A NEUROCOGNITIVE MODEL OF HIGH ANXIETY TRAIT IN VICTIMS WITH POST DISASTERS EXPERIENCE

KAMAL ADEMOLA AZEEZ

MASTER OF SCIENCE
UNIVERSITI UTARA MALAYSIA
2015
Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to:

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Abstrak


Kata kunci: Mekanisma neurokognitif, Sifat kebimbangan yang tinggi, Pemodelan pengkomputeran, Pengalaman pascabencana
Abstract

People with disasters experience are the most vulnerable victims of high anxiety trait. This behavior could develop overtime to pure anxiety if the individuals do not have any means of support. Hence, understanding this behaviour in the individuals is an essential means of unveiling anxiety emergence. Anxiety has been a phenomenon of focus over the years. Its manifestations have been extensively studied at the lower level of human functioning system (the body). Also, some researches have extended to the higher level of cognitive functions. Still, evidences showed that a precise approach have not been provided to elicit its emergence in human behavior. Meanwhile, extant literatures showed that anxiety disorders are the most prevalent psychological problems the world is facing today. More so, numerous numbers of people around the globe were suffering from these disorders. Therefore, this study examines how individuals with post disasters experience could develop anxiety by virtue of exposure to further events in the environment. This is a proactive measure to cater for wider emergence of anxiety disorders that might arise through disasters occurrence which is now a worldwide affair. This aspect was achieved through consideration for the role of neurocognitive mechanisms in the emergence of anxiety. The outcome of the investigation shows that, neurocognitive mechanisms play role in the emergence of anxiety. This was demonstrated through computational modeling concept to simulate those mechanisms identified through literatures and expert opinions. Increased activation of amygdala is observed to favor the development of anxiety while that of the prefrontal cortex favor the prevention of anxiety and vice versa. In addition, possible transformation of the individuals’ conditions was assessed using mathematical equations to show the possible changes overtime.

Keywords: Neurocognitive mechanisms, High anxiety trait, Computational modeling, Post disasters experience.
Acknowledgement

First and foremost, I expressed my thanks to Allah Subuhannahu watahalla for His indefinite mercy on me. I adore him and appreciate His assistance over me. Without him, it might not be possible to sail through the huddles. Though, the road was so rough but Alhamdulillah, I was able to sail through.

Many thanks also go to the various individuals who have in one way or the other contributed to the success of this work. Most significantly, my supervisor, Assoc. Prof. Dr. Fausiah Ahmad for accepting my supervision and I believe she is proud of me. Also, I appreciate the effort of Dr. Azizi ab Aziz for taken off with me in the research and the touches he made at the onset of the research.

Meanwhile, this page wouldn’t have been extortive without mentioning the likes of Dr. Youanis Yussuff, Dr. Norliza Katuk, Dr. Hayanni, and Dr. Sharrul Asmin. Most significantly, Dr. Youanis Yussuff who provided a parental support when the storm was high and Dr Norliza and Hayyani who by their kind heart provided guidance when the need arise. These individuals are so wonderful and they have contributed significantly to the success of this study.

In life, though some people are not blood bonded but Allah made them a searchlight to see when the road is dark. I can never forget the likes of my brother here in Malaysia, Ishola D. Muraina. He is such a wonderful brother who is always wishing and willing for the best of others. He provided sufficient support for me both morally, financially, physically and academically, may Allah continue to be him and his family.

Also, to all my friends who have in one way or the other contributed to the success of my Masters programme in Universiti Utara Malaysia, may Allah be with them all. In conclusion, I really appreciate the efforts of my family, may Allah save and protect me to pay them more than they have invested.
# Table of Contents

Permission to Use .................................................................................................................... i
Abstrak ...................................................................................................................................... ii
Abstract ................................................................................................................................. iii
Acknowledgement ................................................................................................................ iv
Table of Contents .................................................................................................................... v
List of Tables ........................................................................................................................... viii
List of Figures ........................................................................................................................... ix
List of Appendices .................................................................................................................... x

## CHAPTER ONE BACKGROUND OF STUDY ......................................................... 1
1.1 Introduction ......................................................................................................................... 1
1.2 Problem Statement ............................................................................................................. 3
1.3 Research Questions ......................................................................................................... 4
1.4 Research Objectives ......................................................................................................... 5
1.5 Research Scope and Limit .............................................................................................. 5
1.6 Significance of Study .................................................................................................... 6
  1.6.1 Theoretical Contribution ......................................................................................... 7
  1.6.2 Practical Contribution ............................................................................................ 7

## CHAPTER TWO LITERATURE REVIEW ......................................................... 8
2.1 Introduction ......................................................................................................................... 8
2.2 Disasters and its Prevalence .......................................................................................... 9
2.3 Potential Impact of a Disaster ....................................................................................... 11
2.4 Anxiety ............................................................................................................................ 11
2.5 High Anxiety Trait: An antecedent of Anxiety ............................................................ 18
2.6 Neural Mechanisms in the Development of High Anxiety Trait .................................. 21
2.7 Related Theories ............................................................................................................. 24
2.8 Discussion of Related Works ......................................................................................... 26
  2.8.1 Cognitive Model of Anxiety .................................................................................. 26
  2.8.2 Personality Trait Model of Anxiety ....................................................................... 28
  2.8.3 Information Processing Bias Model ........................................................................ 30
4.2 Logical Analysis of Factors Relationships ...................................................... 69
4.3 Simulation Results .......................................................................................... 77
  4.3.1 Results for first simulation ....................................................................... 77
  4.3.2 Results for second simulation .................................................................... 79
    4.3.2.1 Scenario #1: High anxious state ....................................................... 79
    4.3.2.2 Scenario #1: Low anxious state ......................................................... 81
4.4 Evaluation ....................................................................................................... 83
  4.4.1 Mathematical verification of model ............................................................ 83
  4.4.2 Mathematical verification of domain problem ......................................... 87
4.5 Summary ......................................................................................................... 91

CHAPTER FIVE CONCLUSION AND RECOMMENDATION ......................... 92
5.1 Conclusion ....................................................................................................... 92
  5.1.1 Contribution ............................................................................................. 94
  5.1.2 Limitations ................................................................................................ 94
5.2 Recommendation and Future work .............................................................. 95
  5.2.1 Verification ................................................................................................ 95
  5.2.2 Simulation .................................................................................................. 95
  5.2.3 Implementation ......................................................................................... 95

REFERENCES ....................................................................................................... 96
List of Tables

Table 2.1: Neural Mechanisms .......................................................... 23
Table 2.2: Related studies on human behaviour computational modelling .......... 39
Table 3.1: Factors of neurocognitive process in the development of anxiety ............. 43
Table 3.2: Formalization of neurocognitive mechanisms ....................................... 47
Table 3.3: Variable conditions for stimulus representations in Ss ......................... 51
Table 3.4: Variable conditions for stimulus representations in Sn ........................ 52
Table 3.5: Variable conditions for stimulus representations in Hm ......................... 53
Table 3.6: Variable conditions for stimulus representations in Sc ........................ 54
Table 3.7: Variable conditions for stimulus representations in Pc ........................ 55
Table 3.8: Variable conditions for stimulus representations in Ag ........................ 57
Table 3.9: Variable conditions for stimulus representations in Hc ......................... 58
Table 3.10: Variable conditions for stimulus representations in Hp ......................... 59
Table 3.11: Variable conditions for stimulus representations in Er ......................... 60
Table 3.12: Variable conditions for stimulus representations in Am ....................... 61
Table 3.13: Variable conditions for stimulus representations in Bs ........................ 62
Table 3.14: Variable conditions for stimulus representations in Sb ......................... 63
Table 3.15: Variable conditions for stimulus representations in Sr ......................... 64
Table 3.16: Variable conditions for stimulus representations in Fn ......................... 65
Table 3.17: Variable conditions for stimulus representations in Ax ......................... 66
Table 4.1a: Value assigned for neural activation .............................................. 77
Table 4.1b: Value assigned for neural activation .............................................. 78
List of Figures

Figure 2.1. Cognitive model of event appraisal in anxiety (Westbrook et. al., 2011). ........27
Figure 2.2. Five factor Model of Personality Trait (Costa & McCrae, 2011)....................29
Figure 2.3. Information processing bias model..........................................................31
Figure 2.4. Neurocognitive model of high anxiety to depression (Sandi & Richter, 2009). .34
Figure 2.5. Model of psychological impact of disaster (Ding, 2007).............................36
Figure 2.6. Representation of neurocognitive description ............................................37
Figure 3.1. Methodology phase..................................................................................42
Figure 3.2. Neurocognitive model ............................................................................45
Figure 3.3. Sensed stimulus .......................................................................................50
Figure 3.4. Sensor state ..............................................................................................51
Figure 3.5. Thalamus .................................................................................................52
Figure 3.6. Sensory cortex .........................................................................................53
Figure 3.7. Prefrontal cortex .......................................................................................54
Figure 3.8. Amygdala .................................................................................................56
Figure 3.9. Hippocampus ...........................................................................................58
Figure 3.10. Hypothalamus .........................................................................................59
Figure 3.11. Emotional response.................................................................................60
Figure 3.12. Anxious mood .........................................................................................61
Figure 3.13. Body state ...............................................................................................62
Figure 3.14. Sensor state for body state .......................................................................63
Figure 3.15. Sensor state for body response ...............................................................63
Figure 3.16. Feeling .....................................................................................................64
Figure 3.17. Anxiety ..................................................................................................65
Figure 4.1b. Amygdala activation.................................................................................79
Figure 4.1c. Result of scenario #1...............................................................................80
Figure 4.1d. Result of scenario #2 ..............................................................................82
Figure 4.2. Transition stage .......................................................................................88
List of Appendices

Appendix A Simulation Code for Scenario #1: High anxious state ............................................. 106
Appendix B Simulation Code for Scenario #2: Low anxious state ............................................. 110
CHAPTER ONE
BACKGROUND OF STUDY

This chapter presents the introduction to this research by explaining the background information underlying the concepts in the study, the problem statement, research objectives as well as scope and significance of the study. It explicitly defined the focused of the study and provides brief insight into the target model.

1.1 Introduction

Anxiety is a feeling and emotion exhibited in response to a particular threat. It is characterized by set of physiological and behavioral patterns such as arousal, vigilance, and avoidance that protect individuals from the possible danger associated with that threat (Gross & Hen, 2004).

These patterns of behaviour form part of the psychological and universal mechanisms employed to excite the states of the mind towards a threat (Choi et al., 2011). Physiologically, these are normal reactions, but, if the condition associates with the cognitive functioning process, it becomes problem and if not given the necessary attention could lead to chronic condition that could affect the normal psychological state of individuals (Eysenck, 2013).

The symptoms of anxiety share similar features with fear, but, a clear distinction could be made between these and fear in term of response to a specific threat that is short lived (Rachman & Maser, 2013). In the pathological form, anxiety exist in six forms as provided in the Diagnostic and Statistical Manual of the American Psychological association (Gross & Hen, 2004). These classifications include Panic
The contents of the thesis is for internal user only
REFERENCES


98
proposals based on theoretical accounts of attentional bias. *Frontiers in human neuroscience, 7.*


Norris, F. H., Friedman, M. J., & Watson, P. J. (2002). 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health


findings from the National Study of Americans' Reactions to September 11. 
*Jama, 288*(5), 581-588.


from the national epidemiologic sample on alcohol and related conditions.  


