FUNCTIONAL NEUROANATOMY OF THE FRONTAL LOBE AND ITS IMPLICATIONS FOR PSYCHIATRIC DISORDERS' SYMPTOMATOLOGY

Essay

submitted for partial fulfillment of the Master Degree in Neuropsychiatry

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2012

قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
(٣٢)

صدَقَ الله العَظِيم

سورة البقرة

Acknowledgement

First and before all I thank God for his great mercy, generous blesses, continuous gifts and for giving me the ability to achieve this work.

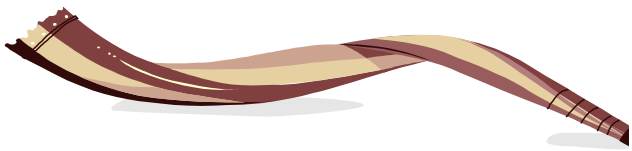
Really I can hardly find the words to express my gratitude to **Prof. Dr. NAHLA EL-SAYED NAGY** Professor of psychiatry, faculty of medicine, Ain Shams University, for her supervision, continuous help, encouragement throughout this work and the tremendous effort she has done in the meticulous revision of the whole work. It is a great honor to work under her guidance and supervision.

I am also indebted to **Dr. ABEER MAHMOUD EISA** Assistant Professor of psychiatry, faculty of medicine, Ain Shams University for her guidance, continuous assistance and sincere supervision of this work.

Words can never express my sincere appreciation to **Dr. MARWA ABDEL MEGUID HAMED** Assistant Professor of psychiatry, Faculty of medicine, Ain Shams University, , for her continuous encouragement , enthusiastic support, indispensable suggestion and great help throughout the course of this study .

Last but not least, I dedicate this work to my family, whom without their sincere emotional support pushing me forward; this work would not have ever been completed.

Mohammed Ahmed Kamel



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List of Abbreviations

1PP	First person perspective taking'
ACC	Anterior cingulate cortex
AD	Alzheimer's disease
ADHD	Attention deficit/hyperactivity disorder
ADLS	Activities of daily living
AES	Apathy evaluation scale
AM	Autobiographical memory
BAS	Brodmann's areas
bv-FTD	behavioural variant frontotemporal dementia
CADASIL	Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy
CMS	Cortical midline structures
CT	Computed tomography
D	Dopamine
DLPC	Dorsolateral prefrontal cortex
DLPFC	Dorsolateral prefrontal cortex
DMPFC	Dorsomedial prefrontal cortex
DSM	Diagnostic and statistical manual of mental disorders
DTI	Diffusion tensor imaging

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EMG	Elecromyography
EOG	Electroculography
FC	Frontal cortex
fMRI	functional magnetic resonance imaging
FP	Frontopolar
GABA	Gamma-aminobutyric acid
GP	Glopus pallidus
HC	Healthy controls
HIV	Human immunodeficiency virus
IGT	Iowa gambling task
IPL	Inferior parietal lobule
LFC	Lateral frontal cortex
LPFC	Lateral prefrontal cortex
LPR	Lifetime psychomotor retardation
MCI	Mild cognitive impairment
MDD	Major depressive disorder
MFC	Medial frontal cortex
MOODS-SR	Mood spectrum self-report questionnaire
MPFC	Medial prefrontal cortex
MS	Multiple sclerosis
MTL	The medial temporal lobe

NAA	N-acetylaspartate
NOS	Not otherwise specified
OCD	Obsessive-compulsive disorder
OFC	Orbitofrontal cortex
OMPFC	Orbital and medial prefrontal cortex
PAS	Physical anhedonia scale
PET	Positron emission tomography
PFC	Prefrontal cortex
PM	Prospective memory
PMC	Prospective memory component
PME	Premenstrual exacerbation
PTSD	Post traumatic stress disorder
QOL	Quality of life
rCBF	regional cerebral blood flow
RMC	Retrospective memory component
ROCs	Receiver operating characteristics
SAS	Social anhedonia scale
SCR	Skin conductance responses
SDS	Schedule for the deficit syndrome
SM	Semantic memory
SMA	Supplementary motor area
SPD	Schizotypal personality disorder

SPECT	Single photon emission computed tomography
SSRIS	Selective serotonin reuptake inhibitors
STAR*D	Sequenced treatment alternatives to relieve depression
TBI	Traumatic brain injury
TOM	Theory of min
VLPFC	Ventrolateral prefrontal cortex
VM	Ventro-medial
VMPC	Ventromedial prefrontal cortex
VS	Ventral striatum
VTA	Ventral tegmental area
WM	Working memory

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Introduction

At the time of Hippocrates' writing, many disorders, from epilepsy to madness, were thought to be the result of divine influence. Hippocrates opined that they are essentially somatic in origin and that the right approach to understanding them is through the natural sciences. Most famous and relevant to this discussion is a statement by the Greek philosopher-physician Hippocrates that "from the brain come joys, delights, laughter and sports, and sorrows, grieves, despondency and lamentations, and by the same organ we become mad and delirious, and terrors and fears assail us" ***(Heimer et al., 2008).***

All human experience, emotion, motivation, behavior, and activity are products of brain function. This basic premise underlies contemporary approaches to understanding human behavior and the effects of brain dysfunction in the clinical discipline of neuropsychiatry. This approach does not deny the important influence of interpersonal relationships, social and cultural influences, and the modulating influence of the environment on human emotion and behavior; the brain-based approach acknowledges that all of these environmental influences are mediated through central nervous system (CNS) structures and function. For every deviant environmental event there will be a corresponding change in CNS function, and when CNS function is altered there will be corresponding changes in the behavior or experience of the individual ***(Cummings and Mega, 2003)a.***

It's the advances in the fields of cognitive and affective neuroscience and biological psychiatry that allowed us to identify the neural systems underlying emotion regulation and how abnormalities in these neural systems may be associated with the presence of symptoms of certain psychiatric disorders ***(Phillips et al., 2008)***.

For example, the frontal lobes mediate behaviors that are distinctively human. They are the focal point for the integration of information from the environment, the internal milieu of the body, and the emotional state of the individual. The frontal lobes generate behavior and mediate action on the environment. Frontal lobe dysfunction produces some of the most extravagant syndromes encountered in neuropsychiatry. Disorders of cognition, mood, motivation, and behavioral control emerge in patients with frontal lobe disorders ***(Cummings and Mega, 2003) b.***

And although the etiology and pathophysiology of bipolar disorder and major depressive disorder (major depression) have not yet been completely elucidated, a number of structural and functional neuroimaging studies suggest the importance of the frontal lobe. For example, a reduction in the volume of cerebral regions, particularly the gray matter and glial cell density in the frontal lobe, has been reported in structural neuroimaging studies ***(Kameyama et al., 2006)***.

Moreover, in the unmedicated patients with bipolar depression, there is evidence of prefrontal hypometabolism relative to healthy controls ***(Brooks et al., 2009)***.