) able to modify the behaviour of the intermediate units. Attention is thus seen not as a qualitatively different entity within the information processing system, but as an additional source of input within a processing pathway. Performance on any task that requires a particular processing pathway involves establishing a pattern of activation in the relevant sensory modules to generate the appropriate pattern of activation in the relevant output modules. A pathway is defined in terms of the connections between units that make up the modules used in a task. The strength of these connections determine the speed and accuracy of activation along the pathway which, in turn, determine the speed and accuracy of a response.

Apart from the 'expertise effect' (attention is drawn toward concern-related stimuli because they are more highly practiced), there are two other ways of accounting for colour-naming interference (i.e., the Stroop effect). First, input units for such words may have a higher resting level of activation. Second, any such input unit, if associated with threat, might be subject to neuromodulatory (i.e., an increased release of the anxiety-related neurotransmitter) control affecting the responsivity of those units. The overall result is then an increase in responsiveness such that colour-naming interference as a result of attention to the reading of words occurs despite the fact that the colour-naming

process is in operation (Williams et al., 1997). In telling the participants to name the colour of the word, attention is not strategically allocated to reading the words (the task irrelevant processes) (Williams et al., 1996). The fact that word reading produces interference in colour-naming without relying on such an allocation of attention, is consistent with the notion of 'automatic' or 'pre-attentive' (Williams et al., 1996). In this sense the connectionist model accounts for the mechanisms underlying Stroop interference effects, including notions of current concern, expertise, and danger schema (also see Williams et al., 1996).

The major advantage of the connectionist model lies in its ability to be extended from the explanation of task selection processes (such as word reading or colour-naming in the Stroop) to the spatial allocation of attention demonstrated in the dot-probe paradigm (Williams et al., 1997). For instance, if attentional bias units can be represented as different locations so that attention allocated to the different locations will result in the information at those locations to be preferentially processed, the connectionist model can account for the mechanisms underlying the dot-probe (Williams et al., 1997). The model also accounts for the ability of some people to avoid or override attentional bias (e.g., Amir et al., 1996a; Sebastian et al., 1993) in some circumstances by increasing their effort in colour-naming processes (increasing demand units) (Williams et al., 1996). Furthermore, the fact that the results of several studies (e.g., Lundh et al., 1999) have demonstrated biased responding on a subliminal Stroop task which was not found for a supraliminal version, shows that processing on such implicit levels may not be amendable to override effects, and thus potentially suggesting that implicit or subliminal versions offer a more sensitive measure of current concern (Williams et al., 1996). The generalisability of the connectionist model may hopefully also account for some of the results obtained in the current study.

Most of the literature pertaining to the effect of emotion on cognition is derived from experiments using the Stroop colour naming task. With the use of the subliminal Stroop task, evidence for implicit information processing biases pertaining to anxiety has been forthcoming (as is clear from the discussed literature). However, a major shortfall in

Stroop-related research concerns the extent to which such biases may exist on the level of automatic associations in memory (as was discussed in Chapter Three). The next section will introduce the reader to an implicit latency-based task which may be useful in assessing precisely such implicit processes.

4.3.3. The Implicit Association Task (IAT)

4.3.3.1. Conceptual Description

The Implicit Association Task (IAT) is a computerised cognitive task, recently developed by Greenwald, McGhee and Schwartz (1998). It becomes difficult to interpret the consistently observed biases in attention and judgement in the absence of a clear understanding of memory effects (Teachman et al., 2001). The IAT was developed as an attempt to investigate more basic underlying biases in memory structure, such as automatic associations in memory (Teachman et al., 2001). It measures automatic associations in the sense that they occur outside of conscious control and sometimes conscious awareness, and in this way they seem to share many aspects ascribed to schemas (Teachman & Woody, 2003).

The IAT is a categorisation task which functions as an indirect measure of the strength of associations between concepts (Greenwald et al., 1988), and typifies the relationship between automaticity and schema structure (Teachman & Woody, 2004). As the IAT is a classification task (performed on computer), participants are required to sort stimuli representing four different constructs (e.g., insects, flowers, pleasant, and unpleasant) into appropriate categories with the use of only two response keys. The IAT measures the implicit associations between (a) paired concepts (e.g., ‘flowers’ versus ‘insects’), that are usually bipolar opposites, and (b) associated evaluations (e.g., pleasant versus unpleasant) by assessing how easily these categories are mapped on to each other. One set of opposites is known as the target categories (e.g., ‘flowers’ and ‘insects’), while the other evaluative word pair is known as an attribute dimension (e.g., ‘pleasant’ and ‘unpleasant’). In other words, during some trial blocks, response key A will represent both ‘flower’ and ‘pleasant’, while response key B represents ‘insect’ and ‘unpleasant’ while in other trial blocks key A will represent ‘flower’ and ‘unpleasant’, while key B

will represent 'insect' and 'pleasant'. As processing speed is assumed to be an indication of the strength of association between two concepts in memory, faster responses (i.e. shorter response latencies), which are the result of an absence of processes requiring conscious introspection, are assumed to be indicative of more strongly associated concepts (Greenwald et al., 1988). The basic premise is that if two concepts are highly associated (e.g., 'flower' and 'pleasant'), the sorting task will be easier (as reflected by faster response latencies) when the two associated concepts share the same response key (called a 'congruent trial') than if they share different response keys (an 'incongruent trial', e.g., 'flowers' + 'unpleasant') (Egloff & Schmukle, 2003).

The dependent variable in the IAT is the difference in the time it takes to respond to the congruent combination trials (e.g., flower + pleasant) as compared to the incongruent combination trials. In other words, the mean response latencies for the 'flower' + 'pleasant' combination, is subtracted from the 'flower' + 'unpleasant' combination (Greenwald et al., 1998). This 'IAT effect' (response times are usually measured in milliseconds) is then interpreted as the degree of automatic association between the paired categories (Greenwald et al., 1988). For example, as people have a greater tendency to favour the self in a pleasant (as opposed to unpleasant) manner, it can be expected that participants will respond faster to trials in which 'me' + 'pleasant' (with the corollary 'not-me' + 'unpleasant') share the same response key as compared with those trials in which 'me' + 'unpleasant' (and 'not-me' + 'pleasant') share the same response key (e.g., Bosson et al, 2000). This is because it is easier to assimilate self-related information with pleasant (Bosson et al., 2000). Facilitation of classification time is assumed to indicate a stronger association in memory between self and pleasant (as opposed to self and unpleasant) (Greenwald et al., 1988; Bosson et al., 2000). On the other hand, when response keys represent two incongruent or mismatched categories (such as when 'me' + 'unpleasant' share the same response key), responses are expected to be slower (inhibition of response created by competing processing pathways). It is believed that the incongruency between the mismatched pair will oppose the automatic association that exists in memory, thus resulting in the individual having to think (increasing response latencies) about the correct answer (Greenwald et al., 1988).

4.3.3.2. *Uses and Purposes*

The IAT has so far proved itself to be a suitable general-purpose procedure for the measurement of associative strength in the investigation of self-related and implicit information processing associated between various kinds of concepts. As many socially significant categories form complimentary pairs (e.g. black/white, homosexual/heterosexual, young/old, weak/strong, male/female), the IAT has been used extensively with a wide domain of socially significant categories. It has, for instance, been used to investigate ingroup biases of social and sexual natures, implicit cognition in unipolar depression, unexpressed self-esteem, as well as age, gender, race and national automatic preferences, to mention but a few (see Chapter Five). In spite of the accumulation of IAT-related research, there are, however, very few studies that have investigated underlying associations in the memory of clinically anxious participants. Although Gemar et al. (2000) have reported findings that indicate automatic negative associations in formerly and currently depressed participants under a mood induction procedure, and Teachman et al. (2001) have reported threat-consistent association biases in people with spider and snake phobia, these studies are not applicable in revealing the underlying associations in memory of people with social phobia and panic disorder. This presents a shortfall in literature, and therefore the motivation for the current research.

4.3.3.3. *Mechanisms Underlying the IAT*

Recently a number of possible mechanisms underlying the IAT effect have been investigated, yet precisely how the IAT works still remains unclear (Fazio & Olson, 2003). One idea states that incompatible response mapping (e.g., 'flower' + 'unpleasant') produces a shift in response criteria, creating competing pathway activation, with the result of increased response latencies for both target and attribute stimuli on incompatible trials (Brendl, Markman, & Messner, 2001). This can be likened to the proponents of the connectionist model mentioned previously. Another explanation is based on the possibility of respondents neglecting the instruction to switch between task sets in congruent versus incongruent trials. Responding to congruent combinations (e.g., 'flower' + 'pleasant') on the basis of attribute information alone is sufficient to respond in a fast and accurate manner. In this case all positive information (whether it be a

'flower' representative, or a 'pleasant' word) can be classified by, for instance, the left response key, while any negative information (regardless of target or attribute) is immediately assigned the opposite response key. In response mapping (i.e., the incongruent combinations) this manner of response is no longer appropriate and task switching must occur for accurate response (Mierke & Klauer, 2001).

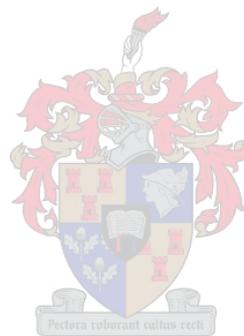
Interestingly, Fazio and Olson (2003) point to the different mechanisms underlying the Stroop and the IAT task. Whereas Stroop effects depend on the unconscious or implicit activation of stored evaluations in response to schema-consistent stimuli, IAT-related responses are influenced by the assessment of automatically activated associations to the category labels (Fazio & Olson, 2003). Another important distinction concerns the role of automaticity (in Fazio & Olson, 2003). In Stroop-related research, automatic refers to the spontaneous activation of evaluations in response to a given stimulus. IAT responses are concerned with category, and are regarded as automatic in that they are expressed without intention or control, although it may be that participants become aware of the constructs under investigation (Dasgupta et al., 2000). These different mechanisms suggest evidence for different information processing biases that are tapped by the two measures. Whereas the Stroop task involves the activation of motivational processes such as attention, the IAT activates associations from the more elaborative processes related to memory.

4.4. CONCLUSION

The recent interest in cognitive research has included a focus on the development of paradigms that can be used to assess underlying, implicit processes or structures in an objective but unobtrusive and inconspicuous manner (e.g., de Houwer, 2002; de Jong, 2002; de Jong, Pasman, Kindt, & van den Hout, 2001; Gemar et al., 2000; Teachman et al., 2001). Besides the Visual Dot Probe and renowned Stroop Colour-naming task, one implicit measure that is currently gaining immense popularity is the IAT (Greenwald et al., 1998). As with all the other 'implicit' paradigms, the IAT purports to measure certain cognitive processes that lend themselves to the development and maintenance of cognitive biases that are characteristic of people with emotional disorders. However,

where the IAT differs from these other paradigms, is in its supposed ability to assess the degree (or strength) with which underlying concepts are associated in memory.

Based on the dire lack of cognitive research into the investigation of biased associations in memory underlying pathology, and the increasing popularity of the recently developed IAT, the present researcher has selected the IAT task as the tool for assessing implicit threat-related associations in the memory of people with social phobia and panic disorder. For this reason, Chapter Five is dedicated in its entirety, to discussing the properties and related aspects of the IAT. As minimal IAT-related studies have concerned the role of underlying associations in the memory of people with clinical anxiety, the current study imparts a relatively novel contribution to IAT-related research.



CHAPTER FIVE

IMPLICIT ASSOCIATION TASK

In an attempt to clarify the role of the more basic, underlying biases in memory structure (such as threat-based associations in memory) of people with social phobia and panic disorder, the present researcher has employed the recently developed the Implicit Association Task (IAT; Greenwald et al., 1998). The current chapter will provide an outline of the IAT in terms of the initial IAT procedure, how this task has been adapted for measurement in other domains, and the psychometric properties attributed to this measure. Particular emphasis will be placed on how such research is of relevance in light of the current study.

5.1. THE INITIAL IAT PROCEDURE

The first experiment with the IAT (Greenwald et al., 1988) sought to measure the association between the concepts of 'flower' (e.g. 'rose', 'tulip', 'marigold') and 'insect' (e.g. 'horsefly', 'bee', 'wasp'), and the valence attributes of 'pleasant' and 'unpleasant' (Greenwald et al., 1998). Within a sequence of five blocks, participants were required to sort individually presented word stimuli (e.g., 'tulip', 'ant', 'love', 'abuse') representing one of four concepts (e.g., 'flower', 'insect', 'pleasant', 'unpleasant') into appropriate response categories, with the use of two response keys (e.g., A and B as represented by a left and right response key). Task instructions for the classification task varied among the five blocks and are tabularised schematically in Appendix A. As these blocks form the basis of subsequent IAT-adaptions, they will now briefly be described.

In the first block, participants were introduced to the concept categories (namely 'flower' and 'insect'). They were required to classify a series of words (such as 'marigold', 'tulip', 'ant', and 'caterpillar') into their respective categories by pressing a relevant left (indicating 'flower') or right (indicating 'insect') response key. For instance, when the word 'rose' appeared in the centre of the computer screen, it would be assigned to the category 'flower' by pressing the left response key, while the word 'bee' would require a right response key click to allocate it to the 'insect' category.

The second block involved the introduction of an associated valence dimension. This also took the form of two-category discrimination. In this block participants were required to classify a series of words (such as ‘freedom’, ‘love’, ‘abuse’, ‘crash’) into either a ‘pleasant’ or ‘unpleasant’ category by use of a relevant left (for ‘unpleasant’ stimuli) or right (for ‘pleasant’ stimuli) response key.

Block three introduced the participants to the first combined (practice) task in which both the first and the second block’s task instructions were superimposed. In other words, the left response press represented both the category of ‘flower’ and ‘pleasant’, while the right response press represented both the ‘insect’ as well as the ‘unpleasant’ categories. If the word ‘rose’ appeared, the participant was expected to press the left response key, as ‘rose’ belong to the category ‘flower’. As this combination trial represents a congruency between concepts (i.e., ‘flower’ + ‘pleasant’ and ‘insect’ + ‘unpleasant’), facilitated responses are expected. This is known as a congruent or compatible combination trial. As it is a practice block, the data was not collected for analyses.

Block four is identical to block three except that it is a ‘real’ block, which means that the recorded data was used for analyses. Although the initial Greenwald et al. (1998) experiment did not contain any practice trials, such trials are included in the majority of adapted IAT versions and have therefore received consideration.

In the fifth block, the initial concept categories (i.e., ‘flower’ and ‘insect’) are reintroduced, but this time with a reversal of response keys (‘flower’ is represented by the right response key, while ‘insect’ is represented by the left key).

Block six represents the second ‘practice’ combined task, which is similar to block three, but with a reversal in the concept combinations represented by each key (i.e., ‘insect’ + ‘pleasant’ are represented by the left response press, and ‘flower’ + ‘unpleasant’ were represented by the right response key). So, if the word ‘daisy’ appeared, the correct response would have been indicated by pressing the right response

key, which is representative of category for 'flower', regardless of the fact that it incidentally shares the same response press as the 'unpleasant' category. It is believed that participant responses will temporarily be offset by the incongruence between the concept and valence categories sharing the same response key (which are known as incongruent or incompatible combination trials). This distraction will produce a certain amount of interference which will be evidenced in terms of a longer time needed to correctly respond to the incongruent inquiry. Once again, as it is a 'practice' block, the recorded data was not used for analysis. And finally, block seven is identical to block six, bar the fact that the data from this 'real' block is once again used for analysis.

The IAT effect was calculated as the difference in average response latency between the scores of the congruent (block 4) versus incongruent (block 7) classification trials. This effect was assumed to be an index of the strength of association between the concept categories (i.e., 'insect' or 'flower') and the attributed valence categories ('pleasant' versus 'unpleasant'). More specifically, the difference score indicated that (and how much), in aggregate, 'flower' + 'pleasant' and 'insect' + 'unpleasant' were more strongly associated than 'flower' + 'unpleasant' and 'insect' + 'pleasant'. The results of the initial IAT experiment supported the conclusion that consistently superior performance in the IAT is revealed when associatively compatible (as opposed to non-compatible) categories are assigned the same response key (e.g., when the concepts of 'flower' + 'pleasant' or equivalently, 'insect' + 'unpleasant' shared the same response press) as opposed to incompatible concepts (e.g., 'insect' + 'pleasant', or likewise, 'flower' + 'unpleasant').

5.2. EXTENSION OF THE IAT TO OTHER DOMAINS OF RESEARCH

The IAT method offers the advantage of being adaptable to assessing a wide variety of evaluative associations between bipolar pairs of semantic and social categories. As these adaptations are not of primary concern for the current research paper, they will not all be mentioned, or discussed in any detail, but interested readers are referred to Greenwald & Nosek (2001) for a comprehensive overview. By replacing the initial concept categories of 'flower' and 'insect' (Greenwald et al., 1988) with any of several

social concept categories (such as Japanese and Korean surnames, or typical White and Black names) (Greenwald et al., 1988), the IAT has been successfully adapted to investigate the extent and prevalence of automatic race-related preferences and biases (Dasgupta et al., 2000; Devine, 1989; Greenwald & Banaji, 1995; Greenwald et al., 1998; Ottaway, Hayden, & Oakes, 2001).

A recent and more relevant adaption of the IAT involved substituting the initial IAT target-concepts with 'me' versus 'not-me' (i.e., 'self' vs. 'other'). Presenting this in combination with the 'pleasant'/'unpleasant' contrast, implicit self-esteem, reflected by the association between the self and evaluative information regarding the self, has been investigated (see Bosson et al., 2000, for an overview). In this way, the IAT has assumed an efficient role in the measurement of implicit evaluative associations underlying self-esteem (Bosson et al., 2000; de Jong, 2002; Farnham, 1999; Farnham & Greenwald, 1998; Farnham, Greenwald, & Banaji, 1999; Greenwald et al., 1998; Greenwald & Farnham, 2000; Rudman, Greenwald, & McGhee, 2000). Similarly, Markus's (1977) self-schema construct was investigated by combining 'self'-'other' (e.g. 'me'/'not-me') target concepts with a variety of other attribute dimensions, in an attempt to investigate how these dimensions are related to the self-concept (cf. Greenwald & Farnham, 2000; Farnham, 1999). For instance, by comparing 'self' + 'feminine' and 'other' + 'masculine', with 'self' + 'masculine' and 'other' + 'feminine' associations, researchers have investigated gender self-concepts (Greenwald & Farnham, 2000; Rudman et al., 2001).

5.3. EXTENSION OF THE IAT TO THE STUDY OF DISORDER IN CLINICAL POPULATIONS

The first study that adapted the self-concept IAT for use in a clinical population was that of Gemar et al. (2000). This study employed a mood-manipulation technique to ascertain how sensitive the IAT was to the susceptibility to the automatic negative effects of mood variation (i.e., lowering self-esteem) of formerly depressed individuals. The study comprised a group of currently depressed patients, a group of formerly depressed patients, and a normal control group. Word stimuli were selected to represent 'me' and 'not-me' concept categories, which were combined with positive and negative valence

attributes (obtained from a previous study by Segal et al., 1995). Results showed that under normal conditions formerly depressed participants exhibited higher IAT self-esteem scores than did the group of currently depressed individuals. This was reflected by generally faster responses for previously depressed participants on ‘me’ + ‘positive’ combinations than ‘me’ + ‘negative’ combinations. However, after the sad-mood-induction formerly depressed individuals scored equivalently to currently depressed individuals in terms of a greater association bias for negative self-relevant information (i.e. faster responses for combinations in which ‘me’ shared the same key as ‘negative’). These results imply that under conditions effecting mood variation, formerly depressed individuals are just as susceptible as current depressives to the automatic negative effect of mood variation (i.e., lowering the individual’s self-esteem) and that the IAT is sensitive to this susceptibility. In this way, the results of the Gemar et al. (2000) study not only pointed to negative esteem-related association biases within a clinically depressed sample but also demonstrated the sensitivity of the IAT to clinical status (Gemar et al., 2000).

5.4. IMPLICIT ASSOCIATION TASK FOR ASSESSING ANXIETY

Very few IAT-related studies have investigated the role of underlying associations in the memory of people with anxiety disorders. Of particular relevance to the present research is a study by Egloff and Schmukle (2002) who adapted the IAT to assess implicit fear-based structures in people with anxiety. Egloff and Schmukle adapted the IAT to measure anxiety (called the IAT-Anxiety) by assessing associations of self (e.g., ‘me’ and ‘my’) versus other (e.g., ‘you’, ‘your’, and ‘their’) with anxiety-related (such as ‘nervous’ and ‘afraid’) versus calmness-related words (such as ‘relaxed’ and ‘balanced’). The IAT effect, reflecting anxiety, was computed as the difference between the critical block during which ‘self’ + ‘anxiety’ versus ‘other’ + ‘calmness’ were presented, and the critical block in which ‘self’ + ‘calmness’ versus ‘other’ + ‘anxiety’ was presented. In the sense that the IAT-Anxiety measures the ease with which self-related items are associated with anxiety items, as compared to the ease with which self-related items are associated with calmness items. The IAT-Anxiety effect indicates a measure of the implicit self-concept of anxiety. Unfortunately Egloff and Schmukle’s study was conducted on a

sample of university students and as such the results are not generalisable to the fear-based associations underling pathological anxiety. As was expected within a 'normal' population, the results demonstrated facilitated responses for 'self' + 'calmness' combinations (as compared to 'self' + 'anxiety' combinations), indicating an overall tendency toward self-relevant calmness associations.

Another anxiety-related study was that of de Jong (2002) who investigated the role of implicit self-esteem in a population of high versus low socially anxious women. In the study, de Jong combined categories of 'me' (e.g., 'I', 'mine') and 'not-me' (e.g., 'you', 'them') with high-esteem (e.g., 'smart', 'beloved') and low-esteem (e.g., 'stupid', 'failure') categories. Although this is not a common IAT practice, de Jong separated the effects for the individual category combinations and in so doing the IAT was used as an index of implicit self-esteem that was able to differentiate between positive and negative self-evaluations, between self- and other-related attitudes, as well as demonstrating sensitivity to between-group differences. Although the conclusions of de Jong's study point to some interesting considerations regarding the self-esteem of socially anxious people (which will not be discussed as it is not entirely relevant to the current study), it should be pointed out that de Jong's method in separating the evaluations so as to assess independent associations has been criticised by Nosek, Greenwald and Banaji (2003). They argue that the IAT as a relative measure of the strength of associations cannot be undone via analytic methods. Furthermore, the demonstrated low test-retest correlations in de Jong's study cast doubt on the use of this IAT for individual clinical assessment (Farnham et al., 1999).

Apart from the fact that de Jong's (2002) use of self-esteem related categories do not represent fear-specific associations (as are pertinent to the present research), de Jong recruited high and low socially anxious participants from a sample of university students that were not clinically diagnosed with anxiety. That clinically anxious participants demonstrate different cognitive processes to people with non-clinical status has been documented in several studies (Amir et al., 1996a; Macleod & Hagan, 1992; MacLeod & Rutherford, 1992; Martin et al., 1991; Mathews & MacLeod, 1994; Mogg, Kentish, &

Bradley, 1993; Williams et al., 1988). Even if a study was to use a population with high levels of anxiety there may still be differences in information processing compared to a clinically disturbed group. This is because the processing biases of clinically diagnosed people could reflect maladaptive implicit concerns that distinguish them from non-clinical populations. For example, the results of Amir et al.'s (1996a) study demonstrated that clinical status may mediate responses on the Stroop task (see Chapter Four) such that normal interference effects are counteracted as a result of the activation of an anxiety program that facilitates avoidance mechanisms in the face of threat. It is expected that this would be typical for clinically anxious patients, more so than for generally anxious people, as the threat-association for clinical patients would represent their greatest vulnerability concerns. The IAT has also been demonstrated to be sensitive to clinical status (Gemar et al., 2000). To this extent one can expect that the results obtained from clinical samples are dependent on processing biases that are distinct and perhaps different from the information processes of non-clinical populations.

Teachman et al. (2001) conducted four IAT versions on a population with snake and spider phobia to determine whether self-reported fears of specific animals, would be consistent with implicit fear-consistent associations of such animals in memory, in this way reflecting automatic association biases akin to schematic processing. Teachman et al. (2001) used pictures of snakes and spiders as target concepts. Attribute dimensions were presented as four sets of opposing word descriptive categories: 'bad'-'good' (e.g., 'awful' versus 'wonderful') categories to determine the influence of valence; 'afraid'-'unafraid' (e.g., 'frightened' versus 'calm'); and 'danger'-'safety' (e.g., 'harmed' versus 'protected') categories, to assess the automatic level of subjective fear and threat associations; and finally, categories of 'disgusting'-'appealing' (e.g., 'repulsive' versus 'tasty') to determine the role of disgust in spider and snake phobics (Teachman et al., 2001). Results evidenced automatic fear-based associations among both spider and snake phobic groups for stimuli consistent with the threat-related nature of their disorder, which was significant across multiple semantic categories (namely the valence evaluations of fear, danger and disgust) (Teachman et al., 2001). The results reflecting implicit associations were found to be highly predictive of the type of fear-group membership (i.e., whether

the person was snake or spider phobic determined the strength of their associations toward stimuli reflecting their domain of fear). And lastly, results demonstrated a moderate to strong positive correlations not only between each of the four IAT tasks, but also between the self-report measures of specific animal fears (demonstrating convergent validity) (Teachman et al., 2001). Such findings suggest that assessing automatic associations can potentially clarify implicit cognitive processing in clinically anxious individuals, as well as increase our understanding of how such implicit processes are involved in the emotional disorders (Teachman et al., 2001).

Although Teachman et al. (2001) used the 'afraid'- 'unafraid' and 'danger'- 'safety' comparisons to assess fear associations on an implicit level, these categories, by omission of 'me' versus 'not-me' constructs, perhaps do not tap specifically into self-relevant fear associations. It can be argued that the use of me - not-me (self-relevance) constructs implicates the extent to which the self is associated with fear, over and above the societal values that may be implicated in Teachman et al.'s 'danger'- 'safety' comparisons (we are, for instance, taught from an early age to be afraid of snakes and spiders as they can be dangerous) (Williams et al., 1988). An implication of self-relevance can be argued to be of more concern for an anxious person, than merely a general valence category, and thus more likely to activate fear-based structures from memory. Furthermore, a population of snake and spider phobic people may demonstrate alternative cognitive processing biases as compared to people with social phobia and panic disorder, due to the fact that processing biases may appear at different stages in different disorders (Williams et al., 1988).

The above-mentioned studies demonstrate how the IAT was used in an attempt to uncover evaluations of cognitive structure in memory that are hypothesised to contribute to the development and maintenance of neurotic disorders. Evidence of fear-based associations show support for the basic associations in memory that resemble the distinguishing features of schemas (Bosson et al., 2000) and thus such studies prove as a fruitful venture in cognitive research.

5.5. OTHER VERSIONS OF THE IAT

Three variants of the IAT have been developed, but as these versions are of no direct concern for the purposes of the current research paper, they will not be discussed in detail. Firstly, Nosek and Banaji (in Fazio & Olson, 2003) developed the ‘Go/No-Go Association Task (GNAT). This task does not require the use of a contrast category. Participants are required to respond to some, but not all of the stimuli presented at any given time. For example, one can present names of flowers, positive words, and negative words. To measure the attitude toward flowers, participants required to respond to two variations of the task. In Task 1, respondents are asked to press a key only when they see the name of a flower or a positive word, but not to respond if a negative word is presented. Then, in Task 2 respondents are asked to press a key only when the word presented is the name of a flower or a negative word, but not to respond if a positive word is presented. Usually, faster responses are demonstrated for performance in Task 1, which indicates positive attitudes toward the concept ‘flower’ (de Houwer, 2002). Because the GNAT does not require the presence of a second target concept, it allows one to assess associations involving a single target concept. Moreover, GNAT effects appear to be as robust and reliable as IAT effects (de Houwer, 2002).

In another variation of the IAT, Wigboldus (2001) presented only one target concept and two attributes. For example, participants are first required to press a left key for positive words (attribute category) and words related to the concept ‘fruit’ (target category, e.g., ‘apple’) while pressing a right response key for any negative words (another attribute category) presented. The second condition requests that participants press a left key for positive words while pressing a right key for any negative words and words relating to the concept ‘fruit’. Faster response latencies for the first condition imply positive attitudes towards the concept ‘fruit’ (indicating stronger associations between the concept ‘fruit’ and positive valence, than between ‘fruit’ and negative valence). On the other hand, faster responses for the second condition will imply the reverse (negative attitude toward ‘fruit’).

Thirdly, de Houwer (2002; 2003) developed the extrinsic affective Simon task (EAST). This task presents blue, white, and green words, of which some were positive, some negative, and some neutral words. Participants are required to press a left or right response key based on the valence of the white words (i.e. good or bad) and the colours of the coloured words (i.e. green, white, or blue). Responses to conditions in which coloured words have positive meanings resulted in consistently faster responses as opposed to when coloured words have negative meanings. Neutral words were not affected by increased or decreased response latencies, but remained constant. The reverse was true for coloured words with negative meanings.

The three IAT variants discussed in the previous paragraph demonstrate applications in which the IAT was able to assess associations using a single target concept, thus presenting themselves as being more suitable for the investigation of single concept associations in memory than the original IAT (i.e., associations between two single concepts, versus the relative strength assessed between two bipolar-opposite concepts as in the original IAT). As mentioned, several research attempts in which the original IAT was used to assess individual category combinations (e.g., de Jong, 2002) by isolating category assessments, has been discredited by Nosek et al. (2003). De Houwer (2002) argues that in its use of two target categories and two attribute categories, the IAT is limited to measuring the relative strength with which the two target concepts are associated with the two attribute concepts. Because every condition in the IAT necessitates response in relation to all four concepts, it is not possible to tease apart the assessment of any individual target or attribute pair. In this way it was argued that no analytical methods can undermine the inherent limitation of the IAT as a measure of the relative strength of association between bipolar pairs of categories (Nosek et al., 2003). Although the above-mentioned variants have demonstrated a certain amount of reliability, they are not as popular as the conventional IAT and validity issues are still under inquiry (de Houwer, 2002).

5.6. ADVANTAGES AND LIMITATIONS OF THE IAT

One of the primary advantages of using the IAT resides in its within-subject-design (Teachman et al., 2001). This element essentially controls for the influence of state anxiety in the sense that the feared stimuli are presented in both the congruent and incongruent trial combinations (Teachman et al., 2001). The reason that state anxiety is an issue in clinical testing is that many information processing tasks are influenced by the current level of state anxiety. To extrapolate the conditions in which performance on tasks are a result of implicit fear cognition rather than an effect based on the influence of anxious arousal (state anxiety) is a crucial determinant in attempting to explain the genesis of anxiety states as opposed to the effects of anxiety (Teachman et al., 2001). By using an automatic processing paradigm that reflects simple associations and controls for state anxiety effects (as does the IAT) represents a potential strategy for assessing implicit fear-based cognition in anxiety (Teachman et al., 2001).

Other advantages reside in the fact that the IAT, as an indirect cognitive task, has an apparent resistance to self-presentation concerns (Banse et al., 2001; Egloff & Schmukle, 2002; Kim & Greenwald, 1998) and is independent from introspective access to the association strengths being measured (Greenwald et al., 2002). It has, however, been demonstrated that even if participants do become aware of the constructs under investigation, the level of awareness does not enable participants to control their response on the IAT measure (Greenwald et al., 1998; Kim, 2001).

In an important article, de Houwer (2002) provided a comprehensive account of the strengths and limitations regarding the IAT as a measure of threat-related associations in psychopathology. De Houwer (2002) argues that although the IAT is a potential tool for the measurement of dysfunctional beliefs it is important to understand that it is limited in its design and purpose, that is, to assess the strength of association between concepts related to such beliefs in memory. It therefore does not reflect the nature or directionality of such associations, nor can it be used to capture complex conditional beliefs such as 'if I stutter, people will think I am stupid' (de Houwer, 2002). Rather, the IAT can be used to provide an index of the associations assumed to be involved in certain beliefs, in this

way, providing indirect evidence for the presence of such beliefs. Another limitation of the IAT is the unresolved question about the constraints on the comparison of relative categories as has been previously discussed. As the IAT effects reflect the difference scores (i.e., the speed of response for incongruent trials minus the speed of response for congruent trials), evaluating automatic associations within one category (e.g., anxiety) cannot be understood independently of the participant's associations within the other category (e.g., calmness) (de Houwer, 2002; Nosek, Greenwald, & Banaji, 2002). As the IAT always uses at least two target concepts with two attribute concepts, it can only provide a measure of the relative strength of the associations between both the attribute and target concepts, as opposed to being able to provide a measure of the relative strength of the association between the attribute concept and one particular target category only, as de Jong (2002) attempted to do. In other words, as it is based on assessing the relative strength of various associations it cannot be used to measure a specific dysfunctional association.

On the other hand, the flexible nature of the IAT in its attempt to assess associations between opposing social constructs, lends itself to adaption to assess a broad variety of socially significant associations (see Greenwald & Nosek, 2001, for an overview). The IAT is therefore believed to be a convenient paradigm in the investigation of a variety of constructs specifically related to an individual's fear representations, including his or her fearfulness of something as being an integral part of his or her self-concept.

5.7. PROPERTIES OF THE IAT

The current study's investigation concerns the adequacy of an adapted IAT to assessing the strength of threat-related associations in a clinically anxious population. Because the study of implicit cognition is relatively new, there is as yet no common consensus regarding the best strategy for measuring it (Bosson et al., 2000). The following section will provide the reader with an overview of previous research into the psychometric properties of the IAT.

5.7.1. Procedural Variables of the IAT

IAT results have proven to remain stable across a number of procedural variables, such as whether the pleasant category was assigned to the left or the right response key, variations in the time interval between the participant's response to one stimulus and the presentation of the next (which varied between 150 ms to 750 ms), as well as whether the category set consisted of 5 or 25 items (Greenwald et al., 1998). Furthermore, IAT effects have also demonstrated stability across a number of variations of the scoring algorithm, that is, with regard to the treatment of data from error responses, and in the strategies that have been used in dealing with the usually skewed, extended upper tail latency distributions (Greenwald & Farnham, 2000).

The only variable that was consistently found to be capable of moderating the effect of the IAT, is the order of task-compatible combinations. For instance, it was consistently found that larger effects were obtained when compatible combinations (e.g., 'flower' + 'pleasant' and 'insect' + 'unpleasant') were presented before incompatible combinations (e.g., 'flower' + 'unpleasant' and 'insect' + 'pleasant') (Greenwald & Nosek, 2001). Although this does not undermine the validity of the IAT, it does compromise the position of the zero point. Stated in terms of another example, if a participant was devoid of any implicit pro-Black or pro-White bias, a slight tendency toward pro-White would appear to result from an IAT task in which 'White' + 'pleasant' preceded 'Black' + 'pleasant', but the same participant would appear to be slightly pro-Black if the 'Black' + 'pleasant' combination appeared first.

5.7.2. Internal Consistency

Fortunately the issue of the IAT's reliability has been of research concern right from the start (Greenwald et al., 1998). Internal consistency coefficients in terms of Cronbach's alpha, of various types of IAT measures, usually demonstrate high values in the range of .80 (Banse et al., 2001; Bosson et al., 2000; Egloff & Schmukle, 2002). To bolster the support for the internal consistency of the IAT, several studies have refuted the influence of stimulus familiarity (Dasgupta et al., 2000; Greenwald et al., 1998; Nosek, Banaji, & Greenwald, 1998; Ottaway et al., 2001; Rudman, Greenwald et al.,

1999). A good internal consistency, although sufficient for an adequate measure of state anxiety, does not necessarily imply stability over time (as determined by test-retest reliability coefficients), which is necessary for it to be a reliable measure of trait anxiety.

5.7.3. Test-Retest Reliability

Several studies have investigated the IAT's test-retest reliability. Dasgupta and Greenwald (2001) found a correlation of .65 for their race-related IAT after a one day interval. In another race-related study, Cunningham, Preacher and Banaji (2001) demonstrated a mean test-retest correlation of .32 (range between .16 and .51; mean time interval = 28 days). A correlation of .69 was reported for the self-esteem IAT by Bosson et al. (2000) after an interval of 31 days, and Greenwald and Farnham (2000) demonstrated a correlation of .52 for their self-esteem IAT after an interval of 8 days. The IAT-Anxiety (Egloff & Schmukle, 2002), on which the currently adapted IAT is modelled, demonstrated a coefficient of .57 after a one-week interval. An average stability coefficient for several of IAT-related studies (including Bosson et al., 2000; Dasgupta & Greenwald, 2001; Greenwald & Farnham, 2000) was $r = .64$. These stability coefficients, although quite low for measures of individual differences, are still considerably higher than what is reported for other measures of implicit cognition (Egloff & Schmukle, 2003). Although lower than the internal consistency, the IAT does demonstrate a reasonable stability for the IAT.

5.7.4. Convergent and Predictive Validity

Being an indirect measure, results of the IAT should be associated with other implicit measures of relatively automatic (or non-conscious) forms of behaviour, and to this extent, predictive of such behaviours (i.e., predictive validity). Several studies have demonstrated the effects of the IAT to be significantly related to the results cognitive priming procedures used for measuring automatic affective processes or schemas (Dovidio et al., 1997; Fazio, et al, 1995; Spalding & Hardin, 2000), such as the sequential priming task (e.g. Bargh et al., 1992; Fazio et al., 1986; Greenwald, Klinger, & Liu 1989; Neely, 1997), semantic priming measures of associative strength (Cunningham et al., 2000; Mellot & Greenwald, 2000; Rudman & Kilianski, 2000), as well as projective tests

(Bornstein, 1998). In fact Greenwald et al. (1998) claimed that the IAT's sensitivity to measure evaluative differences is about twice that of semantic priming procedures.

One of the most important psychometric qualities of any task is its ability to predict certain empirical indicators of the construct under investigation. Predictive validity refers to the ability of the IAT to predict behaviours over and above what explicit measures of anxiety predict (Bosson et al., 2000). In terms of its ability to predict behaviours, race-related implicit constructs were found to be predictive of non-verbal indicators of discomfort (McConnell & Leibold, 2001), and amygdala activation as assessed by fMRI (functional magnetic resonance imaging) (Phelps et al., 2000). IAT-assessed implicit self-esteem was a better predictor (than other measures) of nonverbal anxiety behaviour (Spalding & Hardin, 2000), negative mood (Greenwald & Farnham, 2000), as well as a buffering effect (for those with high self-esteem) regarding aspects of success versus failure (Farnham & Greenwald, 2000). IAT-related constructs predicted non-conscious aspects of shyness (Asendorpf, Banse, & Mücke (2002), while IAT-assessed gender stereotypes were predictive of prejudice toward female job applicants (Rudman and Glick (2001). IAT-anxiety, as reported by Egloff and Schmukle (2002), was able to predict changes in performance after failure, experimenter-related anxiety after stress induction, as well as global and specific behavioural anxiety indicators during a stressful speech condition. These studies all lend credence to the predictive validity of the IAT, which is one of the most important properties of any assessment tool.

5.7.5. IAT versus Explicit Measures

Correlations between results of the IAT and various self-report measures of the same construct have demonstrated a mixture of significant and insignificant relationships depending on the construct under investigation (mean $r = .24$; Nosek, Banaji, & Greenwald, 2002). The highest correlations were apparent in attitudes toward homosexuality ($r = .62$; Banse et al., 2001) and political candidates ($r = .52$; Nosek et al., 2002). Usually the correlations between the IAT and explicit measures were found to be weak but positive. For instance, the average correlation between implicit self-esteem (as

assessed by the IAT) and six self-report measures of self-esteem was .18 (Farnham et al., 1999) and .21 for four other explicit self-esteem measures (Bosson et al., 2000). Weak correlations were found in a study by Egloff and Schmukle (2002) in which the IAT effect did not correlate significantly with the State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, 1970; $r = .24, p = .14$), and the Social Desirability Scale (SDS-17R; Stöber, 2001; $r = -.18, p = .26$). This weak association is replicated in many other IAT-related studies (e.g., Banaj & Greenwald, 1998; Dasgupta et al., 2000; Greenwald & Farnham, 2000; Greenwald et al., 1998; McConnell & Leibold, 2001; Mellot & Greenwald, 2000; Rudman, Ashmore & Gary, 1999; Rudman & Glick, 2001; Rudman et al., 2000; Spalding & Hardin, 2000). Based on such weak correlations, the IAT is assumed to be able to measure implicit constructs which are distinct from explicitly measured constructs (Greenwald et al., 1998). This can, for instance, be attributed to the different learning processes involved (i.e., implicit, unconscious versus explicit, strategic) in such tasks (Bosson et al., 2002). Evidence of insignificant but positive correlations, still maintains that the relationship between implicit and explicit measures may be in the expected direction and as such can still be nominally correlated with the constructs under investigation (Greenwald et al., 2002).

Despite the apparent psychometric weaknesses, the usefulness of the IAT in measuring implicit information processes in memory, in an attempt to examine cognitive theories of emotional pathology, cannot be overlooked (Teachman & Woody, 2003). As Bosson (in Bosson et al., 2000) argued, a novel approach to the study of personality cannot be disregarded on the basis of mere initial psychometric weaknesses. Early versions of the Thematic Apperception Test (TAT) were also characterised by poor psychometric standards. Consistent research, however, contributed to gradual changes in scoring strategies that have improved the IAT's psychometric properties and have rendered it a useful tool for the prediction of important variables (Bosson et al., 2000). Continued efforts in research may help to perfect the IAT as a reliable and valid measure of implicit information processing and hence a tool of greater utility, which is the topic of discussion in the next section.

5.8. NEW ALGORITHM

The initial IAT publication (Greenwald et al., 1998) introduced a conventional scoring algorithm which has been used in the majority of subsequent IAT-related studies. The conventional IAT algorithm consisted of: (1) only using data from the ‘real’ blocks (i.e., block 4 and block 7), (2) dropping the first two trials of the critical (combined) trial blocks in the IAT’s two combined classifications tasks (block 4 and block 7), (3) any values outside the lower boundary (300ms) were recorded as 300ms, and outside the upper boundary (3000ms) were recorded as 3000ms, (4) latencies are log-transformed before being averaged, (5) error latencies are included in the analysed data, (6) and data for respondents who have unusually high or low responses are excluded from analysis. The reason that this algorithm was most commonly used is that compared with several other procedures that used latency data, this procedure typically produced the largest statistical effect sizes (Greenwald et al., 2003).

As a new cognitive tool, the validity of the IAT in terms of both incremental (i.e., whether it is able to contribute value beyond the scope of explicit measures) as well as predictive validity (its ability to predict behaviour) have often been challenged (e.g. Bosson et al., 2002; Egloff & Schmukle, 2002; Teachman et al., 2001; Teachman & Woody, 2004) and described as ‘weak’ (Bosson et al., 2000). It is believed that improvements in scoring procedures may yield further developments in strengthening the psychometric properties of the IAT (Bosson et al., 2000). Furthermore, the psychometric properties pertaining to the conventional IAT scoring procedures (as defined in Section 5.6.) have never been challenged by systematic investigations (Greenwald et al., 2003), and as such this scoring method lacks any rationale that distinguishes as superior to any other scoring alternatives (Greenwald & Nosek, 2001).

As an attempt to address these issues, Greenwald et al. (2003) have relied on the data collected from thousands upon thousands of computer-based entries of several IAT administered tasks. The tasks were available to online drop-in visitors on an educational Web site <http://www.yale.edu/implicit/> which has since been changed to <http://www.harvard.edu/implicit>. Approximately 1.2 million tests were completed at this

Yale IAT site between October 1998 and May 2002 (Greenwald et al., 2003). Such extreme sample sizes afforded the statistical power to discriminate small, but consequential differences in the properties of various scoring procedures (Greenwald et al., 2003). Based on this vast data base, a series of experiments were conducted with the aim of assessing a variety of alternative scoring procedures and findings strongly suggested replacing the conventional scoring procedures with a new, more suitable algorithm (Greenwald et al., 2003). The steps of the new algorithm are compared with the steps of the old scoring algorithm (as well as the currently adapted algorithm, which will be discussed in Chapter Seven) in Appendix B.

The new algorithm's primary deviations from the conventional scoring procedure, is in terms of its inclusion of 'practice'-block latency data, its use of error penalties (calculated as the standard deviation of that specific block plus 600ms), and its use of calculated individual-respondent standard deviations in providing the measures scale unit (a pooled standard deviation for all trials in the critical or real blocks is calculated, which is later used as a divisor in the difference between response latencies for the compatible and incompatible blocks) (Greenwald et al., 2003). An advantage of using the improved algorithm can be explained in terms of the percentage saving in research resources as a result of the increased research power. Computations of statistical significance based on the conventional and improved algorithm yielded results that the required sample size for the conventional algorithm was 63 while a reduced sample size of 39 was required for the improved procedure (Greenwald et al., 2003). This suggests an overall reduction of 38.1% in sample size afforded by the improved algorithm (Greenwald et al., 2003). Such a saving can be crucial in research with high pre-respondent costs, such as when subjects are difficult to locate (Greenwald et al., 2003). Compared with the conventional scoring measures, the new algorithm offers a gain in construct purity, and thus should provide a better reflection of underlying association strengths (Greenwald et al., 2003). It should more powerfully assess relations between association strengths and other variables of concern (Greenwald et al., 2003). The new algorithm also offers a reduced sensitivity to influences based on prior experience with the IAT, which is advantageous in pretest-posttest designs as well as the effect of order of administration for multiple IAT measures

(Greenwald et al., 2003). And lastly, the new algorithm is expected to be a better indicator of individual differences that are due to association strengths as opposed to any other variable (Greenwald et al., 2003).

In a subsequent study, Nosek et al. (2003) investigated methodological issues relevant to the design, analysis and interpretation of the IAT as based on the new algorithm (Greenwald et al., 2003). The conclusions based on these studies provided answers to a number of important questions regarding the implications for use of the IAT and are summarised in Appendix C.

5.9. CONCLUSION

Due to its popularity in associative cognitive research, there is currently an explosion of investigations into the psychometric properties of the IAT and its associated tasks. IAT-related studies have consistently yielded results that implicate the presence of unconscious/implicit fear-related associations in anxiety-based studies that are predictive of fear-group membership. Besides being able to indirectly detect associations that exist beyond that of conscious awareness, an advantage of the IAT is its within-subject-design which controls for the influence of state anxiety. Internal reliability and validity studies have demonstrated that the IAT is a suitable measure of threat-related associations, exhibiting moderate relations with explicit tests of anxiety. These findings all suggest the usefulness of the IAT and that assessing automatic associations in anxiety can potentially elucidate implicit cognitive processing differences among different individuals (Teachman et al., 2001).

The flexible nature of the IAT design permits an investigation into the question of generality regarding the processing biases associated with anxious schema. To the best of our knowledge, the present research represents the first attempt in which the IAT has been adapted to measure the strength of threat related associations in subjects with panic disorder and social phobia. For this reason, the results of the current study may shed light on some of the processing differences unique to people with these disorders, with possible implications regarding the degree to which a client's underlying memory

structures put them at risk for developing such disorders or experiencing relapse after treatment. The current study also provides an extension into research regarding the psychometric properties of the IAT in its adaptability to investigating threat-related associations in a clinical sample. Although there are still several reservations regarding the merits of the IAT, the available evidence does suggest that when used appropriately, the IAT can provide a valuable tool in the investigation of cognitive processes underlying psychopathology (de Houwer, 2001).



CHAPTER SIX

AIMS, OBJECTIVES AND HYPOTHESIS

6.1. AIMS AND OBJECTIVES OF THE PRESENT STUDY

For purposes of the current research, the IAT has been adapted by involving stimulus materials related to the concerns that are characteristic of people with social phobia and panic disorder. In order to achieve this, the present researcher has constructed two versions of the IAT, namely the physical threat IAT (PIAT) and the social threat IAT (SIAT). In line with the research conducted by Egloff and Schmukle (2002), the categorisation into self ('me') and other ('not-me') categories are combined with the classification of items into social threat and social safety words (for the SIAT) and physical safety and physical threat words (for the PIAT) (see Chapter Seven for adaption procedures). Defined in operational terms, the PIAT and SIAT are expected to measure the ease with which participants categorise self-related items with anxiety-related items as compared with safety-related items. The threat and safety words of the PIAT consist of words pertaining exclusively to physical threat and physical safety issues that are characteristic concerns of people with panic disorder. On the other hand, SIAT threat and safety words consist of words pertaining exclusively to social threat and safety issues that are characteristic concerns for people with social phobia. Based on these adaptations, it is expected that the IAT will provide evidence that people with social phobia more readily associate social threat-related stimuli with the self or 'me' (and social safety attributes with others), while people with panic disorder more readily associate physical threat-related stimuli with self-related constructs (while associating physical safety constructs with others).

Integral (and often underestimated) to the consideration of a newly designed test for use in future research is the issue regarding reliability, on which all subsequent validity studies are based (Egloff & Schmukle, 2002). Although an impressive amount of IAT studies on validity and reliability have accumulated over the last few years (Bosson et al., 2000; Fazio & Olson, 2003), the present study possibly represents the first IAT-related study investigating implicit associations in clinically diagnosed populations with

social phobia and panic disorder, with as yet, there are no documented accounts of the reliability and validity of these measures. For this reason, this present study will focus on establishing whether the PIAT and SIAT are reliable and valid indirect measures of threat-related associations in memory. To this extent, the hypothesis section has been sub-divided into two parts; part one for the establishment of reliability, and part two, for the investigation into the validity of the measures.

The dependent variable is response latency. In establishing validity, it was expected that stronger associations will be reflected by shorter response latencies (see Chapter Four) for clinical samples in conditions in which there exist an association between domain specific threat words and the self-concept. If the expected IAT effects were to be demonstrated, it will not only support the validity of the measures, but furthermore, it will supply evidence for the nature of the theoretically proposed schematic structures (Beck et al., 1985) characteristic of social phobia and panic disorder respectively. In other words, it will confirm the existence of a strong and coherent association network (Bower, 1981) consisting of domain specific fears and self-related threat elements (Segal, 1988). The expected results will provide evidence for the validity of three separate but related theories of emotional disturbance (discussed in Chapter Three) within the information-processing paradigm for people with anxiety.

A secondary objective of the study was to investigate the relationship between the expected implicit threat-specific IAT effects and a range of potentially related variables, namely the explicit constructs of social phobia severity and panic disorder severity, trait and state anxiety, and depression. It seems obvious that in determining the validity of the IAT, the strength of association between self-concept and threat- or safety-related stimuli (evidenced as the IAT effect) should be associated with results from several explicit measures claiming to measure a similar construct.

6.2. THE HYPOTHESES EXAMINED IN THE PRESENT STUDY

The PIAT and SIAT have been administered to a group of participants with social phobia, panic disorder and a control group with an absence of any of the emotional or

anxiety-based disorders. In view of the aims and objectives of the present research as set out in Section 6.1. and based on the literature review presented in Chapter Two through to Chapter Five, the following hypotheses were formulated.

6.2.1. Reliability Study

As both the PIAT and SIAT consist of two independent IAT measures (see Chapter Seven), it is expected that the results of all participants of the PIAT1 will be highly correlated with PIAT2 results. Similarly, the results of all participants on the SIAT1 will be highly correlated with SIAT2.

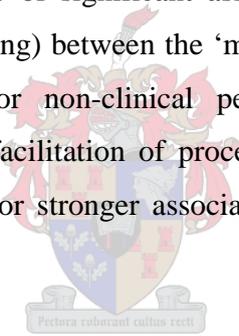
6.2.2. Investigations into the Validity of the PIAT and SIAT

In order to establish the PIAT and SIAT as valid measures of threat-related associations in people with social phobia and panic disorder, and in line with the theoretical aspects mentioned throughout this research, several validity-related hypotheses were formulated:

1. Participants with social phobia will demonstrate a significant, negative SIAT effect (for the Social Threat IAT). This will be reflected by the fact that in aggregate the 'me + social threat' and 'not-me + social safety' words will show stronger associations (reflected by shorter response latencies) than the 'me + social safety' and 'not-me + social threat' words. These results indicate a strong association between the individual's self presentation and social threat/fear, and thus reflect biased information processing (facilitation for self-relevant threat association) during a domain-specific word classification task.
2. Participants with panic disorder will demonstrate a significant, negative PIAT effect (for the Physical Threat IAT). This will be reflected by the fact that in aggregate the 'me + physical threat' and 'not-me + physical safety' words will show stronger associations (reflected by shorter response latencies) than the 'me + physical safety' and 'not-me + physical threat' words. These results indicate a strong association between the individual's self representation and physical

- threat/fear, and thus suggest biased information processing (facilitation for self-relevant threat associations) during a domain-specific word classification task.
3. Participants with social phobia will demonstrate a significant, negative PIAT effect. This will be reflected by the fact that in aggregate the 'me + physical threat' and 'not-me + physical safety' combinations will show stronger associations (i.e., shorter response latencies) than the 'me + physical safety' and 'not-me + physical threat' words. These results will be indicative of a strong association between the self representation of a person with social phobia and physical threat/fear. It reflects biased information processing in the form of facilitated responses for self-relevant threat associations during a word classification task. This is to be expected as there is strong evidence pointing to an overlap between social and physical concerns in people with social phobia.
 4. The PIAT effects demonstrated by participants with social phobia will be less than their SIAT effects (reflected by a higher PIAT effect *value* than a SIAT effect *value*). Such results demonstrate IAT effects as domain specific and indicating a stronger association between the self-representation and social threat/fear for a person with social phobia, than the association between their self-representation and physical threat.
 5. Participants with panic disorder will demonstrate a significant, negative SIAT effect. This will be reflected by the fact that in aggregate the 'me' + 'social threat' and 'not-me' + 'physical threat' combinations will show stronger associations (i.e., shorter response latencies) than the 'me' + 'social safety' and 'not-me + social threat' words. These results will be indicative of a strong association between the self representation of a person with panic disorder and social threat/fear. It reflects biased information processing in the form of facilitated responses for self-relevant threat associations during a word classification task. This is to be expected as there is strong evidence pointing to an overlap between social and physical concerns in people with panic disorder.

6. The SIAT effects demonstrated by participants with panic disorder will be less than their PIAT effects (reflected by a higher SIAT effect *value* than a PIAT effect *value*). Such results demonstrate IAT effects as domain specific and indicating a stronger association between the self-representation and social threat/fear for a person with panic disorder, than the association between their self-representation and physical threat.

7. a) It is expected that the control group will demonstrate a non-significant PIAT effect, thus providing evidence that PIAT effects reflect domain specific concerns specific to anxiety and is thus able to discriminate between the fears that characterise people with panic disorder from a non-clinical population. This will be reflected by an absence of significant association effects (hence, a lack of biased information processing) between the ‘me + physical threat’ and ‘not-me + physical safety’ words for non-clinical people on this classification task (reflecting an absence of facilitation of processing of self-relevant threat cues, with a preferred tendency or stronger association towards positive self-relevant associations).
The image is a faint watermark of a university crest, likely from the University of Cambridge, featuring a shield with various symbols and a motto scroll at the bottom. The motto on the scroll reads "Pectora roburant cultus recti".
b) It is expected that the control group will demonstrate a non-significant SIAT effect, thus providing evidence that SIAT effects reflect domain-specific concerns specific to anxiety, and is thus able to discriminate between the fears that characterise people with social phobia from a non-clinical population. This will be reflected by an absence of significant association effects (hence, a lack of biased information processing) between the ‘me + social threat’ and ‘not-me + social safety’ words for non-clinical people on this classification task (reflecting an absence of facilitation of processing of self-relevant threat cues, with a preferred tendency or stronger association toward positive self-relevant associations).

8. a) The PIAT effects demonstrated by the control group are expected to be significantly smaller (reflected by response latencies [i.e., effect sizes] of a larger

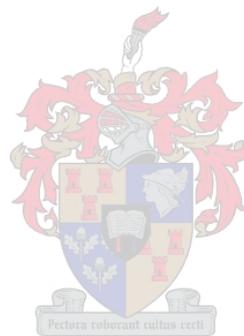
- value) than the PIAT effects obtained by either of the clinical groups (i.e., participants with panic disorder and social phobia). Such results will demonstrate the sensitivity of the PIAT for clinical anxiety.
- b) The SIAT effects demonstrated by the control group are expected to be significantly smaller (reflected by response latencies [i.e., effect sizes] of a larger value) than the SIAT effects obtained by either of the clinical groups (i.e., participants with panic disorder and social phobia). Such results will demonstrate the sensitivity of the SIAT for clinical anxiety.
9. For purposes of investigating construct validity, there are expected to be significant positive correlations between the PIAT effects obtained by participants with panic disorder, and certain explicit measures which propose to assess theoretically related constructs. The specific hypotheses in this respect are:
- a) PIAT effects for the panic disorder group will correlated significantly and positively with their level of panic severity measured by the Panic Disorder Severity Scale (PDSS; Shear et al., 1997).
- b) PIAT effects for the panic disorder group will correlate significantly and positively with their level of state anxiety as measured by the State Scale (STAI-S) of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983).
- c) PIAT effects for the panic disorder group will correlate significantly and positively with their level of trait anxiety as measured by the Trait-Scale (STAI-T) of the STAI (Spielberger et al, 1983).
- d) PIAT effects for the panic disorder group will correlate significantly and positively with their level of depression as measured by the Beck Depression Inventory- Second Edition (BDI-II, Beck, Steer, & Brown, 1996).

10. For purposes of investigating construct validity, there are expected to be significant positive correlations between the SIAT effects obtained by participants with panic disorder, and certain explicit measures which propose to assess theoretically related constructs. The specific hypotheses in this respect are:
- a) SIAT effects for the social phobia group will correlate significantly and positively with their level of social phobic severity as measured by the Social Phobia Inventory (SPIN, Conner et al., 2000).
 - b) SIAT effects for the social phobia group will correlate significantly and positively with their level of state anxiety as measured by the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983).
 - c) SIAT effects for the social phobia group will correlate significantly and positively with their level of trait anxiety as measured by the Trait-Scale of the STAI (Spielberger et al, 1983).
 - d) SIAT effects for the social phobia group will correlate significantly and positively with their level of depression as measured by the Beck Depression Inventory- Second Edition (BDI-II, Beck, Steer, & Brown, 1996).

6.3. CONCLUSION

As mentioned in the literature overview, little research has been aimed at investigating implicit processing biases in the association processes within memory. Furthermore, previous research with the recently developed IAT has, to the best of our knowledge, not attempted to assess differential fear-based information processes in populations who were clinically diagnosed with social phobia and panic disorder. For this reason, the current study's investigation into the reliability and validity of the newly adapted PIAT and SIAT will not only provide evidence of the reliability and validity of these measurement tasks, but may also contribute to insights into the role of implicit fear cognition in anxiety.

Advances in the study of automatic fear processing may potentially lead to improvements in assessment and intervention approaches for anxiety disorders and a better prediction of vulnerability or relapse of anxiety-based symptoms (Teachman & Woody, 2004).



CHAPTER SEVEN

METHOD

7.1. INTRODUCTION

The present study was partly conducted in co-operation with researchers from the Medical Research Centre's (MRC) Unit on Stress and Anxiety Disorders at Tygerberg Hospital in Belville, Cape Town, as well as the Department of Psychology at the University of Stellenbosch. Apart from meeting ethics approval from the University of Stellenbosch, the research protocol was further approved by the MRC/ Tygerberg Ethics committee, in accordance with the Declaration of Helsinki. The research project was commenced in March 2000. Progress was temporarily interrupted on two occasions for a total period of about one year due to the personal concerns. With this included, the study was conducted over a period of five years (March 2000 to December 2004).

The current chapter is divided into sections dealing with the design of the study, the participants, the apparatus used (including the construction of the adapted version), the procedures followed in collecting the data, and the statistical procedures that were used to analyse it.

7.2. DESIGN

The basic structure of the present study was based on a cross-sectional within- and between-groups design, with each participant assigned to one of three groups; 1) a social phobia group, 2) a panic disorder group, or 3) a control group. Each participant was administered all the measures included in the study on a single testing occasion. Variables concerning order of test administration, age, gender, language and intellectual ability were controlled for. The dependent variables included physical threat implicit association, social threat implicit association, panic disorder severity, social phobia severity, level of state anxiety, level of trait anxiety, and level of depression.

7.3. PARTICIPANTS

The final sample consisted of 17 clinically diagnosed social phobic and 17 clinically diagnosed panic disorder participants meeting the DSM-IV (1994) criteria for panic disorder and social phobia respectively. These 34 participants will be referred to as the 'clinical participants' or 'clinical groups'. A group of 17 control participants were also included on a comparative basis.

7.3.1. Clinical Participants

The majority of clinical participants were recruited through the Anxiety Disorders Clinic of the MRC Anxiety Disorders Unit in Tygerberg, Cape Town from an existing database. The recruitment of several other participants was based on obtaining volunteers from among several clinical psychologists in private practice (from the Eastern and Western Cape of South Africa), selected outpatient centres of several Cape Town based state hospitals, and recommended resources from the South African Mental Health (such as the Depression and Anxiety centre in Johannesburg).

As assistance from the majority of health workers in the medical field was for a large part unfortunately not forthcoming, and due to the extreme difficulty in finding participants with social phobia and panic disorder currently experiencing a certain level of symptom severity (as medication most often results in symptom relief), alternate recruitment procedures were involved which included obtaining participants from responses to local media advertisements, referrals by local support groups, and reactions from a local radio talk regarding social phobia and panic disorder. Most of these recruitment attempts, however, proved to be largely futile and due to this, as well as time constraints, the total sample was limited.

Participants that were not previously diagnosed according to DSM-IV (1994) criteria were assessed with the Structured Clinical Interview for DSM-IV diagnosis (SCID-I; First, Spitzzer, Gibbon, & Williams, 1996) by an experienced clinical psychologist. Although some of the participants were taking medication at the time of assessment, all participants experienced at least a minimum of the required standards for

symptom severity according to previously established criteria. Based on these criteria, the results of 35 participants were excluded from the study. Enquires were made with regard to age, level of education, home language, and medical history.

7.3.1.1. Inclusion Criteria

A grade 12 pass (to ensure a basic level of competence for the English language as English is a compulsory school subject until the final grade); panic disorder according to DSM-IV (1994) diagnostic criteria, established by means of the SCID-I, social phobia according to DSM-IV (1994) diagnostic criteria established by means of the SCID-I.

7.3.1.2. Exclusion Criteria

The following exclusion criteria were applied which resulted in the exclusion of 2 participants:

- history of a brain tumour, mental retardation, degenerative disorder, or any other disorders that could affect the patient's mental capacity for performing the IAT.
- visual impairments that cannot be corrected by means of spectacles or other optic means.

7.3.2. Control Participants

In selecting the control group, it was essential that participants were chosen that would be similar to the social phobic and panic disorder groups in as many respects as possible, with the exception of the presence of the mentioned two anxiety disorders, as well as the mental disorders described in the previous section. Absence of psychiatric disorders was established by means of the MINI Neuropsychiatric Interview which was administered by an experienced clinical psychologist. Control participants were selected from volunteers among the staff at Tygerberg Hospital, the staff and associates of a local Cape Town restaurant, and several psychology students from the University of Stellenbosch. A grade 12 pass was required to ensure a basic level of competence for the English language as English is a compulsory school subject until the final grade. In selecting the control participants, the same exclusion criteria used for the clinical groups were applied. Enquires were made with regard to age, level of education, home language, and medical history.

7.3.3. Demographic Characteristics of Participants

To avoid the influence of too many potentially confounding variables regarding language and ethnicity (as this is not the primary focus of the present study), the researcher has recruited only 'white' subjects for whom either English or Afrikaans are the primary and secondary languages. As all participants selected were 'white', the researcher assumed a similarity of background and culture, so the variables of race and culture were not investigated further.

7.3.3.1. Age

The ages of participants ranged between 18 years and 75 years. The mean age of the social phobic participants ($n = 17$) was 33 years ($SD = 12.24$), 41 years ($SD = 13.79$) for the panic disorder participants ($n = 17$), and 38 years ($SD = 13.62$) for the control group ($n = 17$). An ANOVA revealed no significant differences with regard to age between the three groups ($F = 1.57; p > .05$).

7.3.3.2. Gender

The panic disorder group consisted of 13 female and 4 males, and the social phobic group consisted of 6 females and 11 males. In the control group there were 8 females and 9 males. An ANOVA revealed a significantly uneven distribution of gender among the three groups ($F = 3.28; p < .05$).

7.3.3.3. Language

Of the panic disorder group 13 were predominantly English speaking and 4 Afrikaans. The social phobic group consisted of 11 English speaking participants, while the home language of 6 was Afrikaans. The Control group consisted of 11 English and 6 Afrikaans speaking participants. There was no significant difference between the groups in terms of language distribution ($F = .35; p > .05$).

7.3.3.4. Intellectual Functioning

Intellectual ability was assessed by the National Adult Reading Test (NART; Nelson, 1983; see Section 7.4.). There was no significant difference between the groups with regard to their level of intellectual functioning ($F = 1.98; p > .05$).

7.4. MEASUREMENTS

7.4.1. IMPLICIT ASSOCIATION TASK

In Chapter Five the nature and development of the Implicit Association Task (IAT) was described. In this section the adaption of the IAT will be discussed, that is, the development of the Physical Threat IAT (PIAT) and the Social Threat IAT (SIAT).

7.4.1.1. *The Computer Hardware and Software*

The procedure starts by running the IAT program on a computer monitor executed in IATWind (Yot-wind), which runs on a Windows 2000 (Microsoft) operating system. This program allows the IAT to be adapted for the measurement of a variety of implicit associations (see Chapter Five). All participants were tested with a Sony Vaio Laptop (PCG-FX770K) to which was added an external keyboard so that response keys resemble those of a regular desktop computer.

7.4.1.2. *Concepts and Categories*

The present research has replaced the initial IAT's (Greenwald et al., 1998) target concepts of 'flower' versus 'insect' with 'me' versus 'not-me', and the initial attribute dimensions of 'pleasant' versus 'unpleasant' with 'safety' versus 'threat' dimensions. This approach is in line with the study conducted by Egloff and Schmukle (2002) (see Section 5.5.) who used target concepts 'me' versus 'other' and attribute dimensions 'anxiety' versus 'calmness' in their IAT with students. Although similar to Egloff and Schmukle's category labels, the present research used stimulus words ('threat' versus 'safety') corresponding to the particular fears characteristic of panic disorder and social phobia (see Section 7.4.4.). To prevent insight and manipulation by the participants (and ensure indirect measurement) the current 'safety' and 'threat' categories were labelled as 'pleasant' and 'unpleasant'.

Both the PIAT and SIAT contain four constructs, which form four different categories (a set of target concepts and a set of attribute dimensions). In the PIAT the attribute dimensions are ‘physical threat’ (for which the category label is ‘unpleasant’) and ‘physical safety’ (for which the category label is ‘pleasant’), and the target concepts ‘me’ and ‘not-me’. Similarly, the attribute dimensions in the SIAT are ‘social threat’ (for which the category label is ‘unpleasant’) and ‘social safety’ (with the category label of ‘pleasant’), while the target concepts are ‘me’ and ‘not-me’. Despite the alteration of the category labels they still represent the constructs under investigation (namely ‘threat’ and ‘safety’) and will ensure that participants can easily identify individual items as belonging to one of the category labels (as stipulated by Nosek et al., 2003). Every ‘threat’ word is simultaneously chosen to represent something of an unpleasant nature (e.g., ‘embarrassed’ or ‘dizzy’ for a social phobic, a panicker, or a control participant), and ‘safety’-related words have been selected also to represent something pleasant (see Section 7.4.4. for stimulus word selection). The target concepts retain their construct names as category labels, namely ‘me’ and ‘not-me’.

7.4.1.3. Stimulus Words

A variety of concepts or stimulus words were pre-selected to represent the attribute dimensions that are particular to each task (see Section 7.4.4.). The attribute dimensions involve a list of 21 physical threat words (e.g. ‘choking’) and 21 physical safety words (e.g. ‘healthy’) for the PIAT, as well as a list of 21 social threat words (e.g. embarrassed) and 21 social safety words (e.g. confident; $n = 21$) for the SIAT. Social threat and safety words are presented in the SIAT, while panic related threat and safety words are used for the PIAT, and the threat and safety words appear on the computer screen in random order. In order to draw up the word cues, certain inclusion and exclusion criteria were established, to which the words in the different word lists had to adhere. The final word lists are presented in Table D1 and Table D2 in Appendix D.

A description of the inclusion and exclusion criteria follows.

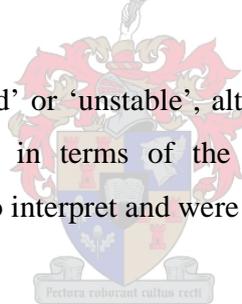
Threat-Related Words:

1. Should be distinguishable from words descriptive of general negative affect, for example, the words 'nervousness' or 'apprehension', which are more representative of a general anxiety trait.
2. Should be distinguished, as far as possible, from the concerns of panic disorder, namely physical threat (for the social phobic word list) and from the concerns of social phobia, namely social threat (for the panic disorder word list), so that each word list consists of domain specific words (i.e., related to the characteristic fears of the specific disorder). A physical threat word, such as 'choking', should for instance be distinguishable from the fear of (or concern related to) social threat (and of course, *visa versa* for a social threat word). The word 'stress', for example, would qualify as being relevant to the experiences of both an individual with panic disorder and social phobia and does therefore not qualify for selection.
3. Should be related to the fears, concerns or responses (i.e., subjectively experienced distress, or physiological or behavioural responses) of panic disorder (e.g. 'palpitations', 'suffocate') and social phobia (e.g. 'embarrassed').
4. In addition to the fact that the threat related words should be domain specific, they should also be self rather than other related. Most of the words selected (except 'suffocate', 'deadly') are able to complete phrases such as "I am...", "I feel...", "I have...", "I fear...". Although the word 'injury' for example, qualifies in terms of relatedness to physical threat, it does not qualify in terms of the requirement of self-relatedness. The respondent will probably not be injured (although he/she might fear being injured in the future) and might therefore be inclined to associate it more with others than self. On the other hand, the word 'illness' might qualify as being more related to the self than the other. Although not physically ill, the fear of having or contracting an illness might be so strong in the case of an individual with panic disorder that he/she will probably tend to associate the word more with self than others.

Safety Related Words:

1. The social safety words should be more related to social safety than physical safety, and the physical safety words should be more related to physical safety than to social safety, so that that nature of the association with the words differ between social phobic and panic disordered individuals. The words ‘safe’, ‘safety’, ‘relaxed’, and ‘fearless’, for example, is related to non-threat for both social phobic and panic disordered participants. These words are therefore not suitable for detecting differences in self-related associations in the two anxiety disorders. Similarly, the word ‘dangerous’ was omitted as a physical safety stimulus, for although it might be associated with a sense of physical safety (‘I live dangerously’), it can also be related to the concerns of people with panic disorder (“life is dangerous”).
2. It should be more associated with others than the self (e.g., ‘accepted’ for social phobia and ‘healthy’ for people with panic disorder).

Words such as ‘unbalanced’ or ‘unstable’, although suitable in terms of forming complimentary bipolar opposites in terms of the safety and threat contrast, being preceded by ‘un’, may be harder to interpret and were thus omitted.



7.4.1.4. Trials and Blocks

The stimulus words appear in the centre of the computer screen one at a time, in random order for a period of 150ms. Each stimulus word represents one of the four categories. One trial is one presentation of a word (e.g. presentation of the word ‘embarrassed’). Each task (i.e., PIAT or SIAT) consists of a series of classification trials grouped into blocks. A block is a certain amount of trials in which several stimulus words appear on the screen while the category decisions (e.g., the left response key represents ‘me’ as well as ‘social threat’ words, and the right key the concepts ‘not-me’ and ‘social safety’) remain the same. This means that throughout the block, the presentation of the category labels (whether it is the target concept, attribute dimension, or combination thereof) represented by a particular left or right response key, will remain constant for all the trials in the block. If the left key represents ‘me’ and ‘threat’ it will be so for all trials

in that block, while the right key will simultaneously and constantly represent ‘not-me’ and ‘safety’ for the trials during that same block. Table 1 provides a tabularised presentation of the format and order of blocks and corresponding category decisions as presented in the PIAT and SIAT, which is discussed in detail thereafter. For clarity, it should be noted that each task (i.e., the PIAT and SIAT) is split into two separate parts (e.g., PIAT1 and PIAT2, SIAT1 and SIAT2). The reason for this will be discussed at the end of this section.

Table 7.1

Schematic Presentation of the Blocks, Task Instructions and Number of Trials that are Used in the Current Adapted Version of the Implicit Association Task, with Examples of Correct Responses as Indicated by the Appearance of a Black Dot

Block	Task Description	Task Instruction	Sample Stimuli
IAT1 bl 1	Target-concept discr.	•me not-me•	•South Africa (me) Laos (not-me)•
IAT1 bl 2	Attribute discr.	•safety threat•	•respected (SP) blushing (SP)• •secure (PD) palpitations (PD)•
IAT1 bl 3	Initial Combined (Practice)	•me not-me• •safety threat•	•Elbers (me) Nguyen (not-me)• •healthy (PD) fatal (PD)• •admired (SP) criticised (SP)•

Block	Task Description	Task Instruction	Sample Stimuli
IAT1 bl 4	Initial Combined (Real trials)	•me not-me• •safety threat•	•Elbers (me) Nguyen (not-me)• •healthy (PD) fatal (PD)• •admired (SP) criticised (SP)•
IAT1 bl 5	Reversed Attribute Discr.	•threat safety•	•insecure (SP) competent (SP)• •nauseous (PD) safe (PD)•
IAT1 bl 6	Reversed Combined (Practice)	•me not-me• •threat safety•	•Cape Town (me) Tokyo (not-me)• •ridiculous (SP) confident (SP)• •choking (PD) sane (PD)•
IAT1 bl 7	Reversed Combined (Real)	•me not-me• •threat safety•	•Cape Town (me) Tokyo (not-me)• •ridiculous (SP) confident (SP)• •choking (PD) sane (PD)•

Block	Task Description	Task Instruction	Sample Stimuli
IAT2 bl 2	Attribute Discr.	•safety threat•	•respected (SP) blushing (SP)• •secure (PD) palpitations (PD)•
IAT2 bl 3	Combined Task (Practice)	•me not-me• •safety threat•	•Elbers (me) Nguyen (not-me)• •healthy (PD) fatal (PD)• •admired (SP) criticised (SP)•
IAT2 bl 4	Combined Task (Real)	•me not-me• •safety threat•	•Elbers (me) Nguyen (not-me)• •healthy (PD) fatal (PD)• •admired (SP) criticised (SP)•
IAT2 bl 5	Reversed Attribute Discr.	•threat safety•	•insecure (SP) competent (SP)• •nauseous (PD) safe (PD)•

Block	Task Description	Task Instruction	Sample Stimuli
IAT2 bl 6	Reversed Combined (Practice)	•me not-me• •threat safety•	•Cape Town (me) Tokyo (not-me)• •ridiculous (SP) confident (SP)• •choking (PD) sane (PD)•
IAT2 bl 7	Reversed Task (Real)	•me not-me• •threat safety•	•Cape Town (me) Tokyo (not-me)• •ridiculous (SP) confident (SP)• •choking (PD) sane (PD)•

Note. IAT represents both the PIAT and the SIAT; Discr. = discrimination; bl = block; Practice = practice block consisting of 10 trials; Real = real block consisting of 40 trials that are used for data collection; PD = panic disorder; a physical threat word belonging to the Physical Threat Association task (PIAT); SP = Social Phobia; a social threat word belonging to the Social Threat Association task (SIAT). This table represents the template for both the PIAT and the SIAT (which are individually labelled for instance as PIAT1 block3, SIAT2 block6 or PIAT1 block 5 or SIAT2 block 4). Panic related threat and non-threat words (examples of which are followed by a ‘PD’ in brackets) are omitted from the SIAT. Similarly, the social phobic stimuli (as followed by an ‘SP’ in brackets) will not be present in the PIAT. The content in the brackets announces the category label to which the word belongs. The black dot represents the correct response key click (i.e., left or right) for that particular stimuli presentation.

A trial in which one response key represents one category label (whether it is a target concept such as ‘me’, or an attribute dimension such as ‘safety’) while the other response key necessarily represents the opposite of the category pair (i.e. ‘not-me’ or ‘threat’) is known as a single category decision (see IAT1 blocks 1, 2, and 5 and IAT2 blocks 2 and 5, in Table 1). On the other hand, combined blocks (in which one particular response key represents two categories simultaneously) are essential for data collection

and the measurement of the IAT effect (see IAT1 and IAT2: blocks 3, 4, 6, and 7 in Table 1). A 'response category' refers to anyone of the two categories (i.e., 'me' and 'not-me', 'threat' and 'safety') that is represented as bipolar opposites. A specific key can represent two response categories simultaneously (i.e., 'me' + 'safety') while the other response key represents its bipolar opposite (e.g., 'not-me' + 'threat').

In both the PIAT and SIAT there are 13 different blocks. Of the 13 blocks, 8 blocks represent combined trials, while 5 blocks are single category decisions. Nine of the 13 blocks are 'practice' blocks consisting of 10 trials each. The remaining blocks are 'real' blocks (used for data capture), which consist of 40 trials each.

For clarity in explaining the results, each IAT (consisting of 13 blocks) has been divided into two separate but independent IATs. In other words the PIAT encompasses PIAT1 and PIAT2. Similarly, the SIAT encompasses SIAT1 and SIAT2. A duplicate IAT version was incorporated within each task (PIAT and SIAT) in order to ensure the availability of results even if a problem is to occur during assessment. If problems are encountered during the testing process in the first half of the IAT administration, results from the second half could still be used without having to forfeit valuable and hard-to-obtain participant data. A duplicate version also enables the assessment of reliability (in terms of the alternate form method). The incorporation of a duplicate IAT can to some extent solve the problems of a compromised validity (such as is to be expected when using the split-half method). However, the duplication, in terms of increasing the length of assessment, does not resolve issues regarding learning effects, nor the effects of concentration loss on response latencies due to an increased level of fatigue.

As PIAT2 and SIAT2 are duplications of the initial PIAT1 and SIAT1, and for purposes of clarity in dealing with the statistical analyses, the blocks are numbered in a similar manner (i.e., PIAT1 block3 is a duplication of PIAT2 block3, and SIAT1 block4 is a duplication of SIAT2 block4). Each IAT (namely the PIAT and SIAT) follows the same format. The only difference, as mentioned, is the substitution of attribute dimensions with domain specific stimuli (physical threat and safety words in the PIAT,

and social threat and safety words in the SIAT). The similar format for PIAT and SIAT is represented in terms of one template IAT (i.e., IAT1 representing PIAT1 and SIAT1, while IAT2 represents PIAT2 and SIAT2).

7.4.1.5. IAT Procedure

Before beginning the actual categorisation procedures within the PIAT or SIAT and apart from the pre-selected attribute stimuli ('threat' and 'safety' stimuli), the participant is first required to specify from a choice of words appearing on the computer screen a selection of words which are best related to the self (i.e., the 12 'me' words). These 'me' related items consist of twelve items such as home-town, first name, middle name, last name, home state, home country, and race or ethnicity, and more. Responses such as first or last name of the participant are allocated either by typing the answers into a dialogue box, or selecting from a list of alternatives, or by making a choice between two options. Thereafter, and in a similar manner, the participant is required to select a number of 12 'not-me' words. These words are to be neither particularly liked nor disliked but in a neutral way, are to be considered as 'not self-related'. The 'not-me' items are similar to the 'me' items, but require that the participant selects a 'not-me name, 'not-me' country, 'not-me' town, 'not-me' date (and so forth) from several presented lists. Participant's answers are recorded for further use. These initial two steps ensure that each participant is responsible for an idiosyncratic selection of 'me' as well as 'not-me' items, that once selected, will be used throughout the test. Once these steps are completed, the selected word lists will appear on the screen for the subject to read and correct if necessary (the participant is allowed to drop any items, which if in retrospect, are found to be inappropriate or incorrectly spelt), before attempting the remainder of the task (Greenwald et al., 2001).

In commencing the categorisation task, participants are required to assign randomly presented stimuli (representing the four categories) into appropriate super-ordinate categories by pressing one of two designated response keys (each key may represent a maximum of two categories, e.g. 'me' and 'social threat'). The 'A' key press is selected to represent the response categories appearing on the left side of the screen,

while the '5' key is selected to represent response categories appearing on the right hand side (see Table 2).

In the first step or block 1 (for both the PIAT and SIAT), the participant is introduced to the target concepts ('me' versus 'not-me'). On appearance of the stimuli (from the previously selected and recorded 'me' and 'not-me' stimuli), the participant is required to classify the words representing the self ('me') by pressing a left key press (i.e., 'A') and the words not representing the self ('not-me') with the right key press (i.e., '5'). From this step onward, each IAT is divided into two identical and independent parts (PIAT1, PIAT2, and SIAT1, SIAT2), which for the remainder of the explanation shall be discussed in terms of the IAT template in Table 2 (as both IAT versions follow the same format).

The second block (IAT1 block 2; 10 trials) introduces the participants to the attribute dimensions (the 'threat' versus 'safety' words, but to prevent insight into what is demanded, were called 'pleasant' and 'unpleasant'). Here it is required that the participant classifies the presented word into a 'pleasant' (with a press of the left response key) and 'unpleasant' category (with a press on the right response key). As discussed previously, these words represent social threat and safety words for the SIAT and physical threat and safety words for the PIAT.

The third block (IAT1 block 3) represents the first practice (10 trials) combined block in which the left key represents both the 'me' as well as 'safety' ('pleasant') categories, while the right key represents both the 'not-me' as well as the 'threat' ('unpleasant') categories.

The fourth block (IAT1 block 4) contains exactly the same combination of response categories. As a 'real' block it consists of 40 trials that are used for data collection.

The fifth block (IAT1 block 5) once again presents a practice block with a single category decision, containing the same response categories as in block two, but with a reversal of the position of the attribute dimensions. In other words, threat words ('unpleasant') are now designated a left response key, while safety ('pleasant') words are designated a right response key.

IAT1 block 6 is another combined practice block (10 trials). It resembles block 4, but this time with a reversal of the position of the attribute dimensions (in other words, the left response key represents the 'me' as well as the 'threat' ['unpleasant'] category, while the right key represents the 'not-me' and the 'safety' ['pleasant'] categories).

IAT1 block 7 has the same response categories as in block 6, is a 'real' block consisting of 40 trials.

The second half (IAT2) of the task resembles the first half of the task (i.e., IAT1) in every way with the exception of block 1, which is excluded from the second half as it was considered an unnecessary duplication. So, the second block (IAT2 block2) is the same as IAT1 block 2 in every way, representing the onset of a similar sequence for the remainder of the task as followed in IAT1 block 2 through to IAT1 block 7. For instance, IAT2 block3 is also a 10-trial single category decision in which 'pleasant' (safety) words are assigned to the left response key, while 'unpleasant' (threat) words are assigned to the right.

It must be noted, that in line with Egloff and Schmukle's (2002) study, the researcher did not counterbalance the order of blocks 3 and 4 ('me' + 'safety'/'pleasant') with blocks 6 and 7 ('me' + 'threat'/'unpleasant'). Based on Egloff and Schmukle's reasoning, it was decided that the fixed presentation order facilitates optimal between-participant comparisons and thus generates an ordering according to the relative size of the IAT effect. As all participants are forced to respond to the same task, the measurement of individual differences is maximised (Egloff & Schmukle, 2002). It is assumed that these advantages outweigh the disadvantages of a fixed presentation order

(such as the effects of learning and larger IAT effects when positive or ‘compatible’ combinations precede negative or ‘incompatible’ combinations) order as noted in previous IAT research by, for example, Greenwald and Nosek (2001). On the other hand, the design of the present IAT version did control for presentation effects by counterbalancing the order in which the PIAT and SIAT were presented. So, half of the participants in each group first completed the PIAT, while the other half first completed the SIAT.

7.4.1.6. Calculations of IAT effects

The dependent variable of the IAT, namely the IAT effect, can basically be summed as block #7 – block #4 (see Chapter Five and Table 1). In this way, each participant will on each IAT (i.e., the PIAT and SIAT) produce two independent IAT effects, namely a PIAT1 and PIAT2 effect, as well as an SIAT1 and an SIAT2 effect. By calculating the mean between the two IAT effects per task, a final PIAT effect as well as SIAT effect was established. As mentioned in Chapter Five, an algorithm was developed by Greenwald et al. (1998) (and later improved by Greenwald et al., 2003) so as to improve accuracy in calculating the IAT effect. The use of the algorithm will be referred to in section 7.7.

7.4.1.7. Participant Responses on the PIAT and SIAT

As the IAT is based on a time-reaction paradigm, the speed and accuracy with which the individual responds is crucial. Reaction times (or response latencies) are measured in milliseconds, from the time the word first appears on the screen until the correct response has been made. Participants are alerted to any incorrect responses by the appearance of a red ‘X’ and must correct their response in order to continue. Any errors are responsible for time lags and result in an increased latency of response. Error and response latencies are automatically recorded for analysis, and an individual summary feedback is provided at the conclusion of each block.

As mentioned in Chapters Four and Five, the IAT is based on the assumption that participants will typically respond faster (a facilitation of response) when the two categories sharing the same response key are strongly associated (congruent trials). If the

categories are incongruent or weakly associated, interference in response (a delayed response as reflected by longer response latencies) is expected to occur (Greenwald, et al., 2001). Past research has constantly ascertained that people with anxiety disorders have a biased attention toward threat-related information, in the sense that they more readily attend to, process, and retrieve threat-related information (Beck et al., 1985). As such people constantly perceive the world in a threat-related light, they are also more likely to associate threatening information with the self (or 'me') while more readily associating safety cues with other people ('not-me') (Teachman & Woody, 2004). For this reason anxiety disorder participants are expected to respond faster to inquiries in which there is a congruency between the constructs of self and threat (e.g. 'physical/social threat' + 'me'). The association in memory between the two constructs is inferred to be stronger the faster participants respond to the categorisation task (Greenwald et al., 1998). Due to variations in facilitation and interference, the speed of response is used as an indication of the strength of the evaluative association (Greenwald et al., 1998). In this way the current research hoped to measure the association between an individual's self-presentation and social or physical threat, in other words, the extent to which a specific fear (i.e. threat), forms part of the self-concept of the individual suffering from social phobia or panic disorder.



7.4.2. The Panic Disorder Severity Scale (PDSS; Shear et al., 1997)

The Panic Disorder Severity Scale is a seven-item, clinician-rated interview scale, which uses the past month as a time reference period during which panic disorder symptoms are experienced. It was developed for the assessment of overall panic disorder severity (Shear et al., 1997) and is modelled after the well-used and researched Yale-Brown Obsessive Compulsive Scale (Goodman et al., 1989a; 1989b). The PDSS assesses the severity of panic disorder according to seven panic-related dimensions (Shear et al., 1997). These include frequency of panic attacks, subjective distress experienced during panic attacks, amount of anticipatory anxiety, level of agoraphobic fear and avoidance, level of fear for and avoidance of activities that bring about similar interoceptive symptoms as those experienced during a panic attack (such as arguing, exercise, sexual

activities etc.), amount of interference or impairment in work-related functions, and the amount of interference or impairment in social-related functioning.

The PDSS takes a few minutes to complete. A clinician rates responses to each of the seven dimensions on a 0-4 point scale ('0' indicates an absence of/ no panic-related symptoms while 4 indicates the greatest severity of panic-related symptoms). A composite score is calculated from the average of all the scores (Shear et al., 1997). A cut-off score of 8 identifies participants with current panic disorder related symptoms, with increasing numbers relating to greater symptom severity. Panic disorder participants recruited for the current study were required to score a minimum of 8 on this measure.

Excellent interrater reliability coefficients, ranging between .74 and .92 ($p < .001$), were reported, with an intraclass correlation coefficient of .88 ($p < .001$). Internal reliability scores as computed with Cronbach's alpha, ranged between .65 and .88 (Shear et al., 1997). In terms of validity, strong correlations were found (Shear et al., 1997) between individual PDSS items and items of the Anxiety Disorders Interview Schedule (ADIS-R; DiNardo, Brown, & Barlow, 1994) that assessed a similar domain. Furthermore, the PDSS has been found to be sensitive to change. A cautionary note is issued on the use of the Panic Disorder Severity scale, as a sole diagnostic instrument (Shear et al., 1997).

7.4.3 Beck Depression Inventory-Second Edition (BDI-II;Beck et al., 1996)

The BDI-II is a 21-item self-report instrument, which measures the severity of depression in adults and adolescents of 13 years or older, with a time-reference of 'the past two weeks including today' (Beck et al., 1996). It is one of the most widely used and accepted instruments for measuring the severity of depression (Beck et al., 1996). The BDI-II (Beck et al., 1996) is a revised version, which was updated to correspond better to the diagnostic criteria for depression as specified by the DSM-IV (APA, 1994).

This self-administered task takes about 10 to 15 minutes to complete. Each of the 21 items, are organised on a 4-point scale (0-3) reflecting increasing depression-related

severity, with 0 indicating no symptom experience and 3 expressing the greatest amount of symptom severity, with the exception of items 16 and 18 in which there are seven response options. Total scores (with a maximum of 63) are calculated by summing the ratings given to each of the items. Optimal cut-off scores were constructed so that four groups of varying depression-related severity levels were identified. A total score between 0 – 13 on the BDI-II accounts for minimal depression, a score of 14 – 19 accounts for mild depression, a score between 20 and 28 accounts for moderate depression, while severe depression is indicated by scores exceeding 29 (Beck et al., 1996).

With over 35 years of use, the BDI boasts high reliabilities and sound psychometric properties concerning the applications across a broad spectrum of clinical as well as non-clinical samples (Beck, Steer, & Garbin, 1988; Beck, Steer, Kovacs, & Garrison, 1985). Internal coefficient alphas ranging between .80 and .93 ($p < .001$) demonstrated high test-retest reliability. It has been found effective in its ability to differentiate depressed from non-depressed patients (Beck et al., 1996; Beck et al., 1988). To bolster support for the content validity, the BDI-II items were revised and reworded to be a better fit for the criteria as specified by the DSM-IV. Concurrent and construct validity were established as based on studies using a wide variety of psychological measures (Beck & Steer, 1987). It is not suggested to be used as a diagnostic instrument, but rather to identify the presence and severity of symptoms consistent with the criteria of the DSM-IV.

7.4.4. The Social Phobia Inventory (Conner et al., 2000)

The Social Phobia Inventory (SPIN; Conner et al., 2000) is a self-administered rating scale, modelled after the Brief Social Phobia Scale (Davidson et al., 1997). It distinguishes between people with and without social phobia, to provide a valid measure of the severity of social phobia, and to be sensitive to any changes such as the reduction in severity over time, or as a result of any treatment procedures (Conner et al., 2000). It covers three clinically important symptom domains characteristic of social phobia namely

fear, avoidance behaviours, and associated physiological discomfort (Conner et al., 2000):

All 17 items are rated on a scale ranging between 0-4 (0 = not at all, 1 = a little bit, 2 = somewhat, 3 = very much, and 4 = extremely). Cumulative total scores may range from 0 to 68, with increasing numbers indicating greater symptom severity.

The SPIN demonstrates sound psychometric properties in the form of test-retest reliability (Conner et al., 2000), internal consistency and internal cohesion (Conner et al., 2000), convergent and divergent validity (Conner et al., 2000; Guy, 1976), as well as construct validity (Conner et al., 2000). A cut-off value of 19 proved to be an adequate point of distinction between subjects with and without social phobia, with a diagnostic accuracy of 79% (Conner et al., 2000). In support of its discriminative power, the SPIN demonstrated sensitivity to change (Conner et al., 2000).

7.4.5. State-Trait Anxiety Inventory (STAI, Spielberger et al., 1983).

The STAI is an extensively well-used measure, which has been adapted for use in over 30 languages (Spielberger et al., 1983). It is a self-administered task, comprising a measure of state (S-Anxiety), and trait anxiety (T-Anxiety), which are found on opposite sides of a single-page test-form. The S-Anxiety scale (STAI-S; Form Y-1) consists of 20 items, which assesses how the subject feels 'at this moment', or alternatively about a past event or even a future hypothetical situation (covering the essential qualities of apprehension, nervousness, tension and worry) (Spielberger et al., 1983). It is expected that the scores of the S-Anxiety scale will increase in response to physical danger and psychological distress (Spielberger et al., 1983). The T-Anxiety scale (STAI-T; Form Y-2) consists of 20 items, which assesses how the subject 'generally feels', which is indicative of his or her level of trait anxiety or anxiety proneness, which is expected to remain constant regardless of the current experience of stress (Spielberger et al., 1983). The Y-Form STAI has been revised in order to establish a purer measure of anxiety with

the resulting Form-Y demonstrating improved psychometric properties (construct validity) for both the S-Anxiety and T-Anxiety scales (Spielberger et al., 1983).

The range of responses of the S-Anxiety scale varies from 1 (not at all) to 4 (very much so) indicating intensity of anxiety-based feeling. Responses to the T-Anxiety scale are indicative of the frequency of anxiety-based feelings and vary from 1 (almost never) to 4 (almost always). The total score can range between 20 and 80. The Manual for the State-Trait Anxiety Inventory contains all the percentile ranks for samples of working adults, college students, high school students, and military recruits (Spielberger et al., 1983).

The construction, standardisation and validation of the STAI have been done by testing more than 5000 people (Spielberger et al., 1983). Test-retest correlations for the T-Anxiety scale ranged from a 0.65 to a relatively high 0.86 (Spielberger et al., 1983). Lower stability coefficients were found which are to be expected for valid State Anxiety measures, reflecting the influence of the varying testing situations at the time of testing (Spielberger et al., 1983). The STAI has demonstrated accuracy in its ability to discriminate between groups of varying levels of anxiety and is sensitive to the effects of stress-related testing conditions as reflected by decreased mean S-Anxiety scores under relaxed testing conditions, with an observed elevation of scores as the stress level increased, while Trait Anxiety scores remained constant (Spielberger et al., 1983). The STAI has been found to have high convergent and divergent validity as compared with the subscales of various other measures, which are described and tabularised in the manual (Spielberger et al., 1983). All in all, the scale has sound psychometric properties that have been well researched, documented and improved upon in a revised version. It can be seen as a relatively accurate measure for the evaluation of state and trait anxiety.

7.4.6. National Adult Reading Test (NART; Nelson, 1982)

The National Adult Reading Test (NART; Nelson, 1982) was constructed as a means of estimating pre-morbid intelligence levels of adult patients suspected to be suffering from intellectual deterioration (Nelson, 1983). The test consists of 50 short and

unusual words printed in order of increasing difficulty that must be read aloud by the participant. As the pronunciation of several words do not follow the general rules, accurate pronunciation depends on prior knowledge of such words (Crawford, Deary, Starr, & Whalley, in Nelson, 1982). Research has determined that only in the severest cases of dementia does one's ability to read break down. It has been speculated that there should be no significant deterioration as a result of an emotional disorder (Nelson, 1982).

The NART error score is the total number of errors made by the participant on a completed NART administration (calculated as 50 – the total number of correct pronunciations). If this error score is inserted into a prescribed equation a Weschler Adult Intelligent Scale (WAIS) Total IQ, as well as Verbal and Performance IQ can be predicted (Nelson, 1982). IQ predictions for each of the NART error scores are supplied in the appendix of the manual (Nelson, 1982). It is suggested that these IQ's closely resemble the participant's pre-morbid IQ's.

The NART was standardised on a sample of 120 inpatients with extra-cerebral or spinal disorders of various age groups. Research concluded that neither age nor social class has any significant influence on reading ability of people unless severely impaired by dementia (Nelson, 1982). NART-related studies have demonstrated high reliability in terms of internal consistency ($r = .90$) (Crawford, Stewart, Garthwaite, Parker, & Besson, 1988), test-retest reliability ($r = .98, p = .01$) (Crawford, Parker, Stewart, Besson, & De Lacey, 1989), and inter-rater reliability in the form of Pearsons Product moment coefficients (ranging between .96 and .98) (Crawford et al., 1989). To bolster validity, the final words list had sufficient power to discriminate between different reading abilities appropriate to the overall level of difficulty (Nelson, 1982). The NART further demonstrates high retrospective validity in its ability to account for variance in IQ as measured by the short-form WAIS and full length WAIS respectively (Crawford et al., 1989; Nelson, 1982). Evidence for the convergent and divergent validity of the NART has been demonstrated (Nelson & O'Connel, in Nelson, 1982). The demonstrated independence of the NART to current mental disorder status, reflected by absence of significant differences between clinical and control groups, contributes positively to the

support for the use of the NART with psychiatric populations (Crawford, Deary, Starr, & Whalley, in Nelson, 1982).

7.4.7. Structured Clinical Interview (for DSM-IV) (SCID-I; First et al., 1996)

The SCID-1 (for research) is a semi-structured diagnostic instrument designed to assist clinicians, researchers, and trainees in making reliable DSM-IV (1994) psychiatric diagnoses (past and present) for disorders following DSM-IV nosology (First, Gibbon, Spitzer, & Williams, 2004) An Axis-1 SCID interview with a psychiatric patient takes between 1 to 2 hours to complete. The SCID provides specific questions that correspond to the symptoms of DSM-IV criteria.

Reliability coefficients with the SCID as used in panic disorder have ranged from as low as .58 (Williams et al., 1992) and .65 (Zanarini & Frankenburg, 2001) to as high as .88 (Skyre, Onstad, Torgersen, & Kringlen, 1991). SCID reliability coefficients in studies involving social phobia have ranged from .47 (Williams et al., 1992) to as high as .86 (Zanarini & Frankenburg, 2001). Several studies have used the SCID as a standard for determining the accuracy of diagnoses (e.g., Shear, Greenko, & Kang, 2000; Steiner, Tebes, & Sledge, 1995). Furthermore, other SCID related studies have been demonstrated to prove superior validity over standard clinical interviews at intake (First et al., 2004).

The SCID is one of the most frequently used diagnostic instruments. Interviewers are required to be trained for efficiency in administering it.

7.4.8. Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1997)

The MINI is a short structured diagnostic interview for DSM-IV (1994) disorders. The interview takes about 15-20 minutes to administer and as such is an often preferred short but comprehensive structured psychiatric interview. It covers all patient symptoms (lifetime and current) including 17 Axis I categories, and is used for the purposes of clinical trials, research, screening and continual evaluation (Pinninti, Madison, Musser, & Rissmiller, 2003). For each disorder one or two screening questions rule out the diagnosis when answered negatively (Lecrubier et al., 1997). The MINI is used by mental health professionals and in research all around the world, in over 40 different languages. It is used as a diagnostic instrument for a range of different purposes, including health

screening in the military, and the determination of psychiatric disorder comorbidity in HIV patients (e.g., post-traumatic stress-disorder).

The MINI has been validated against two of the most popular structured interviews, namely the SCID-I (Amorim, Lecrubier, Weiller, Hergueta, & Sheehan, 1998) and the Composite International diagnostic Interview (CIDI; Wittchen H-U, et al., 1990). In a multicenter trial over four countries, the MINI was administered by local GPs and a trained interviewer on the MINI. Concordance scores ranged from .54 (Lecrubier et al., 1997) to .66 for social phobia (Amorim et al., 1998), and .68 for panic disorder (Lecrubier et al., 1997). The reliability coefficients (range: .72 to .97) (Lecrubier et al., 1997) for clinical patients on the MINI, did not significantly differ from full-length interviews (Sheehan et al., 1997; Lecrubier et al., 1997). In a reliability study based on 296 patients and 50 normal controls (Lecrubier et al., 1997), interrater reliability was found to be high (kappa range: .88 – 1.0), with acceptable test-retest reliabilities (kappa range: .76 - .93). In another study kappa ranges were between .50 and .60 for social phobia and between .60 and .70 for panic disorder (Pinninti et al., 2003). The MINI yields reliable DSM-IV diagnoses within a short time span.

7.5. ASPECTS OF TEST CONSTRUCTION THEORY

In order to evaluate the psychometric properties of an evaluation tool, one has to consider the classical test theory proponents of objectivity, reliability and validity (Gregory, 1996). The quest for objectivity entails following standard procedures in terms of the selection of participants, test administration and scoring. To ensure reliability the present researcher controlled for the influence of certain variables in the development of the newly adapted IAT tasks, such as order of presentation, intellectual functioning, age, gender and language. A correlational study was conducted on the two parallel forms, namely the PIAT1 and PIAT2 (which are two independent measures of the same PIAT) and the SIAT1 and SIAT2. There are obvious advantages in a parallel forms method above a split-half method. However, due to the additional length the parallel-forms method does not overcome potential problems related to fatigue or learning effects. Finally, validity was established by looking for differences between the groups and

correlations with theoretically related variables. The results of these investigations will be reported in the next chapter.

7.6. PROCEDURES

With the exception of the SCID-I interview and MINI assessment (both of which were administered by an external examiner on a prior occasion) the assessment of all the participants took place in a quiet and comfortable room. Participants were evaluated in one of several venues:

- the offices of the Stress and Anxiety Disorders Unit in Tygerberg, Cape Town, the offices of the Stress and Anxiety Disorders clinic in Johannesburg,
- a hotel room of a Holiday Inn in Pretoria,
- the researchers personal home,
- the home of the participant when necessary (due to extreme symptom severity, a shortage of transport facilities or the absence of another venue).

All evaluations were conducted in the same manner, with an unchanging sequence of events, in order to minimize error effects. A single researcher, to limit confounding experimenter effects, conducted all assessments. After establishing rapport, participants were requested to read and sign informed consent and ethical considerations were discussed (in the case that they were not properly read) such as the participants right to confidentiality and their right to stop the testing session at any time they desired. They were also warned that some of the inquiries might result in an increase in anxiety. Participants were then provided brief explanations regarding the testing sequence and reasons for the assessments. With regard to the IAT, participants were told that reaction times were being assessed. In this way the participants' attention was drawn away from any attempts to curb implicit associations related to the nature of their specific disorders, without having to divulge any incorrect information. More comprehensive explanations were offered after the task and series of tests had been conducted, with an opportunity to discuss, at length, any aspects regarding the assessment or their disorder.

After completing informed consent forms, participants were asked several demographic questions. After these inquiries, control variables were operationalised by

means of administering the following instruments to all participants, in the order presented:

- NART
- BDI-II
- STAI
- SPIN
- PDSS

These tests took approximately 15-30 minutes to complete. Participants were then asked to sit comfortably in front of the laptop computer for the commencement of the PIAT and SIAT. All participants were administered both subtasks of the IAT (namely the PIAT and the SIAT) in counterbalanced order². Participants were instructed that pressing the 'A' key would be indicative of a left response, while the '5' key press was indicative of the right hand response. Further instructions were given by means of computer administered requests as well as by the researcher. 'Practice' trials were used as opportunities for explanation, while in 'real' trials the participants were not to be interfered with. Participants were given a 5 minute resting period after completing the paper-and-pencil measures as well as between the administration of the two IAT versions so as to minimise the disruptive effects of fatigue or lack of concentration. The PIAT and SIAT took approximately 30 minutes (i.e., 15 minutes each) to complete.

Nearly all participants completed their testing session. One participant's data was excluded from use as the severity of her illness caused tremendous difficulty in concentration and resulted in a testing session that lasted approximately 4 hours. Another woman's data was also excluded as her level of anxiety created the onset of several panic-related symptoms which debilitated her test performance. Three patient's data was

² Although a certain amount of controversy does exist regarding the possibility of carry-over effects in completing explicit measures prior to an implicit measure, an empirical study by Egloff and Schmukle (2002) found these effects to be insignificant. Nevertheless, consideration should be given to the fact that the prior presentation of lengthy explicit measures may activate certain explicit preferences which may influence responses on subsequently presented implicit measures (Nosek, Greewald, & Banaji, 2003).

excluded because of their poor mastery of the English language. And the data of another 3 patients had to be excluded as technical problems resulted in incoherent results.

7.7. STATISTICAL PROCEDURES

Instead of calculating the IAT effects with a simple subtraction (i.e., block 7 – block 4), a formula for a recently developed algorithm, proposed by Greenwald et al. (2003) (discussed in Chapter Five), was used to further improve accuracy in attaining the IAT effect. The formula for the new algorithm provides guidelines in dealing with extreme variables, error latencies and other considerations in computing the final IAT effect. However, as the data for the present research had been collected prior to the publication of the new algorithm, the present researcher used the practice trials in data collection procedures as grounds for training or explanations when required. The inclusion of practice trials as specified by the new algorithm would possibly have resulted in distorted IAT effects. For this reason, the current study follows the new algorithm procedures, bar the inclusion of practice trials. A comparison between the old and new algorithm and the one adapted for use in the current research is set out in Appendix B.

The results of all measures were computed as final scores onto 'excel' spreadsheets in Word for Windows (Microsoft). IAT effects and error latencies that were automatically recorded into output files were also imported into 'excel' format, manipulated according to the new algorithm, and merged with the rest of the results. The transformation of all data into appropriate files was supervised by an external assistant. The final results were imported into the Social Science Statistical Package (SPSS 11.0) through which all subsequent analyses was run.

In determining validity of the research, 20 significance tests were conducted. In all 20 tests a confidence interval of 95% was used. Due to the large number of statistical tests, Bonferonni corrections were applied. This resulted in a corrected alpha-level of 0.25%. SPSS conducts only two-tailed investigations. In order to test one-tailed hypotheses the researcher doubled the alpha level for the SPSS analysis to maintain the

desired one-tailed alpha level ($\alpha = .005$). P-values below .005 were interpreted as significant. The direction of the differences is indicated with a positive or negative value.

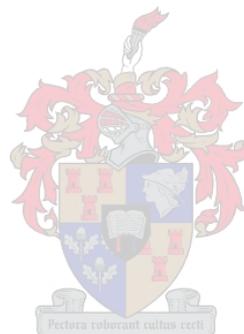
The frequency distribution of the SIAT and PIAT effects for the social phobia group, panic disorder group, and control group can be seen in Figure E1 and Figure E2 in Appendix E. To determine whether the effects were distributed normally the researcher conducted a Kolmogorov-Smirnov test (the results of which can be found in Appendix F). The Kolmogorov-Smirnov test compares an observed cumulative distribution function to a theoretical cumulative distribution. Large significance values ($p > .05$) in the asymptotic test indicate that the observed distribution corresponds to the theoretical distribution. The results of the Kolmogorov-Smirnov demonstrated a normal distribution and for this reason parametric tests were used to test the present hypotheses.

T-tests ($\alpha = .005$; two-tailed as conducted with SPSS) were used to investigate whether the means differed significantly from zero (Hypotheses 1, 2, 3, 5, and 7) and whether the means of two dependent variables (i.e., PIAT and SIAT averages) differed significantly from one another (Hypotheses 4, 6, and 8). Pearson's Product Moment correlations were conducted to investigate relationships between variables (Hypotheses 9 and 10).

7.8. CONCLUSION

The current study involved adapting the IAT to match the fears and concerns characteristic of panic disorder and social phobia. In accordance with Egloff and Schmukle (2002), both adapted versions used constructs of 'me' and 'not-me' combined with physical (for the PIAT) and social (for the SIAT) 'threat' versus physical and social (for the PIAT and SIAT respectively) 'safety' constructs. The PIAT and SIAT were administered in counterbalanced order to a group of 17 participants diagnosed with social phobia, 17 participants diagnosed with panic disorder, and 17 selected 'normal control' volunteers with an absence of any emotional disorder. The dependent variables comprised an implicit index of social phobia (the SIAT effect) and panic disorder (PIAT effect), as well as an explicit measurement of the level of social phobia severity, an

explicit measurement of the level of panic disorder severity, level of state and trait anxiety, and a depression index measured with self-report questionnaires (prior to the administration of the PIAT and the SIAT). Variables concerning order of test administration, age, gender, language and intellectual ability were controlled for. Statistical procedures followed sound guidelines as specified by a prescribed algorithm (Greenwald et al., 2003) and validity studies were based on a confidence interval of 95% with a corrected alpha level of 0.25% that was doubled ($\alpha = .005$) to maintain the desired one-tailed alpha level when analyses were conducted with SPSS.



CHAPTER EIGHT

RESULTS

8.1. INTRODUCTION

Results of the present study will be reported in this chapter. For purposes of clarity the chapter will be divided into a section for reporting descriptive statistics, a section for reliability studies, and finally, a section for the validity studies or inferential statistics.

8.2. DESCRIPTIVE STATISTICS

8.2.1. PIAT

The PIAT effects were based on subtracting the mean latencies for critical blocks in which ‘me’ shares the same response key as ‘physical safety’, from the critical clocks in which ‘me’ shares the same response key as ‘physical threat’ (according to the specifications as set out by the new algorithm (see Chapter Seven). The descriptive statistics are tabulated in Table 8.1.

Table 8.1

Descriptive Statistics for the PIAT Effects

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	0.16	0.85	0.45	0.21
Panic Disorder	17	0.01	1.27	0.67	0.37
Control	17	-0.27	1.12	0.57	0.4

8.2.2. SIAT

As with the PIAT effects, the SIAT effects were based on the comparison of the means of the two combined ‘real’ or critical blocks of the SIAT. The descriptive statistics are presented in Table 8.2.

Table 8.2

Descriptive Statistics for the SIAT Effects

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	.00	1.14	.58	.33
Panic Disorder	17	.02	1.13	.52	.37
Control	17	.03	1.22	.58	.30

8.2.3. Trait Anxiety

The descriptive statistics for trait anxiety scores of the three groups measured by the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983) is tabularised in Table 8.3.



Table 8.3

Descriptive Statistics for the Trait-Anxiety Inventory Scores

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	37	83	57.29	13.15
Panic Disorder	17	27	71	50.88	12.13
Control	17	20	41	29.47	6.25

8.2.4. State Anxiety

Descriptive statistics for state anxiety as measured by the State-scale of the STAI, for the three groups appear in Table 8.4.

Table 8.4

Descriptive Statistics for the State-Anxiety Inventory Scores

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	33	76	50.76	13.18
Panic Disorder	17	21	73	44.59	17.24
Control	17	20	44	28.71	7.02

8.2.5. Social Phobia

Descriptive statistics for social phobia severity, as measured by the Social Phobia Inventory (SPIN; Conner et al., 2000) for the three groups are presented in Table 8.5.

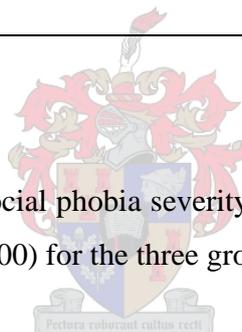


Table 8.5

Descriptive Statistics for the Social Phobia Inventory Scores

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	25	65	41.59	10.94
Panic Disorder	17	6	61	24.76	17.71
Control	17	0	21	7.24	5.32

8.2.6. Panic Disorder

Descriptive statistics for panic disorder severity as measured by the Panic Disorder Severity Scale (PDSS; Shear et al., 1997) for each of the three groups are presented in Table 8.6.

Table 8.6

Descriptive Statistics for the Panic Disorder Severity Scale Scores

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	4	17	7.71	2.85
Panic Disorder	17	7	26	14.65	6.02
Control	17	.00	.00	.00	.00

8.2.7. Depression

The level of depression for the three groups was measured by the Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The descriptive statistics are represented in the Table 8.7.

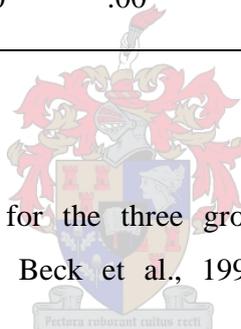


Table 2.7

Descriptive Statistics for the Beck Depression Inventory-II Scores

Group	n	Min	Max	<i>M</i>	<i>SD</i>
Social Phobia	17	2	54	21.88	16.23
Panic Disorder	17	5	45	22.00	12.62
Control	17	0	14	4.94	3.73

8.3. RELIABILITY

Pearson's Product Moment correlations were conducted to assess the reliability (Equal Forms) of the two replicate versions of the IAT (i.e., the PIAT1 with PIAT2, SIAT1 with SIAT2) for all three groups together ($N = 51$). The reliability coefficient for the PIAT was .66 ($p < .01$) and for the SIAT was .39 ($p < .01$). To investigate the effect of order of the two IAT's ($N = 51$), Pearson's Product Moment correlations were calculated on the equal forms for half the participants that completed the PIAT or SIAT first ($n = 24$) and half the participants that completed the PIAT or SIAT second ($n = 27$). There appeared to be a slight trend (however not significant) for a higher reliability coefficient when the PIAT ($r = .65$) was completed before the SIAT ($r = .49$). The Pearson's Product Moment correlation coefficient for the SIAT was significantly higher when the SIAT was administered first ($r = .64$) as opposed to second ($r = .26$; $p = .01$). On collapsing the two versions of the IAT (i.e., PIAT1 with PIAT2, and SIAT1 with SIAT2), a Cronbach's Alpha was conducted to determine the interitem consistency. This resulted in somewhat higher reliability coefficients for the PIAT ($r = .78$) and the SIAT ($r = .55$). On removing two outliers on the SIAT task, the reliability coefficient improved from $r = .39$ to $r = .66$ for the SIAT (cases 10 and 12).

8.4. VALIDITY AND HYPOTHESIS TESTING

8.4.1. Results of the T-tests to investigate Hypotheses 1, 2, 3, 5, and 7

In order to test Hypotheses 1, 2, 3, 5, and 7, a series of t-tests ($\alpha = .005$; two-tailed as conducted with SPSS) were performed between SIAT and PIAT effects and zero. A summary of the effects of these tests are presented in Table 8.8.

Table 8.8

Comparison of the IAT Effects and Zero for the Three Participant Groups With a T-Test

Groups	<i>M</i>	<i>df</i>	<i>t</i>	<i>p</i>
PIAT Effects				
Social Phobia	.45	16	8.764	< .001*
Panic Disorder	.67	16	7.506	< .001*
Control	.57	16	5.789	< .001*
SIAT Effects				
Social Phobia	.58	16	7.114	< .001*
Panic Disorder	.52	16	5.722	< .001*
Control	.58	16	7.925	< .001*

Note. For each group, $n = 17$.

* $p < .005$.

Hypothesis 1: The SIAT effect for the social phobia group was expected to be significantly below zero.

As can be seen in Table 8.2 and Table 8.8, SIAT effects for the social phobic group yielded a mean above zero, whereby Hypothesis 1 should be rejected. It is noteworthy that the effects were significantly above zero.

Hypothesis 2: The PIAT effect for the panic group was expected to be significantly below zero.

As can be seen in Table 8.1 and Table 8.8, PIAT effects for the panic disorder group were positive (above zero). Hypothesis 2 was thus rejected. It is noteworthy that the effects were significantly above zero.

Hypothesis 3: The PIAT effect for the social phobia group was expected to be significantly less than zero.

It is clear from Table 8.1 and Table 8.8, that the PIAT effects for the social phobics were positive (above zero). For this reason, Hypothesis 3 was rejected. It is noteworthy that the effects were significantly above zero.

Hypothesis 5: The SIAT effect for the panic disorder group was expected to be significantly below zero.

The SIAT effects for the panickers were above zero. So, Hypothesis 5 was rejected. It is noteworthy that the effects were significantly above zero.

Hypothesis 7:

a) The PIAT effect for the control group was expected to be insignificant.

As can be seen form Table 8.8, the PIAT effect for the control group was larger than zero. Hypothesis 7a was rejected. It is noteworthy that the effects were significantly above zero.

b) The SIAT effect for the control group was expected to be insignificant.

The SIAT effect for the control group was larger than zero. Hypothesis 7 was also rejected. It is noteworthy that the effects were significantly above zero.

8.4.2. Results of Paired Sample T-tests to Investigate Hypotheses 4 and 6.

In order to test Hypotheses 4 and 6, a Paired Sample T-test was performed ($\alpha = .005$; two-tailed as conducted with SPSS). This parametric test was used to investigate

significance of the difference between SIAT and PIAT effects for each clinical group. The results appear in Table 8.9.

Table 8.9

Comparison of SIAT and PIAT Effects for Two Clinical Groups With A Paired Sample T-Test

Groups	t	p
Social Phobia	-1.669	.115
Panic Disorder	1.836	.085

Note. For each group, $n = 17$.

Hypothesis 4: The SIAT effects for participants with social phobia were expected to be significantly less than their PIAT effects.

The SIAT effects for social phobics were higher than their mean PIAT scores. Hypothesis 4 was thus rejected. The difference was not significant.

Hypothesis 6: The PIAT effects for participants with panic disorder were expected to be significantly less than their SIAT effects.

The PIAT effect for panickers was higher than their means for the SIAT. For this reason, Hypothesis 6 was rejected. The difference was, however, not significant.

8.4.3. Results of Independent Samples T-tests to investigate Hypotheses 8a and 8b

The independent samples t-test is a parametric test which was used to investigate the difference between two groups with regard to a single dependent variable. As such it was used to test Hypotheses 8a and 8b ($\alpha = .005$; two-tailed as conducted with SPSS). The results are presented in Table 8.10.

Table 8.10

Comparison of Control Group and the Two Clinical groups on IAT Effects with the Independent Sample T-Test

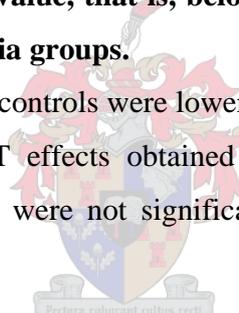
IAT	Groups Compared	<i>t</i>	<i>df</i>	<i>p</i>
PIAT	Control and Panic disorder	-.759	32	.453
	Control and Social Phobia	1.096	32	.281
SIAT	Control and Panic disorder	.531	32	.599
	Control and Social Phobia	.054	32	.957

Note. For each group, $n = 17$.

Hypothesis 8:

- a) **The PIAT effects for the control group were expected to be significantly higher (but still a minus value, that is, below zero) than the PIAT effects for the panic and social phobia groups.**

Mean PIAT effects for the controls were lower than the PIAT effects for the panic group, but higher than the PIAT effects obtained by the social phobia group. The differences between these groups were not significant ($p > .005$). Hypothesis 8a was therefore rejected.



- b) **The SIAT effects for the control group were expected to be significantly higher (but still a minus value, that is, below zero) than the SIAT effects for the panic and social phobia groups.**

As can be seen in Table 8.2, the SIAT effects for the control group and the social phobia group were approximately equal. They were larger than the SIAT effects obtained by the panickers. The difference with the control group, however, was not significant ($p > .005$). For this reason, Hypothesis 8b was rejected.

8.4.4. Results of Pearson Product Correlations to Investigate Hypotheses 9 and 10.

Pearson Product Moment Correlations were calculated in order to test Hypotheses 9 and 10. The results of the various correlations appear in Tables 8.11 and 8.12.

Table 8.11

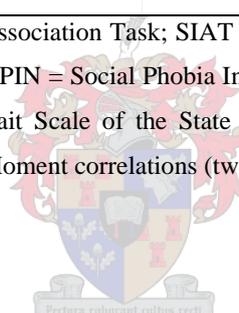
Intercorrelations Between Dependent Variables for the Panic Disorder Group (n = 17)

Measure	PIAT	SIAT	PDSS	SPIN	STAI-S	STAI-T	BDI-II
PIAT		.593**	-.111	-.103	-.03	-.091	-.158
SIAT			-.471	-.511**	-.678*	-.582**	-.711*
PDSS				.669*	.428	.539**	.610*
SPIN					.422	.568**	.583**
STAI-S						.785*	.847*
STAI-T							.868*
BDI-II							

Note. PIAT = Physical Threat Implicit Association Task; SIAT = Social Threat Implicit Association Task; PDSS = Panic Disorder Severity Scale; SPIN = Social Phobia Inventory; STAI-S = State Scale of the State -Trait Anxiety Inventory; STAI-T = Trait Scale of the State -Trait Anxiety Inventory; BDI-II = Beck Depression Inventory. Pearson Product Moment correlations (two-tailed); $n = 17$.

* $p < .01$.

** $p < .05$.



Although not all of the intercorrelations depicted in Table 8.11 and 8.12 are formulated as hypotheses, it might be of interest to take note of the other correlations. There is for instance a moderate correlation between the PIAT and SIAT, and, as could be expected, a strong correlation between the State and Trait scales of the STAI and their correlation with the level of depression.

Hypothesis 9:

- a) **A significant and positive correlation between the PIAT and the PDSS was expected for the panic disorder group.**

The Pearson product moment correlation coefficient ($r = -.11$) between the PIAT and PDSS for the panic group was negative and insignificant ($p = .34$) by which this hypothesis was rejected.

b) A significant and positive correlation was expected between the PIAT and State Anxiety scores for the panic disorder group.

The correlation between state anxiety and PIAT effects ($r = -.03$) was negative and insignificant ($p = .45$) and Hypothesis 9b was thus rejected.

c) A significant and positive correlation was expected for the panic disorder group between Trait Anxiety scores and the PIAT.

The correlation between trait anxiety and the PIAT effects was negative and insignificant ($r = -.09$; $p = .36$) and so Hypothesis 9c was rejected.

d) A significant and positive correlation was expected between the PIAT and BDI-II scores for the panic disorder group.

The correlation between SIAT and BDI-II effects ($r = -.16$) reflects a negative, insignificant relationship between these variables ($p = .27$). For this reason Hypothesis 9d was rejected.

Hypothesis 10:

Table 8.12 contains the results of the Pearson's Product Moment correlations (two-tailed) that were conducted between the SIAT effects of the social phobia group and results from other self-report measures.

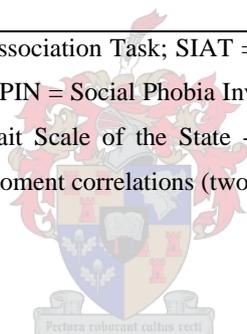
Table 8.12

Intercorrelations Between Dependent Variables for the Social Phobic Group (n = 17)

Measure	PIAT	SIAT	PDSS	SPIN	STAI-S	STAI-T	BDI-II
PIAT		.386	.037	-.045	.212	.009	-.076
SIAT			-.361	-.449*	-.363	-.334	-.302
PDSS				.371	.273	.228	.274
SPIN					.67*	.720*	.769*
STAI-S						.849*	.863*
STAI-T							.871*
BDI-II							

Note. PIAT = Physical Threat Implicit Association Task; SIAT = Social Threat Implicit Association Task; PDSS = Panic Disorder Severity Scale; SPIN = Social Phobia Inventory; STAI-S = State Scale of the State -Trait Anxiety Inventory; STAI-T = Trait Scale of the State -Trait Anxiety Inventory; BDI-II = Beck Depression Inventory. Pearson Product moment correlations (two tailed); $n = 17$.

* $p < .01$.



Once again, not all the correlations depicted in Table 8.12 are formulated as hypotheses but are presented in the reader's interest. As expected, there was a strong correlation between levels of state and trait anxiety as well as between and levels of state and trait anxiety with depression as measured by the BDI-II. There was also a good correlation between levels of social phobic severity, state and trait anxiety and depression.

a) A significant and positive correlation between the SIAT and the SPIN was expected for the social phobia group.

As can be seen from Table 8.12 there is a negative correlation ($r = -.45$, $p = .035$) between the SIAT effects and the scores of the SPIN for the people with social phobia.

For this reason Hypothesis 10a was rejected. It is noteworthy that the negative correlation was significant ($p < .05$).

b) A significant and positive correlation was expected between the SIAT and State Anxiety scores for the social phobia group.

A negative correlation ($r = -.36$, $p = .076$, not-significant) between state variables and SIAT effects for people with social phobia implies that Hypothesis 10b should be rejected.

c) A significant and positive correlation expected between the SIAT and Trait Anxiety scores for the social phobia group.

A negative relationship ($r = -.33$) between trait anxiety and SIAT effects ($p = .10$, not-significant) suggest that this hypothesis should be rejected.

d) A significant and positive correlation was expected between the SIAT and BDI-II for the social phobia group.

There is a negative and non-significant correlation ($r = -.30$, $p = .12$) between levels of depression and SIAT effects for people with social phobia. This finding means that Hypothesis 10d should be rejected.

8.5. SUMMARY

The results reported in the current chapter demonstrated contrasting findings in lieu of what was expected for theoretical considerations. Nearly all the hypotheses (bar those relating to the control group) were rejected as IAT values were consistently and significantly above zero (instead of below zero as was expected). This suggested facilitated responses for combinations in which 'me' and 'safety' shared the same response key. The facilitation for 'me' + 'safety' responses was consistent for all groups on the PIAT and SIAT with no significant difference between either of the groups. Furthermore, the relationships between the PIAT and SIAT effects, and several explicit measures were weak and negative. These findings will be discussed in the next chapter.

CHAPTER NINE

DISCUSSION

9.1. INTRODUCTION

The primary aim of the current research was to ascertain whether the adapted IAT is an adequate measure of the strength of implicit threat-related associations in people with panic disorder and social phobia. In contrast to what was expected, the main findings of the current study demonstrated that PIAT responses of participants with panic disorder were not facilitated in blocks (i.e., block #7) in which ‘physical threat’ and ‘me’ shared the same response key, compared to combinations in which ‘physical safety’ and ‘me’ did share the same response key (i.e., block #4). Similarly, SIAT responses of participants with social phobia were not facilitated in blocks in which ‘social threat’ and ‘me’ (i.e., block #7) shared the same response key compared to blocks in which ‘social safety’ and ‘me’ shared the same response key (i.e., block #4). In fact, the results demonstrated effects whose tendencies were in the opposite direction of what was expected. Although all hypotheses were rejected it was clear from the t-tests (reflected in Table 8.8) that effects were significantly above zero (which could be considered an a posteriori test) and as such the findings will be discussed as being significantly above zero. The expected significantly positive correlations between PIAT and SIAT effects (for the panic disorder and social phobia groups separately) and the explicit domain-specific variables of panic disorder severity and social phobia severity were not forthcoming. In summary, there was no evidence pointing to larger threat-related association biases in participants with panic disorder and social phobia on the PIAT and SIAT respectively, as was expected in accordance with previously established IAT theory.

For purposes of clarity in discussing the results, the current chapter will be divided into several sections, namely a) method as a source of potential error variance, b) reliability, c) validity and d) the results of hypothesis testing. For ease of reading, the latter section will be subdivided into appropriate sections in which the most relevant

findings will be discussed. This will be followed by a discussion of the limitations of the study and some suggestions for future research and, finally, a brief insert regarding the clinical implications of the current research findings.

9.2. METHOD AS A SOURCE OF POTENTIAL ERROR VARIANCE

The PIAT and SIAT were administered in counterbalanced order for each of three groups, namely panic disorder participants, social phobic participants, and a control group. In assessing the effect of order in which the tasks were administered, a Pearson's Product Moment Correlation was conducted to test the reliability of the equal forms. There appeared to be a slight tendency (however not significant) for participants that completed the PIAT first to have a higher Pearson's correlation than for those who completed the PIAT second. On the other hand, the Pearson's Product Moment correlation was significantly higher for the SIAT when it was completed first. This seems to imply that the reliability of the SIAT task is affected by the order in which it is presented. Although moderator variables such as age, language, intellectual functioning and the order in which the PIAT or SIAT were presented, were controlled for, it should be mentioned that the gender distribution of participants among the groups was uneven. As previous IAT-related studies have not been affected by gender (unless it was a gender-specific study, such as those conducted by Greenwald and Farnham [2000], and Rudman et al. [2001]), the current researchers assumed that this is not an important variable to be controlled for.

Apart from the SCID-I and MINI neuropsychiatric assessments, participants were administered all psychometric evaluations within a single session. It is possible that the length of these testing sessions might have interfered with participant concentration levels. It is for this reason that resting periods were introduced into the session at appropriate intervals.

The adapted PIAT and SIAT are computer-based classification tasks. Participants were required to classify stimulus words into appropriate categories by pressing the relevant response keys. Although the task does not require previous computer-related

experience, it should be noted that several participants wavered on their ability to produce results on a computer, which could possibly have had an influence on their performance. This apprehension was more apparent among older participants and could be due to a lack of computer-related experience or computer-related cognitive deterioration due to age (Echt, Morrell, & Park, 1998; Egan, 1988; Egan & Gomez, 1985).

9.3. RELIABILITY

Internal consistency, reflected by Cronbach's Alpha for the PIAT ($r = .78$), was in line with previous IAT-related studies (e.g., Banse et al., 2001; Bosson et al., 2000; Egloff & Schmukle, 2002) which demonstrated relatively high reliability coefficients. On the other hand, Cronbach's Alpha for the SIAT ($r = .55$) was somewhat lower. At first glance, this may suggest a compromised reliability for the adapted SIAT for making individual predictions. However, as the IAT functions as a comparative measure of the strength of threat-related associations among groups of people, these reliability coefficients are more than satisfactory for the purposes of the present study (Nunnally, 1967).

Equal Forms reliability coefficients were slightly lower (PIAT = .65, SIAT = .39). In removing two SIAT outliers, the reliability alpha improved from .39 to .66. (i.e., cases 10 and 12). However, it must be mentioned that the IAT differs from most questionnaire type instruments in an important way. As word stimuli appear in random format, it cannot be controlled in which combination format (i.e., other word stimuli) such a word appears or what it might have been preceded by. For this reason, the IAT has not been designed in such a way as to prevent responses to isolated, single word stimuli. Item assessment per se would require a completely different design, which was not the purpose of the present study. In retrospect the effect of cases 10 and 12 did not have any significant influences on the analysis results. All in all, lower reliability coefficients have been argued to be tolerable in the early stages of research (Bosson et al., 2000; Nunnally, 1967). Furthermore, the moderately low reliability estimates demonstrated by the SIAT are in line with other measures of implicit schematic inquiries as reported by Cunningham et al, (2001), who suggest that low interitem consistency (the extent to which items within a test correlate with each other) may be characteristic of response-

latency measures more generally. Cunningham et al. (2001) argued that reliability does not constrain validity in latency-based analyses. Although correlations between measured variables can only be as valid as the test is reliable, latency-based measures, which assess multiple measures of each construct, are believed to be able to circumvent such problems (Cunningham et al., 2001). As such, the adapted PIAT and SIAT have demonstrated sufficient psychometric qualities for the purposes of the current research.

9.4. VALIDITY AND THE RESULTS OF HYPOTHESIS TESTING

The IAT effects in the present study (block #7 – block #4) unexpectedly had positive values. Negative (below zero) values were expected. In accordance with previous IAT-related studies and Beck's (Beck et al., 1985) notion of schema-congruent information processing biases, it was expected that social phobics would demonstrate stronger associations for the 'me' + 'social threat' combinations (and of course for 'not-me' + 'safety')³ than for the 'me' + 'safety' combinations. Similarly, participants with panic disorder were expected to demonstrate stronger associations in memory for 'me' + 'physical threat' combinations than for 'me' + 'physical safety' combinations. The expected facilitation of the responses of the clinical groups during presentations of the combination of self-relevant information and threat-related information (i.e., blocks #7) would confirm strong association biases in memory between domain-specific threat and the self-concept, a finding that would not be expected for non-clinical persons. Not only would such findings support the validity of the newly adapted measures, but it would also be in line with the theory that it is easier to assimilate information with an already existing fear-based association schema as such responses require less controlled or attention consuming processes (Blair & Banaji, 1996). Negative PIAT or SIAT effect values reflect facilitated responses for 'me' + 'threat' combinations (block #7), and hence, this will reflect self-relevant threat associations. In lieu of what was expected, this section will be divided into appropriate sections in which the most relevant findings of the present study will be discussed.

³ When referring to a specific combination within a specific block, for example to 'me' + 'safety', it implies that they share a response key. Words related to 'not-me' and 'threat' share the other response key and also contributed to the response times during this block, but to ease reading (and promote understanding) the 'opposite side of the coin' constructs will not be referred to in every instance a specific combination is mentioned.

9.4.1. Performance of the two clinical groups on their ‘own’ (domain specific) IAT tasks (i.e., results related to Hypotheses 1 and 2)

The SIAT effects for the social phobics and the PIAT effects for the panickers were significant ($p < .005$), but positive. Positive IAT effects point to facilitation of responses in the opposite direction of what was expected. In other words, instead of facilitating responses for ‘me’ + ‘threat’ combinations (i.e., block #7), there appear to have been either a facilitation of responses for combinations of ‘me’ + ‘safety’ (i.e., block #4), and/ or a disruption in response times for block #7 tasks.

There may be several reasons for the current study’s disparate (and apparently contradictory) findings. The potential explanations that are going to be discussed in the next few paragraphs are the following:

- 1) that the other IAT studies did not use categories that are so strongly self-relevant as the ‘me’/ ‘not-me’ categories in combination with fear/ danger categories as were used in the present research;
- 2) that the processing systems of panickers and social phobics might differ significantly from those of other mental disorders;
- 3) that the stages of information processing (i.e., specifically at a pre-attentive level) may influence IAT effects and that either the used material and/or the disorders investigated, are responsible for a larger amount of processing on this level compared to other IAT-studies; and,
- 4) that higher anxiety levels during completion of the task (in the present research, compared to other IAT studies) disrupt classification performance on some of the demand tasks (i.e., during certain blocks).

After discussing these potential explanations for the unexpected effects (i.e., the positive, and not negative, values of the IAT effects), a theoretical model, the Parallel Distributed Processing Framework (PDF) (a connectionist model) by Cohen et al. (1990) and expanded upon by Williams et al. (1998), will be discussed. The model was developed to explain conflict between the two demand tasks in Stroop-related research, but its concept of different pathways influencing each other via neuromodulatory

processes, will be used to explain how two opposing forces (one facilitating and the other disrupting performance in a classification task) interact and compete to influence IAT performance and the resulting IAT effects. Although the PDF framework may model how two competing forces may interact and compete on a neuromodulatory level, the origin and effects of these opposing forces within performance on the adapted IAT (used in the present study) will be discussed.

Obviously, the current findings seem to be in sharp contrast to the results of other IAT-related depression and anxiety research which demonstrated facilitation effects (reflecting implicit association biases in memory) for the participant's specific fear-related concerns (e.g., de Jong, 2000; Gemar et al., 2002; Teachman et al., 2001). As noted in the previous paragraphs, there may be several reasons for the current study's apparent contradictory findings. First, although the use of 'me' and 'not-me' (or 'self' and 'other') constructs in several of the esteem-related IAT studies (e.g., Bosson et al., 2000; de Jong, 2000) implicate the extent to which the associations investigated were self-relevant, the omission of general fear/ danger-related constructs means that the associations were not an indication of the extent to which self was associated with threat. For instance, combining 'me' and 'not-me' (or 'self' and 'other') with esteem-related constructs (such as words representing low-esteem' and words representing 'high-esteem' in de Jong's [2000] study) or general 'positive' versus 'negative' constructs (e.g., Gemar et al., 2000), does not necessarily indicate the extent to which the self is associated with fear. On the other hand, although Teachman et al. (2001) used the categories 'afraid' versus 'unafraid', and 'danger' versus 'safety' (danger words combined with pictures of snake and spiders) to assess subjective fear-based associations in people with snake and spider phobias, their use of 'afraid' versus 'unafraid' categories, instead of 'me' versus 'not-me' constructs (as used in the present study), perhaps do not tap so specifically into self-relevant fear associations, that is, associations that are therefore probably less self-relevant. It can be argued that the use of me-/ not-me (self-relevance) constructs amplify the extent to which the self is associated with danger and fear, over and above the usually expected and socially learned effects of 'danger'- 'safety' (we are, for instance, taught from an early age to be afraid of snakes and spiders as they can be dangerous). It can be

argued that if self-related concepts are combined with the concerns and fears of an anxious individual it might be more likely to activate fear-based structures within memory. Increasing levels of vulnerability due to the activation of self-relevant threat associations that represent the participant's core clinical concerns, may threaten the integrity of the self-system (Bosson et al., 2000). This may perhaps trigger in clinically anxious people (and not necessarily to the same extent in generally anxious people) (MacLeod & Hagan, 1992), the activation of anxiety-based schemas that influence and guide subsequent information processing in ways that are consistent with Beck's theory (Beck et al., 1985) about the activation of fear-based schemas leading to increased levels of anxiety. The nature and design of the current study is thus not a replicate of the above-mentioned studies in which, as explained, implicit fear-based associations in a self-relevant context were not specifically investigated.

There is also a second potential reason for the disparate findings (compared to other IAT studies). The stronger self-relevant threat associations and higher levels of anxiety presumed to be activated in the present study might not facilitate but rather disrupt performance on the task. Even if the previously mentioned studies had used constructs that did reflect self-relevant threat associations for depressed or snake and spider phobic groups, these associations (and their effects) might differ from those of social phobics and panickers. Different disorders may be associated with different information processing biases that occur in varying stages of information processing (Foa & Kozak, 1986; Lang et al., 1983; Teachman et al., 2001, Teachman & Woody, 2004; Williams et al., 1997). The current study's use of 'me' and 'not-me' categories combined with domain-specific fear constructs concerning 'danger' and 'safety' might therefore have activated implicit associations that not only differ from those in the other IAT studies with regard to their domain-specific content and their self-relevant nature, but also with their potential to disrupt performance (in a classification task) probably through an attention diversion mechanism similar to the attentional bias responsible for the Stroop effect. (This argument will also be returned to at a later stage.)

A third possible reason for the disparate findings in the present study might be related to the stage at which processing takes place. It is common knowledge that people with social phobia tend to associate certain situations or sensations (such as a crowded room or blushing) with humiliation and rejection, while people with panic disorder tend to associate physical sensations (such as a racing heart) with an impending panic- or heart attack (Heimberg et al., 1995; Hope et al., 1990). A question that arises from the present findings is whether the current results are indicative of an absence of such threat association biases or, on the other hand, whether the IAT is either too insensitive to access them, or is at least prevented to do so by other competing processes. In this regard, and in line with the model proposed by Williams et al. (1988), the present researcher proposes an alternative explanation, which became apparent on closer consideration of the mechanisms underlying the IAT effects (see Section 4.3.3.3.). The IAT attempts to assess association biases in memory related to automatically activated associations between a category concept and its related attributes (Fazio & Olson, 2003). These associations are assumed to guide higher level cognitive processes (Teachman & Woody, 2004) than processes responsible for attentional bias which may occur at an earlier stage in processing (Williams et al., 1988). Although the associative processes tapped by the IAT are automatic in that they occur outside voluntary control or awareness, they are not necessarily indicative of the processes that occur on an immediate or pre-attentive level (Fazio & Olson, 2003). In this regard, Stroop-related studies have consistently demonstrated attentional biases for panickers on words pertaining to physical threat (Ehlers et al., 1988; Hope et al. 1990; McNally et al., 1990; McNally et al., 1992; Mogg et al., 1989), and for social phobics on words related to social-evaluative threat (Hope et al., 1990; Mattia et al., 1993). And these biases were demonstrated to operate on an explicit level (with the use of a supraliminal Stroop) (Mathews & MacLeod, 1988) as well as on a pre-attentive level (Lundh et al., 1999; MacLeod & Rutherford, 1992; Mathews & MacLeod, 1994; Mogg, Bradley et al., 1993), demonstrated with a subliminal version of the Stroop. Fazio and Olson (2003) contend that the different mechanisms underlying the two tasks (IAT versus Stroop) are responsible for the two task effects, which are reflective of different information processing biases. The IAT is presumed to assess implicit association biases in memory (pertaining to the later stages of information

processing), while the Stroop might reflect (or at least, also incorporate) earlier information processes, that is, biases which occur on a pre-attentive level (described in the next paragraph). This is not to say that the IAT is insensitive to biases on a pre-attentive level, but rather, that its purpose is in detecting the strength with which concepts are associated in memory.

Bearing in mind the consistent evidence pointing to pre-attentive processing biases in sufferers from social phobia and panic disorder (for threat-consistent stimuli), the present researcher proposes that the currently observed IAT effects may reflect biases which occur at an earlier stage of information processing than association biases which are tapped by other IAT versions. It is important to understand what is meant (at least for purposes of the current study) by a 'pre-attentive level' of information processing. It refers to a very early stage during processing, but is not synonymous with the construct 'implicit'. Pre-attentive refers to a stage just before the individual even realises that his eyes are focused on word cues (e.g., in the subliminal Stroop the participant is not even aware of having 'seen' a stimulus word). Although the individual is also not aware of the association processes that follow, association biases probably occur at a later stage. Although associative processes might theoretically also occur during the pre-attentive phase, associations are usually regarded as later occurring, higher order processes compared to processes of attention.

If this presented theory is correct, then one can explain the unexpected effects of the current study as potentially a consequence of a pre-attentive process in anxiety disordered individuals. This pre-attentional bias precedes the biases at the more elaborative stages of association, and as such occurs at the expense of classifying words into appropriate categories. This in itself does not disprove associative bias theory, but rather provides evidence that information processing precedence in clinically anxious people is awarded to the detection of threat-consistent information under conditions of threat. These findings are in line with the models proposed by Graf and Mandler (1984) and Williams et al. (1988) which assert that anxiety may be characterised by biases in the early stages of information processing such as attention (while depression is characterized

by biases at the later occurring, more elaborative stages). This would then also account for the differential IAT findings between the current research and the study of Gemar et al. (2000), in which significant threat-related IAT (implying strong threat-related associations) effects were demonstrated for participants with depression.

On the other hand, the disruptive effects might have less to do with the stage at which the information is processed but (and this is a fourth potential reason for the disparate findings in the present study) more with the level of anxiety provoked by the threat-related stimuli. It is a well known fact that increased levels of anxiety can either facilitate or disrupt performance. Combining self-relevant words with danger words might be so threatening that the increased anxiety levels actually have an impeding effect on the classification task. There is also a possibility that there is an intricate balance between attentional processes, association processes, anxiety levels, stage of processing, and facilitation versus disruption processes of a nature that is not yet fully understood. To develop a working model to explain the findings of the present study, the connectionist model of Cohen et al. (1990) may offer a valuable framework.

The current research findings can perhaps best be explained in terms of Cohen et al.'s (1990) connectionist model that was discussed in Chapter Four. The task demand in the IAT is to classify a stimulus word. Whether this would happen accurately and quickly depends on a particular processing pathway characterised by connections between input-, intermediate-, and output units. In the case of the Stroop there are at least two input and two output units (related to colour-naming and word reading). In the case of the IAT there is only one (sensory) input, namely a word that has to be classified. There is, however, also a processing pathway related to the avoidance of classification (i.e., to 'wait', or 'stall' and think, before you act in a dangerous situation). The source of this input might be attention from a memory structure such as a danger-related self-schema. It is possible that these two pathways (to classify versus to avoid/ wait and think) are connected at an intermediate neuromodulatory level and that the one processing pathway (avoidance) actually interferes with the other pathway (classification) at this point (intermediate unit level). This will from now on be referred to as the 'two processes'

hypothesis. To quote Williams et al.'s (1998) description of Cohen's PDF model: "Interference takes place when dissimilar patterns of activation converge on a single point of interaction, at any point in processing after sensory registration has occurred" (p.114). According to this model, emotional input representing the greatest current concern for clinically anxious persons may have a higher resting level of activation. If such input is associated with threat, heightened activation levels are coupled with increased subjectivity to neuromodulatory control, which results in an increased strength of processing and as a result, an increased activation at output for pathways representing threat (Williams et al., 1996). As with Stroop-related studies, attention in the IAT is automatically shifted to the detection of threat-consistent information, especially when self-relevant threat associations are presented, despite the task's demand of classifying words into appropriate categories. This is because of the chronically higher activation output for responses to self-relevant threat stimuli. As conscious strategies are aimed at the task's requirement of word classification, the shift in attention to the detection of threat-consistent information can be assumed to operate on an automatic or pre-attentive level (Williams et al., 1996).

Using Cohen's Connectionist model (Cohen et al., 1990) and the concept of different pathways, IAT responses can thus be seen as a consequence of two opposing and competing forces (i.e., the 'two forces' hypothesis). On one hand are the processes of association, and on the other hand are the processes related to attention, each exerting their own influence and each probably operating at different information processing stages (Williams et al., 1988; 1996). Both of these processes are a consequence of fear-based anxiety programs that become activated automatically by clinically anxious people in the presence of stimuli that threatens the self-system (such as self-relevant threat associations presented by the IAT). This is the result of what is called the 'automatic activation effect' within IAT investigations of attitude, which asserts that when an attitude object is encountered, the evaluation that one associates with this object will be activated from memory spontaneously and without conscious effort (e.g., Bargh et al., 1992; Fazio et al., 1986). Hypervigilant threat-related information processing as is characteristic in clinical anxiety, is assumed to be a guided by maladaptive fear-based

schemas (Teachman & Woody, 2004). **Facilitation** processes via the strong **association** in memory between the self and threat, creates a force toward faster responses for block #7 (i.e., ‘me’ + ‘threat’). Bearing in mind that the IAT effect is calculated as block #7 – block #4, facilitated responses move overall IAT values toward the negative end of a continuum (i.e., toward a minus value on a continuum ranging around zero). Because this force has a tendency to shift the IAT effect to a minus value, it will be referred to as the ‘**pulling effect**’ that facilitation, via association, has on the effects (i.e., the direction of the IAT effect). This influence is attributed the role of association in memory as is present in clinically anxious people. One can expect a stronger association between the self and threat for participants with clinical anxiety than for normal participants. Simultaneously, **interference** is created by a competing process which is produced as a consequence of **attention diversion**⁴ (maybe on a pre-attentive level, but still part of the attention process) to self-relevant threat associations (in block #7). The disruption will result in longer latencies (for block #7), such that overall IAT values will move toward the positive side of the scale (called a ‘**pushing effect**’ toward a positive value on the described continuum). This interference reflects the processes of pre-attentive bias in anxiety. It can be expected that the disruption (i.e., interference with the classification task) created by attention diversion will be greater for people who are more anxious as demonstrated by the Stroop effect research previously discussed (Williams et al., 1996). In this way these opposing forces (i.e., facilitation via association versus disruption through attention diversion), interact, facilitate and interfere with one another when dissimilar patterns of activation converge on a single point of intersection (the PDF model of Williams et al., 1996; 1998), in influencing individual responses and eventually the overall IAT effect. In future, this explanation will be referred to as the ‘**two-forces**’ theory.

The effect of the attentional bias might have a larger effect on the response output (the classification task), because it appears earlier in the processing system that is, at a

⁴ It might be of interest to note that *association* is probably present (i.e., two distinctive association processes are involved) in both forces of facilitation and interference. Disruption is a consequence of attention diversion because of the *association* of the ‘me’ + ‘threat’ combination with danger. In other words, it is dangerous to classify self (i.e., ‘me’) into the same category as threat.

pre-attentive level (Blair & Banaji, 1996; Pratto & Bargh, 1991; Dovidio et al, 1997), or at a later (intermediate) level where attention and association processes interconnect. As pre-attentive processing biases occur at an earlier stage for people with anxiety disorders than depression, this might be the mechanism resulting in a stronger ‘push’ than ‘pulling’ effect. These pre-attentive processing biases may exert enough influence to override the opposing secondary forces relating to association between threat and the self, with the result of increased latencies for block #7 which contributes to the overall positive IAT values.

The overall positive IAT effects demonstrated in the present study may be attributed to performance during block #4, #7, or a combination of both. It may be mainly the result of increased facilitation on combinations in which ‘me’ shared the same response key as ‘safety’ (i.e., block #4), or alternatively, a delay in response time due to combinations in which ‘me’ shared the same response key with ‘threat’ (block #7). The IAT effects as the result of performance during both blocks (i.e., #4 and #7) will now be described. During block #4, ‘me’ and ‘safety’ words share the same response key press (and, of course, ‘not-me’ + ‘threat’ share the other response key press). If performance during block #4 did contribute significantly to the present effects (demonstrating overall positive IAT values), then performance should have been especially facilitated through association between the mentioned combinations of constructs. It is unlikely that there could have been a strong association between ‘me’ and ‘safety’ words for clinically anxious participants apart from the association reflected by the sentence “I wish for these safety signals to be descriptive of me and my situation”. It is, furthermore, hard to believe that disruption (interference) through attentional bias could have had a significant influence during block #4 as such combinations contain no threat. If performance during block #4 did contribute significantly to the final IAT effects, it probably occurred via the mentioned association. During block #7 ‘me’ + ‘threat’ words shared the same response key press (and of course ‘not-me’ and ‘safety’ words share the other key). If performance during block #7 did contribute significantly to the present effects (i.e., positive IAT effects), then performance should have especially been disrupted through attention diversion to either the threatening value of the threat words and/ or to the danger involved

when the participant had to classify 'me' words in the same category as the 'threat' words. Attention of the participant diverted to this latter issue (i.e., 'it's dangerous to classify') may have a disruptive effect even when the 'me' words are presented. It is unlikely that attention to the 'not-me' and the 'safety' words, or the fact that they should be classified in the same category, could have had a significant disruptive effect through attention diversion. To summarise: if anxiety is a motivational state directed toward the detection of potentially threatening information, it can be assumed that there is a strong possibility that the disruptive effect of attention diversion to the 'threat' words and 'me' words (as well as to the 'danger' involved due to the demand of classifying them in one category) during block #7 has made a major contribution to the overall (positive and significant) IAT effect. If this interference is strong enough, it may undermine the otherwise facilitative block #7 processes thus resulting in a delayed response for block #7 and a seeming facilitation for block #4 (as reflected by overall positive IAT values). Furthermore, it is theoretically possible that an association such as "I wish for these safety signals to be descriptive of me and my situation" could have made a contribution to the overall IAT effect through facilitation to block #4. Unfortunately the design of the present study do not allow for further investigation of this issue.

In the previous paragraphs a basic outline was proposed to describe the way two processes (attention and association leading to the disruption or facilitation) might have contributed to the IAT effects obtained in the present study. As an extension of some of the proponents of the current researcher's model some of the more common explanatory models for attentional bias will briefly be discussed, each pointing to different aspects of the recently proposed 'two-forces' model.

Firstly, Beck (Beck et al., 1985) and Bower's (1981) theories contend that emotional information attracts disproportionately more processing resources because of the activation of specific fear-based schemas representing emotional threat (Mogg et al., 1989). This model would explain facilitation and disruption as being a consequence of the activation of fear-based cognitive structures (schemas) that guide and influence subsequent information processing.

To further expand on the notion that the danger association in classifying 'me' and 'threat' into one category can result in disturbance in overall task performance, an example is presented concerning the association of the word 'pathetic' + 'me'. Similar to the reasoning of Amir et al. (1996a), Fazio and Olson (2003) contend that performance on the threat-related combinations of the IAT is based on an emotional assessment of the associations implied in such trials (i.e., associating 'social threat' with 'me'). This emotional assessment is tainted by the activation of a coherent fear-based structure (or schema) that is hypothesised to play a role in pathological anxiety (Beck et al., 1985). On one hand a social phobic person will be inclined to accept the implied association which is characteristic and typical of how they feel about themselves (Hope et al., 1990), resulting in facilitated responses ('pulling' force). On the other hand, however, it can also be argued that clinically anxious participants will be more threatened by such associations which are consistent with existing and accessible fear-based schemas. Consequentially, attention may become directed to schema-consistent dangerous combinations resulting in the individual stalling before responding to such combinations, hence, disrupting task performance.

Contributing to the 'two-forces' hypothesis, is a priming and spreading of activation (Bower, 1981; Segal, 1988) element inherent in task completion. Exposing clinically anxious individuals to threat-related constructs might have had a priming effect, in which the presentation of threatening words would have activated accessible fear-based schemas. The result is that once this schema becomes activated it is likely to guide subsequent information processing to the extent that pre-attentive processes (attentional bias) disrupt performance (on the categorisation task) before later occurring processes (such as association) can facilitate it. It would be expected that priming and the spread of activation would be especially large in clinically anxious groups for whom the interconnection between elements of a fear-based schema is particularly strong. The possibility of this priming variable deserves further attention.

In another theory, Dawkins and Furnham (1989) assert that interference created by attention diversion is a consequence of emotional material activating task irrelevant self-preoccupying processes that consume attentional capacity, and occurs at the cost of executing other task demands (such as classification perhaps). These self-preoccupying processes may contribute to the interfering processes demonstrated in response to block #7 and are often reflected as an intrinsic bias toward positive self-esteem (e.g., Greenwald & Banaji, 1995). This self-positivity bias is consistently evidenced in response to self-relevant stimuli as reflected by larger Stroop interference effects (Hope et al., 1990; Segal & Vella, 1990) and facilitated IAT effects (Bosson et al., 2000; Greenwald & Banaji, 1995) among anxious and non-anxious people alike for self-relevant categories (de Jong, 2002). From these findings it was concluded that self-relevant information demands larger amounts of attentional resources (Hope et al., 1990; Segal & Vella, 1990). Disruption, due to threat and attention diversion, can thus also be mediated by an innate tendency toward positive self-esteem which interferes with the classification of self and threat into one category.

And lastly, Mathews and MacLeod's (1994) prioritisation model states that because our cognitive reserves are limited we cannot attend to all information and as such priority (in terms of the allocation of processing resources) is awarded to the processing of information that allows one to process and deal effectively with novel and potentially threatening situations. As such, attention diversion might impede processes of association according to the prioritisation model. This shift in attention towards 'danger' or 'threat' is the 'attentional bias' that is demonstrated as the 'Stroop interference effect'.

In summary, the current researcher has proposed a new model to explain the significant but unexpectedly positive IAT values obtained by the social phobics on the SIAT, and panickers on the PIAT. When confronted by evaluative situations between the self and domain specific fears, information processes of clinically anxious people are more likely to become disrupted (as opposed to facilitated) as a result of attention to diversion. And as this bias occurs on a pre-attentive level it is likely to undermine the otherwise facilitative effects of association.

9.4.2. Performance of the two clinical groups on ‘each others’ (not domain specific) IAT tasks (i.e., results related to Hypotheses 3 and 5)

The unexpected positive and significant ($p < .005$) PIAT values obtained by people with social phobia, and the overall positive SIAT values obtained by people with panic disorder can also be accounted for by the proposed ‘two-forces’ theory.

The fact that there is a comorbidity of 15-30% between social phobia and panic disorder (Taylor, 2000), and also the observation that people with social phobia may experience panic in social-evaluative situations (Heimberg et al., 1995), suggest a common experience of anxiety among the two anxiety disordered groups. Thus, when compared to the control group, clinically anxious persons probably experience increased fear/ concern for each other’s fear domains (i.e., panickers for the social threat and social phobics for physical threat). This is probably the reason why the SIAT effects for panickers and PIAT effects for social phobics, were significant.

The problem, to explain why these effects were positive (instead of negative as expected), however, remains the same as was the case with their own matched IAT’s (i.e., panickers on the PIAT and social phobics on the SIAT). In other words, if the facilitation processes via association for people with panic disorder and social phobia were disrupted as a result of the ‘push effect’ of pre-attentive forces on the PIAT and SIAT respectively, the same interference can be expected for their responses on each other’s IAT’s. This could be due to the fact that both IAT’s use self-relevant threat associations, which to some extent resemble the personal fears of panickers as well as social phobics.

There are also a few ideas and hypotheses in the literature that may illuminate the mechanisms and processes involved to explain why panickers responded to social threat and social phobics to physical threat. This will now be discussed briefly.

According to Bower’s (1981) spreading of activation theory, fear-based association schemas (such as those which characterise clinical anxiety) consist of strongly connected and highly interrelated units (Bower, 1981; Segal & Ingram, 1994) that are

predominantly associated with negative self-schemas (Markus, 1990). The greater interconnectedness of negative or threatening concerns makes other threat-consistent information more accessible, and hence, more likely to influence responses in a similar (i.e., negative or threatening) way (Williams et al., 1996). Based on this reasoning it can be assumed that exposing clinically anxious people to the emotional assessment of implied associations between the self and threat (as in IAT classification tasks), will, by virtue of the interconnectedness among fear-based or threatening elements, increase the likelihood of the relevant fear-based schema becoming activated (Collin & Loftus, 1975; Higgins & Bargh, 1987; Mandler, 1982; Markus, 1990; Segal, 1988). Once activated, and based on the interconnectedness between fear-based elements, it can be expected that fear-based schemas of people with social phobia will not only be biased toward the processing of associations between the self and social threat, but that this bias will be extended to combinations in which the self is associated with physical threat. Likewise, biases in persons with panic disorder will be extended to the combination in which the self is associated with social threat.

9.4.3. Performance of each of the two clinical groups on the two IAT's (i.e., results related to Hypotheses 4 and 6).

In Hypotheses 4 and 6 the expectations were (originally) that the SIAT effects of social phobics would have been significantly larger than their PIAT effects (Hypothesis 4), while the PIAT effects for the panickers would have been significantly larger than their SIAT effects (Hypothesis 6). This will now be discussed.

The present study did not specifically investigate the domain-specificity hypothesis (i.e., whether panickers have a larger fear for physical threat than for social threat, and whether social phobics have a larger fear for social threat than for physical threat). However, after investigating the results of the investigations of Hypotheses 1 and 2, and reconsidering the formulation of Hypotheses 4 and 6 in terms of the proposed 'two-forces' theory, one is inclined to expect significantly larger disruption for the panickers on the PIAT compared to the SIAT, and for the social phobics on the SIAT

compared to the PIAT. There were, however no significant differences between the groups on either of the IAT tasks ($p > .005$).

According to the proposed 'two-forces' model, there are two opposing and competing processes at play and both the 'push' and the 'pull' forces would have affected the final IAT effect. In observation of the positively valued PIAT and SIAT effects, it is clear that the responses of both the social phobics and the panickers, for both the tasks, were more 'pushed' by the disruptive processes of attention diversion than 'pulled' by the facilitative processes of association (reflected by the positive IAT values). However, it may be that the fear- domain specific stimuli affect both of these forces (i.e., interference and facilitation). For example, in the case of the panickers both forces will be relatively strong (although it was speculated that interference was probably the strongest) during performance on the PIAT, and relatively weak during their performance on the SIAT. The end result being that there is no significant difference between the effects of the two IAT's for either of the two clinical groups. In this sense it can be speculated that inconsistent findings are a result of individual response differences in the push and pull of opposing forces. For some people, the strength of association may have had more influence in pulling the effects back toward zero, while for others, disruption through threat-consistent attention may have influenced a greater leaning toward positive (above zero) effects.

Pre-attentive biases for negative threat-related information in general, over and above the attentional bias toward stimuli of current or domain-relevant concerns, have been demonstrated in previous research (e.g., Cassiday et al., 1992; Lundh et al., 1999; McNally et al., 1994; Mogg, Bradley et al., 1993; Mogg, Kentish et al., 1993; Segal et al., 1995). Similar findings were reported for the Dot-probe studies by Asmundson and Stein (1994) and MacLeod et al. (1986), from which it was suggested that processing biases on a pre-attentive level for the detection of threat in clinically anxious individuals were not limited to the content-specificity mechanism.

There are a few research-related findings and hypotheses in the literature that are consistent with the current findings, which will briefly be summarised. These may perhaps clarify the mechanisms and processes involved and which have resulted in the insignificant differences in domain-specific responding.

Firstly, the current random presentation of individual words (as opposed to a presentation of words in blocked format as is the case in some Stroop effect research) may be less likely to elicit content specific effects. It is assumed that individually presented words afford an individual less opportunity to engage in the more elaborative processing of semantic analysis, and as such, selective processing will abide in a relatively unspecific manner (Mogg, Kentish, & Bradley, 1993). On the other hand, blocked presentation formats (all the words are presented on a card or computer screen, although the participant attends to them one at a time) provide more opportunity for elaborative processes and therefore the appearance of content specific concerns becomes more likely. The presentation of individual words may have contributed to the insignificant differences between opposing forces in persons with social phobia and panic disorder on either of the tasks. These conclusions were based on previous research in which domain-specific findings were most consistently demonstrated in Stroop research using a blocked presentation format, while experiments using random formats usually yielded non-specific results.

Secondly, Mathews et al. (1989) suggest that under stress-related conditions, pre-attentive processing resources of people with anxiety disorders in the detection of threat-consistent information will not be limited to domain-specific concerns. Rather, as an attempt to manage anxiety, anxious people may use many strategies to avoid the elaborative processing of threat. As a consequence, people with clinical anxiety, despite their selective attention toward threat-related stimuli may not think carefully about threat-related information (Teachman & Woody, 2004) and involuntary pre-attentive processes become mobilized in such a way that any and all danger is best detected quickly.

9.4.4. Performance of the control group on the IAT tasks and a comparison with the performance of the two clinical groups (i.e., results related to Hypotheses 7 and 8)

Both the PIAT and SIAT effects obtained by the control group were significant ($p < .005$) and positive (instead of the expected insignificant findings). According to the recently proposed model, overall IAT effects (including those for the ‘normal group’) are determined by two opposing forces at play. It can be speculated that during the presentation of block #7, the forces related to disruption through attention diversion to threat (for control participants), were probably significantly stronger than the facilitative effect of self-threat associations. It can be expected that ‘normal’ people would not be as disturbed by the association between ‘me’ + ‘threat’ (in block #7). However, normal people have also demonstrated significant attentional bias in Stroop-related research. This is understandable, because words like ‘embarrassed’ and ‘illness’ should also contain a certain degree of threat to them, or at least, be significantly more threatening than ‘neutral’ or ‘safety’ words. This reasoning might be reflected in the observed positive (significantly above zero) PIAT and SIAT values obtained by the control group.

At this point one might still wonder why the control group did not differ significantly ($p < .005$) from the clinical groups on either of the IAT tasks. The insignificant differences in response cannot be accounted for by a lack of distinction between the groups, as recruitment procedures specified distinguishing criteria that set each of the three groups apart. Rather, it can be speculated that although the ‘pushing effect’ of disruption through attention diversion (during block #7) was probably not as strong for the ‘control’ group as it was for the clinical groups, it is also logical to argue that the ‘pulling effect’ of facilitation through association (also during block #7) was also not as strong for the controls as it would have been for clinically anxious participants, for whom such biases are guided by maladaptive fear-based schemas (Teachman & Woody, 2004). The end result is that the overall IAT-effects of the three groups (control, panickers, and social phobics) did not differ significantly.

In addition to the effect of performance on block #7, performance on block #4 may also have contributed to the overall effect. One may reason that the association

between ‘me’ and ‘safety’ may be stronger for the normal controls than for the participants in the clinical groups. To this extent, however, the design of the present study, unfortunately, does not allow a comparison of the groups on their performance on specific blocks.

9.4.5. Correlations between performance on the two IAT tasks and self-report questionnaires (i.e., results related to Hypotheses 9 and 10)

Before discussing the relationship, it is important to note that because neither IAT’s delivered the expected significant, negative IAT effects, one should conclude that the measures were not valid assessments of implicit associations as theorised. It is therefore not necessary (and actually redundant) to discuss the correlations between the IAT’s and the self-report scales. On the other hand, because it was speculated that the IAT’s reflect the results of two opposing forces (with disruption via attention diversion to threat probably stronger than facilitation through self-threat association), the obtained correlation results will now be discussed in the light of this newly formulated variable (reflected by the IAT effects).

The PIAT and SIAT correlated negatively with the self-report scales for the panic disorder and social phobia groups respectively, and with the exception of the SPIN and SIAT correlation, all the other correlations were insignificant. These findings are consistent with results from previous implicit studies in which correlations between the IAT and other explicit measures were low (Bosson et al. 2000; de Jong, 2000; Egloff & Schmukle, 2002; Fazio et al., 1995; Greenwald et al., 1998; Rudman & Kilianski, 2000; Ottaway et al., 2001; Rudman & Glick, 2001). The weak correlations were attributed to the seemingly independent processes (i.e., implicit versus explicit processes) that are tapped by implicit versus explicit paradigms. Furthermore, performance on the IAT’s may implicitly be influenced by the self-relevant threat of the task’s stimulus material. This is not the case with the self-report scales, or at least, not to the same degree (Bosson et al., 2000). This implicates that implicit, automatic responses to threat words is distinguishable from the explicit, strategic processes tapped by responses to threat-related statements or questions.

This explanation can, however, not account for the significant, negative correlation between SIAT and the SPIN. The researcher's initial expectation (represented by line A in Figure 1) that increased levels of social phobia and panic disorder severity (as well as the other explicit anxiety and depression variables) would covary with increasingly negative IAT values, was replaced by a newly proposed expectation that increasing levels of symptom severity (i.e., SPIN scores for social phobic and PDSS scores for panickers) would be associated with a larger amount of disruption through attention diversion (i.e., positive SIAT and PIAT values respectively) (represented as line B in Figure 1). This expectation corresponds with views in Stroop research literature that (pre-attentive) biases are exacerbated by levels of trait anxiety (cf. de Ruiter & Brosschot, 1994) and concern relevance (Riemann & McNally, 1995; Williams et al., 1996). It also accounts for the consistently larger Stroop interference effects that have been demonstrated by clinically anxious (as opposed to generally anxious or normal) people for threat-consistent stimuli (see Williams et al., 1996). However, the current effects demonstrated that increased levels of symptom severity (i.e., social phobia severity measured by the SPIN) are associated with IAT values that were still positive, but of decreasing values, that is, closer to zero (represented as line C in Figure 1). This seems to indicate that increasing levels of social anxiety may be associated with an increased 'pull' (by response facilitation via association) that forced overall IAT values back to zero. If the effects had been affected only by attentional bias (i.e., interference due to attention diversion), the relationship between SIAT effects and the SPIN would have been positive (reflected as Line B in Figure 1). This implies that although disruption of classification responses on the SIAT did seem to have been the strongest force (in the 'two-forces' theory), for the social phobia group, it may well be that increasing levels of social anxiety covaried with progressively stronger facilitation effects through implicit association. This hypothesis requires further investigation.

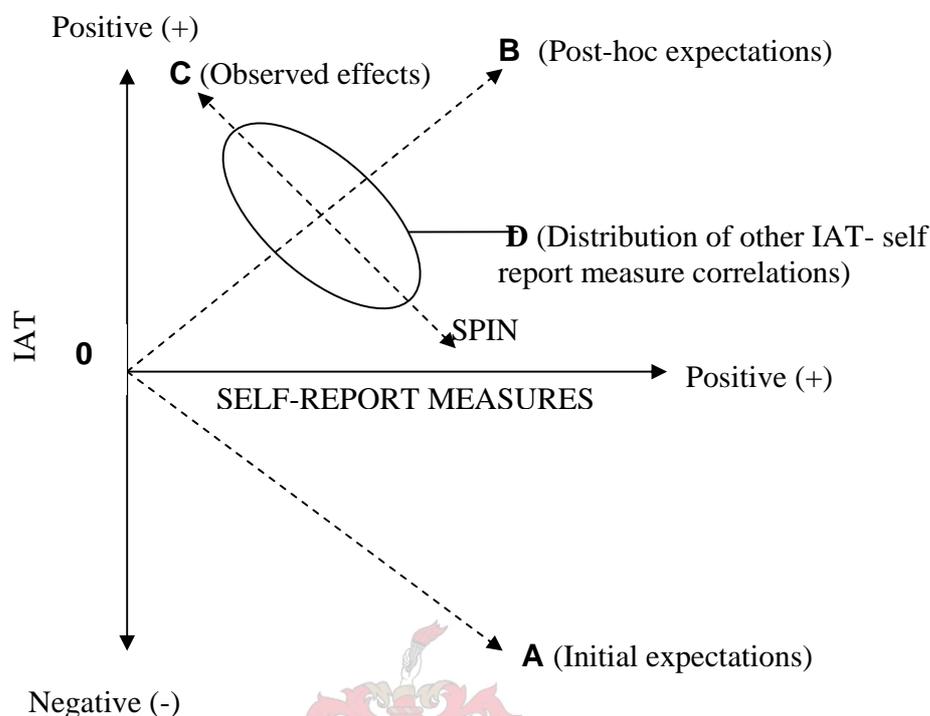


Figure 1. Expected and observed correlations between IAT effects, the SPIN and other self-report measures.

The model proposed to accommodate the unexpected positive IAT effects (including the 'two-forces' theory), as well as the above-mentioned hypothesis to explain the significant negative correlation between social phobic severity and SIAT effects for the social phobia group, needs to be investigated. This will require the development of an IAT for which it will be possible to manipulate, compare and investigate the effects of different word stimulus categories, word stimulus combinations and block trials. The results of such investigations will hopefully lead to an IAT that will accurately demonstrate and measure the strength of implicit associations characteristic of social phobia and panic disorder. These recommendations will be expanded upon in a section that follows.

9.5. LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FUTURE RESEARCH

In order to investigate the validity of the newly proposed theory, it is essential that the present study should be replicated and that the various hypotheses put forward be

tested empirically. To investigate the mechanisms and individual components responsible for the unexpected IAT effects, a dismantling study is recommended. Although such a study would not necessarily have to assess implicit associations, it will have to be designed to shed light on why the present results were in the opposite direction of what was expected.

It would, for instance be interesting to dissemble the individual effects of the different categories of words presented (i.e., isolating the effects for social/physical threat words, and social/physical safety words for each of the three groups). In this way one could establish which of the category combinations containing which category of words was responsible for the greatest interference versus the greatest facilitation effects and for which groups in particular. By isolating the effects of the different category combinations, it could be determined whether normal people, for instance have greater facilitation on block #4 combinations than either of the clinical groups as was speculated in the current discussion. This will also help to determine whether, for the clinical group, facilitation of responses during block #4 did occur, or whether the IAT effects were mainly a consequence of disrupted information processing (due to attention diversion) during block #7. As the IAT is a relative measure of association strength, it is currently not designed to isolate response effects (Nosek et al., 2003). This would require a study with a different design.

One way in which the effects of threat on the IAT can be investigated, is by manipulating the level and nature of threat of the stimulus words. The IAT effects could be investigated by using domain-specific threat words (e.g., 'embarrassed' for social phobics), general threat words (e.g., 'poverty'), domain-specific safety words (e.g., 'confident' for social phobics), and general safety words (e.g., 'secure'), as well as general positive (e.g., 'beautiful') and negative (e.g., 'nasty') words. Comparing the IAT effects on these types of words for different groups (e.g., normal controls, 'non-clinical' individuals with elevated anxiety levels, and clinically anxious patients), will provide a better test for the proposed 'two-forces' theory.

It was speculated that classifying ‘me’ and ‘threat’ words in the same category, may have resulted in the demand task becoming so threatening that disruption through attention diversion actually overshadowed the facilitative effects of association. One way to test this hypothesis is to replace the ‘me’ and ‘not-me’ constructs with generally ‘positive’ and ‘negative’ constructs. This will reduce the self-relevant threat that was inherent in the IAT used in the present study.

If the currently proposed theory stands its ground, one could expect differential effects between the opposing forces among different emotional disorders. It could for instance be expected that if individuals suffering from depression are more susceptible to biases at later stages of information processing, they would demonstrate greater facilitation effects for self-relevant threat association (e.g. Gemar et al, 2000), than individuals suffering from anxiety disorders for whom biases apparently occur at a pre-attentive level. Once again, comparing these groups in a dismantling study would make more apparent the mechanisms and processes involved in the IAT effects.

Although not of direct concern for the investigation of the validity of the currently proposed theory, the remaining general recommendations and limitations of the current study may contribute to improvements in IAT-related research:

With regard to methodological considerations the present researcher is appreciative of the contributions made by Greenwald, et al., (2003) in their attempts to decipher a new scoring algorithm. Unfortunately, as the current data was collected before publication of this new algorithm, the recommended inclusion of practice trials was omitted. This is because the practice trials in the current research were used as training trials which would have influenced response latencies in obvious ways. Nevertheless, the rest of Greenwald et al. (2003) recommendations were followed.

Furthermore, the present researcher would advise against the use of a two-form IAT (i.e., the use of a replicate version within the same IAT). Although the current duplication was aimed at ensuring adequate data collection for a difficult to obtain

population, in retrospect this proved unnecessary and was probably responsible for reducing concentration levels and adding to error variance. Although the affect of order proved to be insignificant, there was still a slight increase in reliability for each task that was administered first, thus implying that higher reliabilities might be attained in shorter task versions.

Some consideration should also be given to the use of explicit self-report questionnaires and the potential priming effect that these measures may have on responses to an implicit measure. Bosson et al. (2000) for instance found higher correlations between implicit and explicit measures when the self-report questionnaires were administered prior to the implicit measures. However, other researchers who have worked extensively with implicit measures have failed to find similar results (Greenwald, in Bosson et al., 2000). Nevertheless, more research is required to determine the influence of explicit measures on responding to implicit measures.

The participants in the present study were a group of White South African citizens whose primary languages were English or Afrikaans. This is not an entirely representative sample of a multicultural South African community and this will be a challenge for future research.



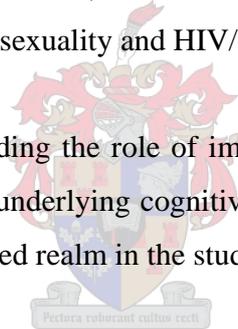
9.6. CONCLUSION

The present study demonstrated that the SIAT and PIAT are reliable but not valid measures of implicit association biases in memory. That the IAT can be a sensitive measure of automatic associations in memory has been consistently demonstrated. That the IAT may also be sensitive to differences in information processing at different stages for probably different levels of anxiety, as was demonstrated in the present study, is a new discovery. Although until now, not much can conclusively be said about the mechanisms that underlie the IAT (Fazio & Olson, 2003), the speculations of the current study offer an alternative framework with which IAT-related results can be interpreted. On this ground the present study offers valuable potential for future IAT-related investigations.

Although research into the IAT is still in its infancy, the development of a reliable and valid task to measure implicit associations would contribute advantageously in terms of assessment and interventions strategies in anxiety and anxiety disorders (Teachman & Woody, 2004). The IAT may prove to be a useful tool in determining termination of treatment, assessing treatment outcome, identifying underlying risk factors for relapse, and even as a tool with which clients can practice forming new and more adaptive associations (Teachman & Woody, 2004).

In addition, research that contributes to the improvement of technology that assesses underlying fear-based cognitive processes would enable investigation into a host of currently topical interests such as the extent of implicit racial discrimination in a newly democratic country such as South Africa, issues of violence and gender discrimination, and underlying attitudes regarding sexuality and HIV/ AIDS-related issues.

Every attempt made at understanding the role of implicit processes and at validating a task which may be able to assess underlying cognitive processes, offers valuable insight into an as yet relatively undiscovered realm in the study of emotional disorders.



CHAPTER TEN

CONCLUSION

The aim of the current research paper was to adapt the IAT so as to assess implicit fear-based associations in the memory of people with social phobia and panic disorder, in accordance with cognitive theories of emotional dysregulation. The motivation for the current paper was based on the shortage of research investigating the role of association in memory of two of the most prevalent of the anxiety disorders. Furthermore, the current study represents one of the first attempts in which the IAT was adapted to assess underlying, self-relevant fear-based structures in a clinical population of people with social phobia and panic disorder, and as such provides a novel contribution to IAT-related research.

In the current study the IAT was adapted so that the categorisation into self (i.e., 'me') and other (i.e., 'not-me') constructs were combined with the classification of items into threat and safety constructs that represent the fears and concerns characteristic of panic disorder and social phobia. In this way, responses to the adapted PIAT and SIAT were expected to reflect the degree and extent of association between the self- and threat, peculiar to people with panic disorder and social phobia respectively. In contrast to what was expected, the clinical and control groups demonstrated significantly faster responses for 'me' + 'safety' (i.e., block #4) compared to the 'me' + 'threat' (i.e., block #7) combinations on both adapted versions, with no significant difference in responses on either of the tasks between the three groups. Although these findings stand in contrast to previous IAT-related studies which demonstrated facilitation effects for participant-related concerns (i.e., facilitated responses for 'me' + 'threat' combinations in block #7), the researchers of the current study have proposed a new framework for the interpretation of such findings as based on implicit processes in clinical anxiety and the mechanisms underlying the IAT.

In line with Cohen's (Cohen et al., 1990) connectionist model, the overall positive IAT values (instead of the expected overall negative IAT values) were interpreted to be a result of a competition between two simultaneous but opposing processes at play when clinically anxious people are placed in circumstances in which the self-system is threatened (i.e., the 'me' + 'threat' combinations in block #7). On one hand, the '**pull**' of association (between 'me' + 'threat') facilitates responses in block #7 (tending toward overall negative IAT values), while on the other hand, the disruptive processes relating to attention diversion (i.e., a pre-attentive bias toward threat-consistent information) interfere with classification demands, '**pushing**' overall IAT values toward the positive end of the continuum. In this sense, the present study's positive IAT values were interpreted as an indication that when clinically anxious people are threatened, processing precedence is awarded to information processes occurring in the earlier stages (such as those reflecting pre-attentive biases), and as such overriding the processes involved in later more elaborative information processing stages, such as association (Blair & Banaji, 1996; Pratto & Bargh, 1991; Dovidio et al., 1997). This is in accordance with Stroop-related literature in which pre-attentive biases toward threat-consistent information for clinically anxious people has consistently been demonstrated.

In light of the newly proposed 'two-forces' theory, the results of the current study suggested that pre-attentive processing biases in clinical anxiety were not limited to domain-specific concerns. Rather, the significant and positive PIAT effects for social phobics and SIAT effects for panickers seemed to indicate a general pre-attentive bias toward the detection of any and all threatening material that occurs at the cost of the task's demand of classifying words into appropriate categories. This can perhaps be expected for clinically anxious people who tend to avoid elaborative threat-related processing (as suggested by Mathew et al., 1993; Mogg, Kentish et al., 1993) and for whom it would be a priority to scan the environment for any and all signs of danger. It might be assumed that the insistent 'push' and 'pull' between opposing forces may have been stronger for panickers on the PIAT (compared to the SIAT) and for social phobics on the SIAT (compared to the PIAT). However, it can also be expected that the culmination of such opposing forces (along with individual differences in the push and

pull forces) would result in no significant difference between the effects of either of the tasks for either of the clinical groups.

The significant and above zero PIAT and SIAT effects obtained by control participants was understandable in light of the fact that normal controls also demonstrated significant attentional bias effects in Stroop-related research. As such 'normal' people may also be more influenced by processes related to attention diversion than processes concerning the association between threat and the self. Attention diversion, coupled with a greater tendency for 'normal' persons to associate the self with positive could explain why the PIAT and SIAT effects for the control group were significant and positive. Once again, the fact that there was no significant difference between any of the three groups (i.e., social phobics, panickers, and controls) regarding IAT responses can perhaps be attributed to a cancelling effect of opposing forces at play. Although the influence of the 'push' and 'pull' forces may have been more significant for the clinically anxious groups (compared to the controls) the opposing nature of such forces and the individual differences among participants may have resulted in final effects for all groups ending up at the same point.

And finally, with the exception of the relation between SIAT effects and SPIN scores for the social phobic group, there are no correlations between PIAT and SIAT effects and the scores from explicit scales. This is accordance with previous implicit-explicit research which contends that these paradigms are unique in assessing independent information processes. The significant and negative relation between the SIAT and SPIN, however, seemed to introduce an unexpected variable into the equation. Where (in line with the newly proposed theory) it might have been expected that increased social phobic severity would account for an increased amount disruption through attention diversion (i.e., increasingly positive IAT effects) the opposite was true. It seemed as if the information processes of people with higher levels of social phobic anxiety may once again be facilitated by the association between self and threat such that overall responses are 'pulled' toward zero. While people with low to medium levels of anxiety may predominantly be influenced by pre-attentive processing biases, people with

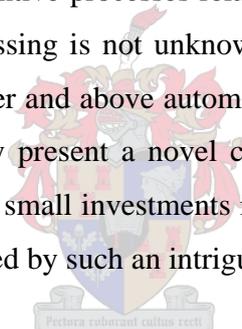
more extreme levels of anxiety, without realising it, might be influenced by the facilitative pull of association processes. This may be because extreme levels of anxiety are associated with an additional avoidance mechanism in which such individuals react spontaneously and impulsively in an attempt to avoid any elaborative threat-related processing or at least the anxiety related to being confronted with dangerous classifications.

That the IAT is sensitive to biases at a pre-attentive level suggests that the IAT may be sensitive to processing differences over and above those which the task was designed to assess. Although this does not mean that the IAT is insensitive to association biases (as concern-relevant biases have been demonstrated in previous IAT-related research), it does somewhat compromise the validity of the PIAT and SIAT as a measure of threat-related associations. Nevertheless, the present study's interpretation of the IAT as being sensitive to pre-attentive biases does support the validity of the IAT as a measure that is able to tap into information processes occurring on a level beyond conscious control. In further support of the adapted measures, the currently observed internal reliabilities of the PIAT and SIAT (which were adequate for purposes of the current study) and correlations between these measures and explicit measures are in line with previous research using latency based paradigms that assess implicit or underlying constructs.

Regardless of the outcome, studies such as the present study contributes potential insight into an as yet undiscovered area of knowledge (namely the potential role of underlying association processes in social cognition), which in itself cannot go unnoticed. It is urged that researchers persist in their efforts to explore such promising avenues and conduct more comprehensive validation studies as this may eventually yield reliable and valid measures of implicit cognition. A greater understanding of the automatic processes hypothesised to underlie anxiety disorders is of relevant knowledge for several aspects of behavioural and cognitive practice and can lead to more accurate assessments of maladaptive cognition and as such contribute to the enhancement of treatment success

and improvements in the ability to estimate the probability of relapse and vulnerability of developing anxiety neurosis (Teachman & Woody, 2004).

Finally, the recent boom in IAT-related research and the strategic contributions made by Greenwald et al. (2003) in their improved scoring formula, not only yield consistent improvements in overall psychometric properties of the recently developed IAT, but also indicate a wide-spread interest in the findings of such an implicit measure. Although the present researcher has, at this stage, no confidence that all the speculations based on such a new theory will remain applicable as investigations continue, it is hoped that such a speculative theory will inspire further investigations into the implications associated with the use of the IAT into the cognitive processes underlying panic disorder and social phobia, as well as the consideration of alternative explanations regarding Null findings on the IAT. That pre-attentive processes related to anxiety involve biases in the early stages of information processing is not unknown, but that the IAT is sensitive to pre-attentive processing biases over and above automatic associations in memory reveals an extraordinary finding that may present a novel contribution to the interpretation of subsequent IAT results. It is these small investments in research that allow day by day, a greater utility of the results obtained by such an intriguing measure.



REFERENCES

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (4th ed.)*. Washington DC: Author.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text revision)*. Washington DC: Author.
- Aminoff, B.Z., Purits, E., Shlomo, N., & Adunsk, A. (2004). Measuring the suffering of the end-stage dementia: Reliability and validity of the Mini-suffering state examination. *Arch. Gerontol. Geriar.* 38, 123-130.
- Amir, N., McNally, R.J., Riemann, B.C., Burns, J., Lorenz, M., & Mullen, J.T. (1996a). Suppression of the emotional Stroop effect by increased anxiety in patients with social phobia. *Behaviour Research and Therapy*, 34 (11/12), 945-948.
- Amir, N., McMally, R.J., Riemann, B.C., & Clements, C. (1996b). Implicit memory bias for threat in panic disorder: Application of the “white nose” paradigm. *Behaviour Research and Therapy*, 34, 157-162.
- Amorim, P., Lecruiber, Y., Weiller, E., Hergueta, T., & Sheehan, D. (1998). DSM-III-R psychotic disorders: Procedural validity of the MINI Neuropsychiatric Interview (MINI) concordance and cases for discordance with the CIDI. *European Psychiatry*, 13, 26-34.
- Argyle, N. (1988). Case histories and short communications. *Behaviour Research and Therapy*, 26, 261-264.
- Asendorpf, J.B., Banse, R., & Mücke, D. (2002). Double dissociation between implicit and explicit personality self-concept: The case of shy behaviour. *Journal of Personality and Social Psychology*, 83, 380-393.
- Asmundson, G.T.G. & Stein, M.B. (1994). Selective Processing of social threat in patients with generalized social phobia: Evaluation on using dot-probe paradigm. *Journal of Anxiety Disorders*, 8, 107-117.
- Ballenger, J.C. & Fyer, A.J. (1996). Panic disorder and agoraphobia. In T.A. Widiger, A.J. Frances, H.A. Pincus, R. Ross, M.B. First, & W.W. Davis (Eds.), *DSM-IV Sourcebook*, (Vol. 2, pp. 411-471). Washington, DC: American Psychiatric Association.
- Banaji, M. R. & Hardin, C. D. (1996). Automatic Stereotyping. *Psychological Science*, 7 (3), 136-141.
- Banaji, M. R., Hardin, C., & Rothman, A. J. (1993). Implicit stereotyping in person judgment. *Journal of Personality and Social Psychology*, 65 (2), 272-281.

- Banse, R., Seise, J., & Zerbis, N. (2001). Implicit attitudes towards homosexuality: Reliability, validity, and controllability of the IAT. *Zeitschrift Für Experimentelle Psychologie*, 48, 141-160.
- Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J.S. Uleman et al (Eds.), *Unintended thought*, (pp. 3-51). New York: Guilford Press.
- Bargh, J.A. (1997). The automaticity of everyday life. In R.S., Jr. Wyer (Ed.), *Advances in social cognition*, (Vol. 10, pp. 1-61). Mahwah, NJ:Erlbaum.
- Bargh, J.A., Chaiken, S., Govender, R., & Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology*, 62 (6), 893-912.
- Bargh, J. A., Chaiken, S., Raymond, P., & Hymes, C. (1996). The automatic evaluation effect: Unconditional automatic attitude activation with a pronunciation task. *Journal of Experimental Social Psychology*, 32 (1), 104-128.
- Bargh, J.A., Chen, M., & Burrows, L. (1996). Automaticity of social behaviour: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, 2, 230-244.
- Bargh, J.A., Lomabardi, W.J., & Higgins, E.T. (1988). Automaticity of chronically accessible constructs in person situation effects on person perception: It's just a matter of time. *Journal of Personality and Social Psychology*, 55 (4), 599-605.
- Beck, A.T. (1967). *Depression: Causes and Treatment*. Philadelphia: University of Pennsylvania Press.
- Beck, A.T. (1976). *Cognitive Therapy and the Emotional Disorders*. New York: International University Press.
- Beck, A.T. & Clark, D.A. (1997). An information processing model of anxiety: automatic and strategic processes. *Behaviour Research and Therapy*, 35, 49-58.
- Beck, A. T., Emery, G., & Greenberg, R.L. (1985). *Anxiety Disorders and Phobias: A Cognitive Perspective*. New York: Basic Books.
- Beck, A.T., Rush, A.J., Shaw, B.F., & Emery, G. (1979). *Cognitive Therapy of Depression*. New York: Guilford Press.
- Beck, A.T. & Steer, R.A. (1987). *Manual for the Beck Depression Inventory*. San Antonio: The psychological Corporation.

Beck, A.T., Steer, R.A., & Brown, G.K. (1996). *The Beck Depression Inventory (2nd Ed.) Manual*. The Psychological Corporation. Harcourt Brace and Company: San Antonio

Beck, A.T., Steer, R.A., & Garbin, M.G. (1988). Psychometric properties of the Beck Depression Inventory: twenty-five years of evaluation. *Clinical Psychology Review*, 8, 77-100.

Beck, A.T., Steer, R.A., Kovacs, M., & Garrison, B. (1985). Hopelessness and eventual suicide: A 10-year prospective study of patients hospitalized with suicidal ideation. *American Journal of Psychiatry*, 142 (5), 559-563.

Becker, E., Rinck, M., & Margraf, J. (1994). Memory bias in panic disorder. *Journal of Abnormal Psychology*, 103, 396-399.

Berkowitz, L. (1984). Some effects of thought on anti- and prosocial influences of media events: a cognitive-neoassociation analysis. *Psychological Bulletin*, 95, 410-427.

Blair, I.V. & Banaji, M.R. (1996). Automatic and controlled processes in stereotype priming. *Journal of Personality and Social Psychology*, 70 (6), 1142-1163.

Bornstein, R.F. (1998). Implicit and self-attributed dependency strivings: Differential relationships to laboratory and field measures of help-seeking. *Journal of Personality and Social Psychology*, 75, 778-787.

Bosson, J.K., Swann, W.B., & Pennebaker, J.W. (2000). Stalking the perfect measures of implicit self-esteem: The blind men and the elephant revisited? *Journal of Personality and Social Psychology*, 79 (4), 631-643.

Bower, G.H. (1981). Mood and memory. *American Psychologist*, 36, 127-148.

Bower, G.H. (1985, September). *A review of research on mood and memory*. Paper presented at the Symposium on Affect and Cognition, Cognitive Psychology Section. British Psychological Society, Oxford.

Bower, G.H. (1987). Commentary on mood and memory. *Behaviour Research and Therapy*, 25, 443-456.

Brendl, C.M., Markman, A.B., & Messner, C. (2001). How do indirect measures of evaluation work? Evaluating the inference of prejudice in the Implicit Association Test. *Journal of Personality and Social Psychology*, 18, 760-773.

Burgess, I.S., Jones, L.N., Robertson, S.A., Radcliffe, W.N., Emerson, E., Lawler, P., & Crow, T.J. (1981). The degree of control exerted by phobic and non-phobic verbal stimuli over the recognition behaviour of phobic and non-phobic participants. *Behaviour Research and Therapy*, 19, 223-234.

- Buzan, B. & Buzan, T. (2002). *The Mind Map Book*. London: BBC Worldwide.
- Cantor, N. & Mischel, W. (1977). Traits as prototypes: Effects on recognition memory. *Journal of Personality and Social Psychology*, 35, 38-48.
- Carson, R.C. & Butcher, J.N. (1992). *Abnormal Psychology and Modern Life (9th ed.)*. New York: HarperCollins Publishers.
- Cassiday, K.L., McNally, R.J., & Zeitlin, S.B. (1992). Cognitive processing of trauma cues in rape victims with post-traumatic stress-disorder. *Cognitive Therapy and Research*, 16, 283-295.
- Chaiken, S. & Bargh, J.A. (1993). Occurrence versus moderation of the automatic attitude activation effect: reply to Fazio. *Journal of Personality and Social Psychology*, 64 (5), 759-765.
- Clark, D. M. (1986). A Cognitive Approach to Panic. *Behaviour Research and Therapy*, 24, 461-470.
- Clark, D. M. (1988). A Cognitive model of panic attacks. In S.Rachman, & J.D.Maser (Eds.), *Panic: Psychological Perspectives*, (pp. 71-90), Hillsdale, N.J.:Lawrence Erlbaum Associates.
- Clark, D.M. (1993). Cognitive mediation of panic attacks induced by biological challenge tests. *Behaviour Research and Therapy*, 15, 75-84.
- Clark, D.M. & Ehlers, A. (1993). An overview of the cognitive theory and treatment of panic. *Applied and Preventative Psychology*, 2, 131-139.
- Clark, D.M., Salkovskis, P.M., Gelder, M., Koehler, K., Martin, M., Anastasiades, P., Hackmann, A., Middleton, H., & Jeavons, A. (1988). Tests of a cognitive theory of panic. In Hand & H.U. Wittchen (Eds.), *Treatment of panic and phobias- modes of application and variables affecting outcome*, (Vol. 2, pp. 39-42). Berlin: Springer.
- Clark, D.M. & Wells, A. (1995). A cognitive model of social phobia. In R. Heimberg, M.Liebowitz, D.A. Hope & F.R Schneier (Eds.), *Social phobia: Diagnosis, assessment and treatment* (pp.69-93) New York: Guilford Press.
- Cloitre, M., Cancienne, J., Heimberg, R.G., Holt, C.S., & Liebowitz, M.R. (1995). Memory bias does not generalize across anxiety disorders. *Behaviour Research and Therapy*, 33 (3), 305-307.
- Cloitre, M., Heimberg, R.G., Holt, C.S., & Liebowitz, M.R. (1992). Reaction time to threat stimuli in panic disorder and social phobia. *Behaviour Research and Therapy*, 30 (6), 609-617.

- Cloitre, M. & Liebowitz, M.R. (1991). Memory bias in panic disorder: An investigation of the cognitive avoidance hypothesis. *Cognitive Therapy and Research*, 15, 371-386.
- Cloitre, M., Shear, K., Cancienne, J., & Zeitlin, S. (1994). Implicit and explicit memory for catastrophic associations for bodily sensation words in panic disorder. *Cognitive Therapy and Research*, 18, 225-240.
- Cohen, J.D., Dunbar, K., & McClelland, J.L. (1990). On the control of automatic processes: A parallel distributed processing account of the Stroop effect. *Psychological Review*, 97, 332-361.
- Collins, A.M. & Loftus, E.L. (1975). A spreading-activation theory of semantic processing. *Psychological Review*, 82, 407-428.
- Conner, K.M., Davidson, J.R.T., Churchill, L., Sherwood, A., Foa, E., & Weisler, R.H. (2000). Psychometric properties of the social phobia inventory: new self-rating scale. *British Journal of Psychiatry*, 176, 379-386.
- Crawford, J.R., Parker, D.M., Stewart, L.E., Bessen, J.A.O. & de Lacey, G. (1989). Prediction of WAIS-IQ with the National Adult Reading Test: cross-validation extension. *British Journal of Clinical Psychology*, 28, 267-273.
- Crawford, J.R., Stewart, L.E., Garthwaite, P.H., Parker, D.M., & Bessen, J.A.O. (1988). The relationship between demographic variables and NART performance in normal subjects. *British Journal of Clinical Psychology*, 27, 181-182.
- Cunningham, W.A., Preacher, K.L., & Banaji, M.R. (2001). Implicit attitude measures: consistency, stability, and convergent validity. *Psychological Science*, 121 (2), 163-170.
- Dalgleish, T. & Watts, F.N. (1990). Biases of attention and memory in disorders of anxiety and depression. *Clinical Psychology Review*, 10, 589-604.
- Dasgupta, N. & Greenwald, A. G. (2001). Exposure to admired group membership reduces automatic intergroup bias. *Journal of Personality and Social Psychology*, 81, 800-814.
- Dasgupta, N., McGhee, D.E., Greenwald, A.G., & Banaji, M.R. (2000). Automatic preference for White Americans: eliminating the familiarity explanation. *Journal of Experimental Social Psychology*, 36, 316-328.
- Davidson, J.R.T., Miner, C.M., DeVeugh-Geiss, J., Tupler, L.A., Colket, J.T., & Potts, N.L.S. (1997). The brief social phobia scale: a psychometric evaluation. *Psychological Medicine*, 27, 161-166
- Dawkins, K. & Furnham, A. (1989). The colour-naming of emotional words. *British Journal of Psychology*, 80, 383-389.

- DeBono, K.G. & Snyder, M. (1995). Acting on one's attitudes: The role of a history of choosing situations. *Personality and Social Psychology Bulletin*, 21 (6), 620-628.
- De Houwer, J. (2001). A structural and process analysis of the Implicit Association Test. *Journal of Experimental and Social Psychology*, 37, 443-451
- De Houwer, J. (2002). The Implicit Association Test as a tool for studying dysfunctional association in psychopathology: strengths and limitations. *Journal of Behaviour Therapy and Experimental Psychiatry*, 33 (2), 115-133
- De Houwer, J. (2003). The extrinsic effective Simon Task. *Experimental Psychology*, 50 (2): 77-85
- De Jong, P.J. (2002). Implicit self-esteem and social anxiety: Differential self-favouring effect in high and low anxious individuals. *Behaviour Research and Therapy*, 40 (5), 501-508.
- De Jong, P.J., Pasmán, W., Kindt, M., & van den Hout, M.A. (2001). A reaction time paradigm to assess complaint-specific (implicit) dysfunctional beliefs. *Behaviour Research and Therapy*, 39, 101-113.
- De Ruiter, C. & Brosschot, J.F. (1994). The emotional Stroop interference effect in anxiety: attentional bias or cognitive avoidance? *Behaviour Research and Therapy*, 32, (3), 315-319.
- Devine, P.G. (1989). Stereotypes and prejudice: their automatic and controlled components. *Journal of Personality & Social Psychology*, 56 (1), 5-18.
- Dijksterhuis, A.P. & van Knippenberg, A.D. (1995). Timing of schema activation and memory: Inhibited access to inconsistent information. *European Journal of Social Psychology*, 12 (4), 383-390.
- Di Nardo, P.A., Brown, T.A., & Barlow, D.H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV: Lifetime version*. San Antonio: Psychological Corporation.
- Dodge, C.S., Hope, D.A., Heimberg, R.G., & Becker, R.E. (1988). Evaluation of the social interaction self-statement test with a social phobic population. *Cognitive Therapy and Research*, 12, 211-222.
- Dovidio, J.F., Kawakami, K., Johnson, C., Johnson, B., & Howard, A. (1997). On the nature of prejudice: automatic and controlled processes. *Journal of Experimental Social Psychology*, 33, 510-540.
- Dreesen, L., Arntz, A., Hendriks, T., Keun, N., & van den Hout, M. (1999). Avoidant personality disorder and implicit schema-congruent information processing bias: A pilot study with a pragmatic inference task. *Behaviour Research and Therapy*, 37 (7), 619-632.

Echt, K.W., Morrell, R.W., & D.C. Park. (1998). Effects of age and training formats on basic computer skill acquisition in older adults. *Educational Gerontology, 24*, 3-25. Abstract retrieved October 3, 2004, from World Institute on Disability Web Site: <http://www.wid.org/archives/telecom/appendix2e.html>.

Egan, Dennis E. (1988). Individual differences in human-computer interaction. In M. Helander (Ed.), *Handbook of Human-Computer Interaction*. Elsevier Science Publishers, 543-568. Abstract retrieved October 3, 2004, from World Institute on Disability Web Site: <http://www.wid.org/archives/telecom/appendix2e.html>.

Egan, Dennis E., & Louis M. Gomez. (1985). Assaying, isolating and accommodating individual differences in learning a complex skill. In R. Dillon (Ed.), *Individual Differences in Cognition*, Volume 2 . New York: Academic Press, 173-217. Abstract retrieved October 3, 2004, from World Institute on Disability Web Site: <http://www.wid.org/archives/telecom/appendix2e.html>.

Egloff, B. & Schmukle, S.C. (2002). Predictive validity of an Implicit Association Test for assessing anxiety. *Journal of Personality and Social Psychology, 83* (6), 1441-1455.

Ehlers, A., Margraf, J., Davies, S., & Roth, W.T. (1988). Selective processing of threat cues in participants with panic attack. *Cognition and Emotion, 2*, 201-219.

Epstein, S. (1994). Integration of the cognitive and psychodynamic unconscious. *American Psychologist, 49*, 709-724.

Eysenck, M. (1992). *Anxiety and Cognition: A Unified Theory*. Hove, U.K.: McGraw-Hill.

Farnham, S.D. (1999). *From Implicit self-esteem to in-group favouritism*. Unpublished doctoral dissertation, University of Washington.

Farnham, S.D. & Greenwald, A.G. (1998, May). *Implicit balance of personal and social identity: I am good + I am female = female is good*. Paper presented at the meetings of the Midwestern Psychological association, Chicago.

Farnham, S.D., Greenwald, A.G., & Banaji, M.R. (1999). Implicit self-esteem. In D. Abrams & M. Hoggs (Eds.), *Social identity and social cognition* (pp. 230-248). Cambridge, MA :Blackwell.

Fazio, R.H. (1986). How do attitudes guide behaviour? In Sorrentino, R.M. and Higgins, E.T. (Eds.), *Handbook of Motivation and Cognition*, (Vol. 1, pp. 204-243). New York: Guilford

Fazio, R.H. (1990). Multiple processes by which attitudes guide behaviour: The MODE model as an integrative framework. In M. P. Zanna (Ed.), *Advances in Experimental Psychology*, (Vol. 23, pp. 75-109). San Diego, CA: Academic Press.

Fazio, R.H. & Dunton, B.C. (1997). Categorization by race: The impact of automatic and controlled components of racial prejudice. *Journal of Experimental Social Psychology*, 33, 451-470.

Fazio, R.H., Jackson, J.R., Dunton, B.C., & Williams, C.J. (1995). Variability in automatic activation as an unobtrusive measure of racial attitudes: A bona fide pipeline? *Journal of personality and Social Psychology*, 69 (6), 1013-1027.

Fazio, R.H. & Olson, M.A. (2003). Implicit measures in social cognition research: their meaning and use. *Annual Review of Psychology*, 54, 297-327.

Fazio, R.H., Powell, M.C., & Herr, P.M. (1983). Toward a process model of the attitude behaviour relation: Accessing one's attitudes upon mere observation of the attitude-object. *Journal of Personality and Social Psychology*, 44, 723-735.

Fazio, R.H., Sanbonmatsu, D.M., Powell, M.C., & Kardes, F.R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology*, 50 (2), 229-238.

Fazio, R.H. & Williams, J. (1986). Attitude accessibility as a moderator of the attitude-perception and attitude-behaviour relations: An investigation of the 1984 presidential election. *Journal of Personality and Social Psychology*, 51, 505-514.

First, M., Spitzer, R., Gibbon, M., & Williams, J. (1996). *Structured Clinical interview for DSM-IV Axis I disorders- Patient edition (SCID-I/P, Version 2.0, 8/89 revision)*. New York State Psychiatric Institute, Biometrics Research Department, New York.

First, M., Spitzer, R., Gibbon, M., & Williams, J. B. W. (2004, March 3). Welcome to the SCID homepage. Retrieved September 10, 2004. Abstract received from American Psychiatric Publishing, from [http://www.scid4 .org/](http://www.scid4.org/).

Fiske, A.D. & Schneider, W. (1984). Consistent attending versus consistent responding in visual search: Task versus component consistency in automatic processing development. *Bulletin of the Psychonomic Society*, 22, 330-332.

Fiske, A.D. & Taylor, S.E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.

Foa, E.B., & Kozak, M.J. (1986). Emotional processing of fear: exposure to corrective information. *Psychological Bulletin*, 99, 20-35.

Foa, E.B. & McNally, R.J. (1986). Sensitivity to feared stimuli in obsessive-compulsives: a dichotic listening analysis. *Cognitive Therapy and Research*, 10, 477-486.

Gemar, M.C., Segal, Z.V., Sagrati, S., & Kennedy, S.J. (2000). *Contributions of effortful and automatic measures of cognition to a risk marker for depressive relapse/recurrence: The Implicit Association Task in depression*. Manuscript submitted for publication.

Glass, C.R., Merluzzi, T.V., Biever, J.L., & Larsen, K.H. (1982). Cognitive assessment of social anxiety: Development and validation of a self-statement questionnaire. *Cognitive Therapy and Research*, 6, 37-55.

Goodman, W.K., Price, L.H., Rasmussen, S.A., Mazure, C., Delgado, P., Heninger, G.R., et al. (1989a). The Yale-Brown Obsessive-Compulsive Scale, II: validity. *Archives of General Psychiatry*, 46, 1012-1016.

Goodman, W.K., Price, L.H., Rasmussen, S.A., Mazure, C., Fleischmann, R.L., Hill, C.L., Heninger, G.R., & Charney, D.S. (1989b). The Yale-Brown Obsessive-Compulsive Scale, I: development, use, and reliability. *Archives of General Psychiatry*, 46, 1006-1011.

Gotlib, I.H. & McCann, C.D. (1984). Construct accessibility and depression: An examination of cognitive and affective factors. *Journal of Personality and Social Psychology*, 47, 427-439.

Graf, P. & Mandler, G. (1984). Activation makes words more accessible, but not necessarily more retrievable. *Journal of Verbal Learning and Verbal Behaviour*, 23, 553-568.

Greenwald, A.G., & Banaji, M.R. (1995). Implicit Social cognition: attitudes, self-esteem, and stereotypes. *Psychological Review*, 102, 1, 4-27.

Greenwald, A.G., Banaji, M.R., Rudman, L.A., Farnham, S.D., Nosek, B.A., & Mellot, D.S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, 109, 3-25.

Greenwald, A.G. & Farnham, S.D. (2000). Using the Implicit Association Test to measure self-esteem and self-concept. *Journal of Personality and Social Psychology*, 79, 1022-1038.

Greenwald, A.G., Klinger, M.R., & Liu, T.J. (1989). Unconscious processing of dichotomically masked words. *Memory and Cognition*, 17, 35-47.

Greenwald, A.G., McGhee, D.E., & Schwartz, J.L.K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, 74, 1464-1480.

Greenwald, A.G. & Nosek, B.A. (2001). Health of the Implicit Association Test at age 3. *Zeitschrift für Experimentelle Psychologie*, 48, 85-93.

- Greenwald, A.G., Nosek, B.A., & Banaji, M.R. (2003). Understanding and using the Implicit Association Test I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, 85 (2), 197-216.
- Gregory, R.J. (1996). Tests and Testing Process. In R.J. Gregory (Ed.), *Psychological testing: history, principles and applications* (pp. 32-61). Needham Heights: Allyn & Bacon.
- Guy, W (Ed). (1976). *Assessment Manual for Psychopharmacology*. Publication ADM 76-338, pp. 217-222. Rockville, MS: U.S. Department of Health Education, and Welfare.
- Halford, K. & Foddy, M. (1982). Cognitive and social skills correlates of social anxiety. *British Journal of Clinical Psychology*, 21, 17-28.
- Harvey, J.M., Richards, J.C., Dziadosz, T., & Swindell, A. (1993). Misinterpretation of ambiguous stimuli in panic disorder. *Cognitive Therapy and Research*, 17, 3, 235-248.
- Heimberg, R.G., Acerra, M.C., & Holstein, A. (1985). Partner similarity mediates interpersonal anxiety. *Cognitive Therapy and Research*, 9, 443-453.
- Hiemberg, R.G., Liebwitz, M.R., Hope, D.A., & Schneier, F.R. (1995). *Social Phobia: Diagnosis, Assessment, and Treatment*. NY: Guilford Press.
- Hibbert, G.A. (1984). Ideational components of anxiety: Their origin and content. *British Journal of Psychiatry*, 144, 618-624.
- Higgins, E.T., & Bargh, J.A. (1987). Social perception and social cognition. *Annual Review of Psychology*, 38, 369-425.
- Holle, C., Heimberg, R.G., & Neely, J.H. (1997). The effects of blocked versus random presentation and semantic relatedness of stimulus words on response to a modified Stroop task among social phobics. *Cognitive Therapy and Research*, 21 (6), 681-697.
- Hope, D.A., Rapee, R.M., Heimberg, R.G., & Dombek, M.J. (1990). Representations of the self in social phobia: vulnerability to social threat. *Cognitive Therapy and Research*, 14, 177-189.
- Houston, D.A. & Fazio, R.H. (1989). Biased processing as a function of attitude accessibility: Making objective judgments subjectively. *Social Cognition*, 7 (1), 51-66.
- Kawakami, K., Dion, K.L., & Dovidio, J.F. (1998). Racial prejudice and stereotype activation. *Personality and Social Psychology Bulletin*, 24 (4), 407-416.
- Kim, D.Y. (2001). *Voluntary controllability of implicit cognition: Can an implicit measure (the IAT) of attitudes be faked?* Manuscript submitted for publication.

- Kim, D.Y. & Greenwald, A.G. (1998, May). *Voluntary controllability of implicit cognition: Can implicit attitudes be faked?* Paper presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL.
- Keogh, E.D., Georgiou, G., & Hunt, C. (2001). Selective attentional biases for physical threat in physical anxiety sensitivity. *Journal of Anxiety Disorders, 15*, 299-315.
- Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C.B., Hughes, M., Eshleman, S., Wittchen, H.U., et al. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry, 51*, 8-19.
- Krosnick, J.A (1989). Attitude importance and attitude accessibility. *Personality and Social Psychology Bulletin, 15* (3), 297-308.
- Lang, P.J. (1977). Imagery in therapy: An informational theory of emotional imagery. *Behaviour Therapy, 8*, 862-886.
- Lang, P.J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 17*, 495-512.
- Lang, P.J. (1985). The cognitive psychophysiology of emotion: fear and anxiety. In A.H. Tuma & J. Maser (Eds.), *Anxiety and the Anxiety Disorders*. Hillsdale, N.J.: Lawrence Erlbaum.
- Lang, P.J., Levin, D.N., Miller, G.A., & Kozak, M.J. (1983). Fear behaviour, fear imagery, and the psychophysiology and emotion: The problem of affective response integration. *Journal of Abnormal Psychology, 92* (3), 276-306.
- Leclubier, Y., Sheehan, D.V., Weiller, E., Amorim, P., Bonora, I., Sheehan, K.H., Janavs, J., & Dunbar, C.J. (1997). The MINI International Neuropsychiatric Interview (MINI). A short diagnostic structured interview: Reliability and validity according to the CIDI. *European Psychiatry, 12*, 224-231.
- Liebowitz, M.R., Gorman, J.M., Fyer, A.J., & Klein, A.F. (1985). Social phobia: Review of a neglected anxiety disorder. *Archives of general psychiatry, 42*, 729-736.
- Liebowitz, M.R., Holt, C.S., Heimberg, R.G., & Hope, D.A. (1992). Situational domains of Social Phobia. *Journal of Anxiety Disorders, 6*, 63-77.
- Lucock, M. P. & Salkovskis, P.M. (1988). Cognitive factors in social anxiety and its treatment. *Behaviour Research and Therapy, 26*, 297-302.
- Lundh, L & Öst, L. (1996). Recognition bias for critical faces in social phobics. *Social Research and Therapy 34, 10*, 787-794.

- Lundh, L.G., Wikstrom, J., Westerlund, J., & Ost, L.G. (1999). Preattentive bias for emotional information in panic disorder with agoraphobia. *Journal of Abnormal Psychology, 108* (2), 222-232.
- MacLeod, C.M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin, 109*, 163-203.
- MacLeod, C. & Hagan, R. (1992). Individual differences in the selective processing of threatening information, and emotional responses to a stressful life event. *Behaviour Research and Therapy, 30*, 151-161.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*, 15-20.
- MacLeod, C. & McLaughlin, K. (1995). Implicit and explicit memory bias in anxiety: a conceptual replication. *Behaviour Research and Therapy, 33* (1), 1-14.
- MacLeod, C. & Rutherford, E.M. (1992). Anxiety and the selective processing of emotional information: Mediating roles of awareness, trait and state variables, and personal relevance of stimulus materials. *Behaviour Research and Therapy, 30*, 479-491.
- MacLeod, C. & Rutherford, E.M. (1998). Implicit and explicit memory bias in anxiety: a conceptual replication. *Behaviour Research and Therapy, 33*, 1-14.
- Mahone, E.M., Bruch, M.A., & Heimberg, R.G. (1993). Focus and attention and social anxiety: The role of negative self-thoughts and perceived positive attributes of the other. *Cognitive Therapy and Research, 17*, 209-224.
- Mandler, G. (1982). The structure of value: accounting for taste. In M.S. Clark and S.T. Fiske (Eds.), *Affect and Cognition*. (pp. 55-78) Hillsdale, N.J.: Lawrence Erlbaum.
- Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology, 35*, 63-78.
- Markus, H. (1990). Unresolved issues of self-presentation. *Cognitive Therapy and Research, 14*, 241-253.
- Martin, M., Williams, R.M., & Clark, D.M. (1991). Does anxiety lead to selective processing of threat-related information. *Behaviour Research and Therapy, 29*, 2, 147-160.
- Mathews, A.M. (1990). Why worry? The cognitive function of anxiety. *Behaviour Research and Therapy, 28*, 455-468.
- Mathews, A.M. & Klug, F. (1993). Emotionality and interference with colour-naming in anxiety. *Behaviour Research Therapy, 23* (1), 57-62.

- Mathews, A.M. & MacLeod, C. (1985). Selective processing of threat-cues in anxiety states. *Behaviour Research and Therapy*, 23, 563-569.
- Mathews, A.M. & Macleod, C. (1986). Discrimination of threat cues without awareness in anxiety states. *Journal of Abnormal Psychology*, 95, 131-138.
- Mathews, A.M. & Macleod, C. (1994). Cognitive Approaches to emotion and emotional disorders. *Annual Review of Psychology*, 45, 25-50.
- Mathews, A.M., Mogg, K., Kentish, J., & Eysenck, M. (1995). Effect of psychological treatment on cognitive bias in generalized anxiety disorder. *Behaviour Research and Therapy*, 33, 293-303.
- Mathews, A.M., Mogg, K., May, J., & Eysenck, M.W. (1989). Implicit and explicit memory bias in anxiety. *Journal of Abnormal Psychology*, 98, 236-240.
- Mathews A.M. & Sebastian, S. (1993). Suppression of emotional Stroop effects by fear arousal. *Cognition and Emotion*, 7, 517-530.
- Mattia, J.L., Heimberg, R.G., Hope, & D.A. (1993). The revised Stroop colour-naming task in social phobics. *Behaviour Research and Therapy*, 31, 305-313.
- McConnell A.R. & Leibold, J.M. (2001). Relations among the Implicit Association Test, discriminatory behaviour, and explicit measures of racial attitudes. *Journal of Experimental Social Psychology*, 37, 435-442.
- McLelland, D.C. (1999). How the test lives on: extensions of the Thematic Apperception Test approach. In L. Gieser & M.I. Stein (Eds.), *Evocative images: The Thematic Apperceptions Test and the Art of Projection*, (pp. 163-175). Washington, DC: American Psychological Association.
- McNally, R.J. (1990). Psychological approaches to panic disorder: A review. *Psychological Bulletin*, 108, 403-419.
- McNally, R.J. (1995). Automaticity and the anxiety disorders. *Behaviour Research and Therapy*, 33, 747-754.
- McNally, R.J., Amir, N., Louro, C.E., Lukach, B.M., Riemann, B.C., & Calamari, J.E. (1994). Cognitive processing of idiographic emotional information in panic disorder. *Behaviour Research and Therapy*, 32, 119-122.
- McNally, R.J., Foa, E.B., Donnell, C.D. (1989). Memory bias for anxiety information in patients with panic disorder. *Cognition and Emotion*, 3, 27-44.

- McNally, R.J., Riemann, B.C., & Kim, E. (1990). Selective processing of threat cues in panic disorder. *Behaviour Research and Therapy*, 28, 407-412.
- McNally, R.J., Riemann, B.C., Louro, C.E., Lukach, B.M., & Kim, E. (1992). Cognitive processing of emotional information in panic disorder. *Behaviour Research and Therapy*, 30, 143-149.
- Mellman, T.A. & Uhde, T.W. (1986). Withdrawal syndrome with gradual tapering of alprazolam. *American Journal of Psychiatry*, 143, 4164-4166.
- Mellot, D.S. & Greenwald, A.G. (2000, May). *Measuring implicit ageism: Do the Implicit Association Test and the Semantic Priming measure the same construct?* Paper presented at meetings of the Midwestern Psychological Association, Chicago, IL.
- Mierke, J. & Klauer, K.C. (2001). Implicit association measurement with the IAT: Evidence of the effects of executive control processes. *Zeitschrift für Experimentelle Psychologie*, 48, 107-122.
- Milliken, B, Lupianez, J., Debner, J, & Abello, B. (1999). Automatic and controlled processing in Stroop negative priming: the role of attentional set. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 25 (6), 1384-1402.
- Mogg, K., Bradley, B.P., Williams, R., & Mathews, A.M. (1993). Subliminal processing of emotional information in anxiety and depression. *Journal of Abnormal Psychology*, 102, 304-311.
- Mogg, K., Bradley, B.P., Millar, N., & White, J. (1995). A follow-up study of cognitive bias in generalised anxiety disorder. *Behaviour Research and Therapy*, 33, 927-935.
- Mogg, K., Kentish, J., & Bradley, B.P. (1993). Effects of anxiety and awareness on colour identification latencies for emotional words. *Behaviour Research and Therapy*, 31, 559-567.
- Mogg, K. & Marden, B. (1990). Processing of emotional information in anxious subjects. *British Journal of Clinical Psychology*, 29, 227-229.
- Mogg, K., Mathews, A.M., Bird, C., & MacGregor-Morris, R. (1990). Effects of stress and anxiety on the processing of threat stimuli. *Journal of Personal Social Psychology*, 59, 1230-1237.
- Mogg, K., Mathews, A.M., & Eysenck, M. (1992). Attentional bias to threat in clinical anxiety states. *Cognition and emotion*, 6, 149-159.
- Mogg, K., Mathews, A.M., & Weinman, J. (1987). Memory bias in clinical anxiety. *Journal of Abnormal Psychology*, 96, 94-98.

- Mogg, K., Mathews, A.M., & Weinman, J. (1989). Selective processing of threat cues in anxiety states: a replication. *Behaviour Research and Therapy*, 27, 317-323.
- Moore, M.C., & Zebb, B.J. (1999). The catastrophic misinterpretation of physiological distress. *Behaviour Research and Therapy*, 37 (11), 1105-1118.
- Navon, D & Margalit, B. (1983). Allocation of attention according to informativeness in visual recognition. *Quarterly Journal of Experimental Psychology*, 35A, 497-512.
- Neely, J.H. (1977). Semantic priming and retrieval from lexical memory: Roles of inhibitionless spreading activation and limited-capacity attention. *Journal of Experimental Psychology: General*, 106, 225-254.
- Neisser, U. (1976). *Cognition and Reality*. San Francisco: Freeman.
- Nelson, H.E. (1982). *National Adult Reading Test (NART): Test Manual*. Windsor: NFER-Nelson.
- Nisbett, R.E. & Wilson, T.D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological review*, 84, 231-259.
- Nortje, C (1999). *A self-help manual for the treatment of social phobia*. Department of Psychology: University of Stellenbosch.
- Nosek, B.A. & Banaji, M.R. (2001). The Go-No Go association task. *Social Cognition*, 19, 625-666.
- Nosek, B.A., Banaji, M.R., & Greenwald, A.G. (May 1998). *Gender differences in implicit attitudes toward mathematics*. Paper presented for the Midwestern Psychological Association, Chicago, IL.
- Nosek, B.A., Banaji, M.R., & Greenwald, A.G. (2002). Harvesting Implicit Group attitudes and beliefs from a demonstration website. *Group Dynamics*, 6, 101-115.
- Nosek, B.A., Banaji, M.R., & Greenwald, A.G. (2002, August). Project Implicit. Retrieved June 6, 2004, from <http://www.harvard.edu/implicit>.
- Nosek, B.A., Banaji, M.R., & Greenwald, A.G. (2002, August). Project Implicit for African study. Retrieved June 6, 2004, from <http://implicit.harvard.edu/southafrica>
- Nosek, B.A., Greenwald, A.G., & Banaji, M.R. (2003). Understanding and using the Implicit association test: II. Methodological issues. *Unpublished manuscript*.
- Nunnally, J.C. (1976). *Psychometric Theory*. New York: McGraw Hill.
- Ottaviani, R. & Beck, A.T. (1987). Cognitive aspects of panic disorder. *Journal of Anxiety Disorders*, 1, 15-28.

- Ottaway, S.A., Hayden, D.C., & Oakes, M.A. (2001). Implicit attitudes and racism: The effect of word familiarity and frequency in the Implicit Association Test. *Social Cognition, 19* (2), 97-144.
- Pace, T.M. (1988). Schema theory: A framework for research and practice in psychotherapy. *Journal of Cognitive Psychotherapy: An International Quarterly, 2* (3), 147-163.
- Pearson, P.D. (1982). Schema Theory. *Volta Review, 84* (5), 25-33.
- Perdue, C.W., Dovidio, J.F., Gurtman, M.B., & Tyler, R.B. (1990). Us and them: Social categorization and the process of intergroup bias. *Journal of Personality and Social Psychology, 59*, 3:475-486.
- Phelps, E.A., O'Connor, K.J., Cunningham, W.A., Funayama, E.S., Gatenby, J.C., Gore, J.C., & Banaji, M.R. (2000). Performance on indirect measures of race bias predicts amygdala activation. *Journal of Cognitive Neuroscience, 12* (5), 729-738.
- Pinninti, N.R., Madison, H., Musser, E., & Rissmiller, H. (2003). MINI International neuropsychiatric schedule: clinical utility and patient acceptance. *European Psychiatry, 18* (7), 361-364.
- Power, M. & Dalgleish, T. (1997). *Cognition and Emotion: From order to disorder* (pp. 70-79 and 122-127), Hove, UK: Psychology Press.
- Pratto, F. & Bargh, J.A. (1991). Stereotyping based on apparently individuating information: Trait and Global components of sex stereotyping under attentional overload. *Journal of Experimental Social Psychology, 27*, 26-47.
- Rachman, S., Lopatka, K., & Levitt, L. (1988). Experimental analysis of panic 2: panic patients. *Behaviour Research and Therapy, 26*, 33-40.
- Rapee, R.M. & Heimberg, R.G. (1997). A cognitive-behavioural model of anxiety in social phobia. *Behaviour Research and Therapy, 35*, 8, 741-756.
- Rapee, R.M., McCallum, S.L., Melville, L.F., Ravenscroft, H., & Rodney, J.M. (1994). Memory bias in social phobia. *Behaviour Research and Therapy, 32* (1), 89-99.
- Riemann, B.C. & McNally, R.J. (1995). Cognitive processing of personally relevant information. *Cognition and Emotion, 9*, 325-340.
- Rogers, T.B., Kuiper, N.A., & Kirker, W.S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology, 35*, 677-688.

- Roskos-Ewoldsen, D.R. & Fazio, R.H. (1992). On the orienting value of attitudes: Attitude-accessibility as a determinant of an object's attraction of visual attention. *Journal of Personality and Social Psychology*, 63 (2), 198-211.
- Rudman, L.A., Ashmore, R.D., & Gary, M. (1999). *Implicit and explicit prejudice and stereotypes: A continuum model of intergroup orientation assessment*. Unpublished manuscript.
- Rudman, L.A. & Glick, P. (2001). Prescriptive gender stereotypes and backlash toward agentic women. *Journal of social issues*, 57 (4), 743-762.
- Rudman, L.A., Greenwald, A.G., & McGhee, D.E. (2001). Implicit self-concept and evaluative implicit gender stereotypes: Self and in-group share desirable traits. *Personality and Social Psychology Bulletin*, 27 (9), 1164-1178.
- Rudman, L.A., Greenwald, A.G., Mellot, D.S., & Schwartz, J.L.K. (1999). *Implicit cognition intergroup relations research: Construct Validation for the Implicit Association Test*. Manuscript submitted for publication.
- Rudman, L.A. & Kilianski, S.E. (2000). Implicit and explicit attitudes toward female authority. *Personality and Social Psychology Bulletin*, 26 (11), 1315-1328.
- Russo, R., Fox, E., & Bowles, R.J. (1999). On the status of implicit memory bias in anxiety. *Cognition and Emotion*, 13, 435-456.
- Sadock, B.J. & Sadock, A.S. (2003). *Synopsis of Psychiatry* (9th ed.) Philadelphia: Lippincott Williams & Wilkins
- Safran, J.D., Segal, Z.V., Hill, C., & Whiffen, V. (1990). Refining strategies for research on self-representations in emotional disorders. *Cognitive Theory and Research*, 14, 143-160.
- Schneier, F.R., Johnson, J., Hornig, C.D., Liebowitz, M.R., & Weissman, M.M. (1992). Social Phobia: Comorbidity and morbidity in an epidemiological sample. *Archives of General Psychiatry*, 49, 282-288.
- Segal, Z.V. (1988). Appraisal of self-schema construct in cognitive models of depression. *Psychological Bulletin*, 103(2), 147-162.
- Segal, Z.V. & Ingram, R.E. (1994). Mood priming and construct activation in tests of cognitive vulnerability to unipolar depression. *Clinical Psychology Review*, 14 (7), 663-695.
- Segal, Z.V., Truchon, C., Horowitz, L.M., Gemar, M., & Guirguis, M. (1995). A priming methodology for studying self-representation in major depressive disorder. *Journal of Abnormal Psychology*, 104, 205-213.

- Segal, Z.V. & Vella, D.D. (1990). Self-schema in major depression: replication and extension of priming methodology. *Cognitive Therapy and Research, 14*, 161-176
- Shear, M.K., Brown, T.A., Barlow, D.H., Money, R., Sholomskas, D.E., Woods, S.W., Gorman, J.M., & Papp, L.A. (1997). Multicentre Collaborative Panic Disorder Severity scale. *American Journal of Psychiatry, 154*, 1571-1575.
- Shear, MK, Greeno, C, & Kang, J. (2000). Diagnosis of non-psychotic patients in community clinics. *American Journal of Psychiatry 157*, 581-587.
- Sheehan, D.V., Lecrubier, Y., Sheehan, H., et al. (1997). The validity of the MINI International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. *European Psychiatry, 136*, 815-817.
- Skyre, I., Onstad, S., Torgersen, S., & Kringlen, E. (1991). High interrater reliability for the Structured Clinical Interview for DSM-III-R Axis I (SCID-I). *Acta Psychiatry Scand, 84* (2):167-73
- Smith, E.R., Fazio, R.H., & Cejka, M.A. (1996). Accessible attitudes influence categorization of multiply categorizable objects. *Journal of Personality and Social Psychology, 71* (5), 888-898.
- Spalding, L.R. & Hardin, C.D. (2000). Unconscious unease and self-handicapping: Behavioural consequences of individual differences in implicit and explicit self-esteem. *Psychological Science, 10*, 535-539.
- Spielberger, C.D. (1966). Theory and research on anxiety. In C.D. Spielberger (Ed.), *Anxiety and Behaviour* (pp. 97-105). New York: Academic Press.
- Spielberger, C.D., Gorsuch, R.L., & Lushene, R. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto: Consulting Psychologists Press.
- Spielberger, D.H., Gorsuch, R.L., Lushene, R., Vagg, P.R., & Jacobs, G.A. (1983). *Manual for the State-Trait Anxiety Inventory (Form Y)*. Palo Alto: Consulting Psychologists Press.
- Spieler, D.H., Balota, D.A., & Faust, M.E. (2000). Levels of selective attention revealed through analyses of response time distributions. *Journal of Experimental Psychology: Human Perception and Performance, 26*(2), 506-526.
- Stangor, C. (1988). Stereotype accessibility and information processing. *Personality and Social Psychology Bulletin, 14* (4), 694-708.

- Steiner J.L., Tebes J.K., & Sledge WH. (1995). A comparison of the structured clinical interview for DSM-III-R and clinical diagnoses. *Journal Nervous and Mental Disorders* 183 (6) 365-369.
- Stöber, J. (2001). The Social Desirability Scale-17: Convergent validity, discriminant validity, and relationship with age. *European Journal of Psychological Assessment*, 17, 222-232.
- Stopa, L. & Clark, D.M. (1993). Cognitive processes in social phobia. *Behaviour Research and Therapy*, 31 (3), 255-267.
- Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643-662.
- Taylor, S. (2000). *Understanding and treating panic disorder: Cognitive and Behavioural Approaches*. West Sussex: John Wiley & Sons.
- Taylor, S.E. & Crocker, J. (1981). Schematic bases of social information processing. In Higgins, E.T., Herman, C.P. & Zanna, M.P. (Eds.), *Social Cognition: The Ontario Symposium*, (Vol.1, pp. 89-134). Hillsdale, NJ: Erlbaum.
- Teachman, B.A., Gregg, A.P., & Woody, S.R. (2001). Implicit associations for fear-relevant stimuli among individuals with snake and spider fears. *Journal of Abnormal Psychology*, 110 (2), 226-235.
- Teachman, B.A. & Woody, S.R. (2003). Automatic processing in spider phobia: Implicit fear associations over the course of treatment. *Journal of Abnormal Psychology*, 112 (1), 100-109.
- Teachman, B.A. & Woody S.R. (2004). Staying tuned to research in implicit cognition: Relevance for clinical practice with anxiety disorders. *Cognitive and Behavioural Practice*, 11, 149-159.
- Trower, P., & Gilbert, P. (1989). New theoretical conceptions of social anxiety and social phobia. *Clinical Psychology Review*, 9, 19-35.
- Watts, F.N., McKenna, F.P., Sharrock, R., & Trezise, L. (1986). Colour-naming of phobia-related words. *British journal of Psychology*, 77, 97-108.
- Wells, A. (1999). *Cognitive therapy of anxiety disorders: A practice manual and conceptual guide*. West Sussex: John Wiley & Sons.
- Wigboldus, D. (2001). *The difference between relative and absolute implicit associations*. Paper presented at the third meeting of the European Social Cognition Network, Houffalize, Belgium

Williams, J.M.G., Mathews, A., & MacLeod, C. (1996). The Emotional Stroop task and Psychopathology. *Psychological Bulletin*, 120 (1), 3-24.

Williams, J.M.G. & Nulty, D.D. (1986). Construct accessibility, depression and the emotional Stroop task: transient emotional or stable structure? *Personality and Individual Difference*, 7, 485-491.

Williams, J.M.G. Watts, F.N., MacLeod, C., & Mathews, A. (1988). *Cognitive psychology and emotional disorders*. Chichester, West Sussex: Wiley & Sons

Williams, J.M.G., Watts, F.N., MacLeod, C., & Mathews, A. (1997). *Cognitive Psychology and Emotional Disorders (2nd ed.)*. New York: John Wiley & Sons

Wittchen H-U, et al. (1990) Interrater reliability of the Composite International Diagnostic Interview (CIDI): results of the Multicenter WHO/ ADAMHA Field trials (Wave 1). In Stefanis C.N., Rabavilas A.D., Soldatos C.R. (Eds.) *Psychiatry: a World Perspective, Voll* (pp. 125-132). Amsterdam: Excerpta Medica.

Zanarini M.C. & Frankenburg F.R. (2001). Attainment and maintenance of reliability of axis I and axis II disorders over the course of a longitudinal study. *Comprehensive Psych*, 42 (5), 369-374.

Zajonc R. B. (1984). On the primacy of affect. *American Psychologist*, 39, 117-123



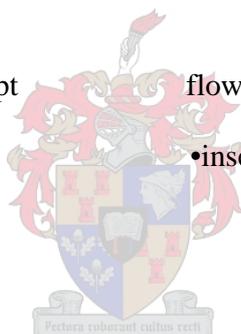
APPENDIX A

The Blocks in the Initial Implicit Association Task Using the Target Concepts of Insect and Flower, and the Valence Attributes of Pleasant and Unpleasant

Block	Task description	Task instruction	Sample stimuli
1	Target-concept discrimination	•flower insect•	•rose bee• •tulip wasp• •marigold horsefly•
2	Attribute discrimination	•unpleasant pleasant•	family• •rotten peace• •ugly happy• •crash
3	Initial combined task (practice trials)	•flower unpleasant• •pleasant	rotten• •petunia butterfly•



Block	Task description	Task instruction	Sample stimuli
		insect•	•gentle
			bomb•
			•lavender
4	Initial combined task	•flower	rotten•
	(real trials)	unpleasant•	•petunia
		•pleasant	butterfly•
		insect•	•gentle
			bomb•
			•lavender
5	Reversed target-concept	flower•	•beetle
	discrimination	•insect	•mosquito
			geranium•
			•moth
			poppy•
			•ladybird
6	Reversed combined task	flower•	daisy•
	(practice trials)	unpleasant•	accident•
		•pleasant	tulip•
		•insect	•rainbow
			•ant



Block	Task description	Task instruction	Sample stimuli
			•caterpillar
7	Reversed combined task (real trials)	flower• unpleasant• •pleasant •insect	daisy• accident• tulip• •rainbow •ant •caterpillar

Note. This table represents the primary blocks of the Initial IAT. To avoid confusion, the table includes the usual additional practice blocks (block 3 and block 5) which are the equivalent of and precede each of the combined blocks (i.e. block 4 and block 7), thus totalling seven blocks. The correct response key options are indicated by the small black dot appearing to the relevant side of the stimulus word. From “Measuring individual differences in implicit cognition: The Implicit Association Test”, by A.G. Greenwald, D.E. McGhee, and J.L.K. Schwartz (1998). *Journal of Personality and Social Psychology*, 74 (5). Copyright 1998 by the American Psychological Association.

APPENDIX B

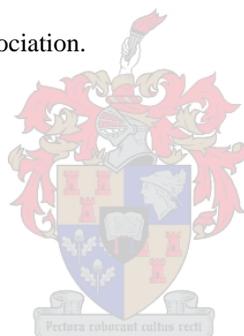
A Comparison of the Old, New (as Developed by Greenwald, Nosek, and Banaji, 2003) and Currently Adapted Algorithm

Step	Conventional algorithm	Improved algorithm	Current algorithm
1	Use data from B4 and B7	Use data from B3, B4, B6 & B7	Use data from IAT1 B4 and B7, and IAT2 B4 and B7
2	Non-systematic elimination of participants for excessively slow or fast responses, or high error rates	Elimination of trials with latencies >10 000 ms; eliminate participants for whom more than 10% of trials have latencies <300 ms	Elimination of trials with latencies >10 000 ms; eliminate participants for whom more than 10% of trials have latencies <300 ms
3	Drop first two trials of each block	Include all trials	Include only real trials
4	Recode latencies outside 300/ 3000 boundaries to the nearer boundary value	No extreme-value treatment (beyond Step 2)	No extreme-value treatment (beyond Step 2)
5		Compute mean of correct latencies for	Compute mean of correct latencies for

Step	Conventional algorithm	Improved algorithm	Current algorithm
		each block	each block
6		Compute one pooled SD for all trials in B3 & B6; another for B4 & B7	Compute one pooled SD for all trials in IAT1 B4 and IAT2 B4; another for IAT1 B7 and IAT2 B7
7		Replace each error latency with block mean (computed in step 5) + 600ms	Replace each error latency with block mean (computed in step 5) + 600ms
8	Log-transform the resulting values	No transformation	No log transformation
9	Average the resulting values for each of the two Blocks	Average the resulting values for each of the four blocks	Average the resulting values for each of the four blocks
10	Compute the difference: B7 – B4	Compute the two differences: B6 – B3; B7 – B4	Compute the two differences: IAT1 B7 – B4; IAT2 B7 – B4
11		Divide each by its associated pooled trials	Divide each by its associated pooled trials

Step	Conventional algorithm	Improved algorithm	Current algorithm
		SD from Step 6	SD from Step 6
12		Average the two quotients from Step 11	Average the two quotients from Step 11

Note. Block numbers (e.g. B1) correspond to the procedure sequence shown in Table 1 (Chapter Five). The conventional algorithm has no procedures corresponding to Steps 5-7 or Steps 11-12 of the improved algorithm. SD = standard deviation. SPSS syntax for computing IAT measures using the improved algorithm can be obtained at http://faculty.washington.edu/agg/iat_materials.htm. From “Understanding and using the Implicit Association Test: An improved scoring formula,” by A.G. Greenwald, B.A. Nosek, B.A., and M.R. Banaji (2003), *Journal of Personality and Social Psychology*, 85 (2), p. 214. Copyright 2003 by the American Psychological Association.



APPENDIX C

Brief Summary of the Study Conducted by Nosek et al. (2003) Regarding Methodological Issues

It was once again confirmed that the IAT is limited to investigating the relative strength of association between bi-polar pairs of categories and that this relative nature of the IAT cannot be undone by analytic methods.

Secondly, the use of at least four stimulus items per category, represent optimal conditions for investigations with the IAT. However, IAT effects are also apparent for conditions in which only two items are used per category and even (but far less robust) in conditions in which stimulus sets are comprised of only the category labels.

The most efficient IATs are comprised of items that are most representative of their relevant super-ordinate categories, that these are not confounded with other categories, and that the categories are highly representative of the concept of interest.

Category labels should be representative of concepts of interest as well maximising the ease with which respondents can identify individual stimulus items as belonging to the categories of concern.

The choice of stimulus item modality (i.e. words as opposed to pictures) does not influence the IAT in any significant way as the IAT appears to tap the semantic construct of interest. However, subtle changes to the semantic construct of interest can dramatically influence IAT effects.

Little or no difference was observed in explicit and implicit effects based on the order of presentation (i.e. first testing participants on explicit measures and then implicit measures versus conditions in which implicit measures are presented first). However these conclusions are qualified in conditions in which implicit and explicit measures are relative short, simple and unambiguous in nature.

And finally, the well-documented extraneous influences based on the order of task performance blocks can be dramatically reduced by doubling the number of trials (from 20 to 40) in the reverse single-discrimination blocks (i.e. Block 5). However, although this procedure enables a significant reduction in the overall impact of task order, it is not eliminated altogether, thus caution should be considered (Nosek et al., 2003).



APPENDIX D

PIAT and SIAT Safety and Threat Words

Table D1

PIAT Safety and Threat Words

Safety words	Threat words
Balanced	Weak
Brave	Trembling
Vitalised	Suffocate
Vigorous	Palpitations
Strong	Nauseous
Secure	Breathless
Sane	Choking
Safe	Deadly
Protected	Dizzy
Robust	Illness
Immune	Insane
Healthy	Light-headed

Table D2

SIAT Safety and Threat Words

Safety words	Threat words
Accepted	Rejected
Successful	Ridiculous
Confident	Stupid
Admired	Embarrassed
Respected	Ashamed
Popular	Awkward
Capable	Humiliated
Optimistic	Blushing
Outspoken	Inferior
Casual	Pathetic
Competent	Foolish
Friendly	Failure

APPENDIX E

Distribution of SIAT and PIAT Effects for Panic Disorder, Social Phobia, and Control Group

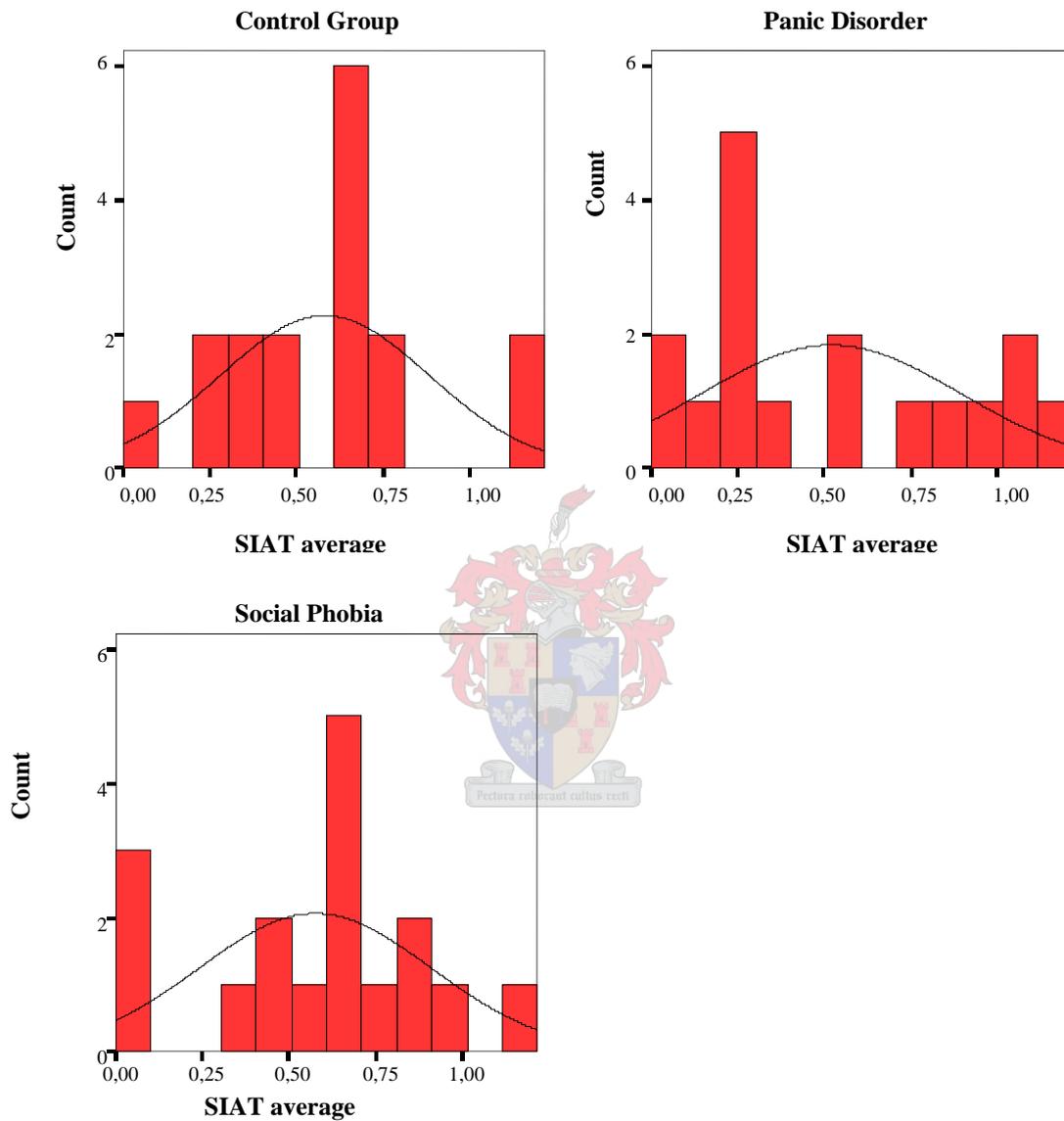


Figure E1. Distribution of Social Phobia Implicit Association Task Effects for the control group ($n = 17$), panic disorder group ($n = 17$), and social phobia group ($n = 17$).

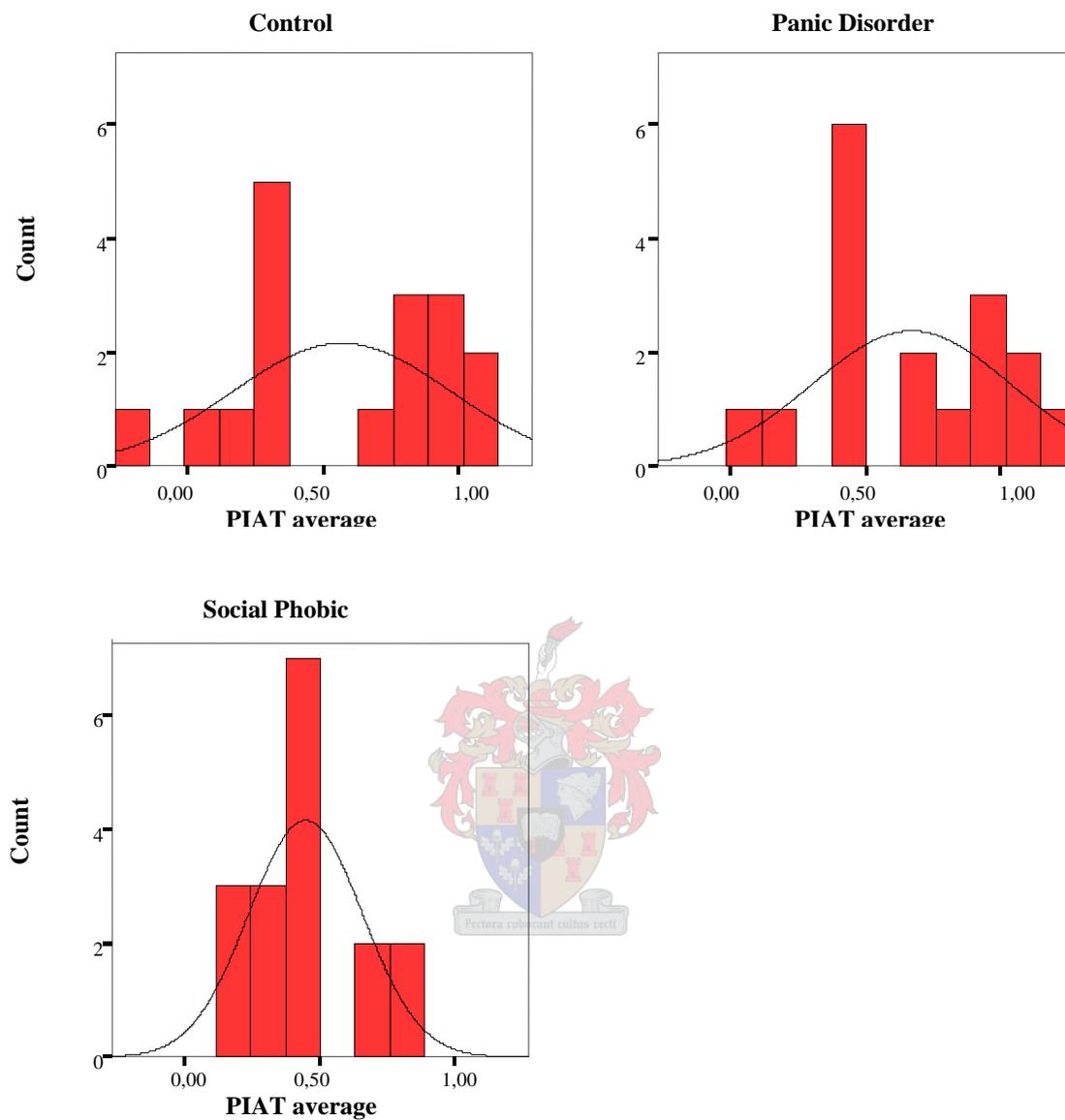


Figure E2. Distribution of Panic Disorder Implicit Association Task Effects for the control group ($n = 17$), panic disorder group ($n = 17$), and social phobia group ($n = 17$).

APPENDIX F

Results of the Kolmogorov-Smirnov Test to see if Effects are Normally Distributed

		SIAT	PIAT
Control Group (n = 17)			
Normal Parameters	M	.5816	.5679
	SD	.30257	.40449
Most Extreme Differences	Absolute	.155	.206
	Positive	.155	.197
	Negative	-.126	-.206
Kolmogorov-Smirnov Z		.641	.849
Asymp. Sig. (2-tailed)		.806	.467
Panic Disorder Group (n = 17)			
Normal Parameters	M	.5196	.6685
	SD	.37440	.36726
Most Extreme Differences	Absolute	.224	.167
	Positive	.224	.165
	Negative	-.106	-.167
Kolmogorov-Smirnov Z		.922	.687
Asymp. Sig. (2-tailed)		.363	.732
Social Phobia Group (n = 17)			
Normal Parameters	M	.5757	.4468
	SD	.33364	.21020
Most Extreme Differences	Absolute	.142	.177
	Positive	.130	.177
	Negative	-.142	-.097
Kolmogorov-Smirnov Z		.586	.730

	SIAT	PIAT
Asymp. Sig. (2-tailed)	.882	.660

Note. SIAT = Social Phobia Implicit Association task. PIAT = Panic Disorder Implicit Association task.

a Test distribution is Normal.

b Calculated from data.

