Sleep, Memory Interrelation and its Impact on Dementia

العلاقة بين النوم و الذاكرة و تائثيرها على مرض العته

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2009

Sleep, Memory Interrelation and its impact on dementia

An Essay

Submitted for partial fulfillment of master degree in Neuropsychiatry

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2009

بسم الله الرحمن الرحيم

(وَمَا أُوتِيتُم مِّنَ الْعِلْمِ إِلَّا قَلِيلًا)

صدق الله العظيم

سورة الإسراء الآيه رقم 85

Acknowledgement

I would like to thank **Prof . Dr . Samia Ashour Mohamad Helal,** Professor of Neuropsychiatry, Faculty of Medicine , Ain Shams university . Who gave me much of her effort, experience and close supervision through out the work . She provided me continuous encouragement and support . Her generous assistance and meticulous guidance had a pivotal role in the completion of this study.

My deep and endless thanks to **Prof. Dr. Nahed Salah Eldin Ahmed,** Professor of Neuropsychiatry , Faculty of Medicine , Ain Shams university, for the time she gave me, her support and sincere help. Her patience and willingness to provide continuous guidance have been instrumental in bringing the study to completion.

It is with pleasure that I express my deepest gratitude to **Prof . Dr . Ahmad Abd Elmonem Gaber ,** Assistant Professor of Neuropsychiatry, Faculty of Medicine, Ain Shams university. For his kind guidance , valuable advice and continuous help in all parts of this work.

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List of abbreviation

Ach	Acetylcholine
AchE – I	Acetylcholine inhibitors
AD	Alzheimer disease
ApoE	Apolipoprotein E
ARAS	Ascending reticular activating system
BPSD	Behavioral and psychiatric symptoms of dementia
CJD	Creutzfeldt jacob disease
CMR Glu	Cerebral metabolic rate of glucose
CPT	8 cyclopentyl theophylline
CRP	C – reactive protein
DA	Dopamine
DLB	Dementia with lewy body
DLPF	Dorsolateral prefrontal cortex
DN	Dentate nucleus
DRN	Dorsal raphe nucleus

DSM	Diagnostic and Statistical Manual of mental disorders
EEG	Electroencephalogram
FEF	Frontal eye field
fMRI	Functional magnetic resonance imaging
FTD	Frontotemporal dementia
GABA	Gamma amino butyric acid
IEG	Immediate early genes
Ikir	Inwardly rectifying potassium current
IL 6	Interleukin 6
LC	Locus corelus
LDT	Laterodorsal tegmental nucleus
LTP	Long term potentiation
MCI	Mild cognitive impairment
MCPO	Magnocelluar pre optic nucleus
MMS	Minimental state
MSA	Multiple system atrophy
NE	Noreadrenaline
NPH	Normal pressure hydrocephlus
NREM	Non rapid eye movement sleep
PCR	Polymerase chain reaction
PD	Parkinsonism
PET	Positron emission tomography
PGO	Ponto – geniculo – occipital wave

PnO	Pontis oralis nucleus
PPC	Posterior parietal cortices
PPT	pedunculopontine tegmental nucleus
PRF	Pontine reticular formation
PT	Pursuit task
PVT	Psychomotor vigilance test
RBD	REM behavioral disorder
rCBF	Regional cerebral blood flow
REM	Rapid eye movement sleep
SCN	Suprachiasmatic nucleus
SD	Sleep deprivation
SEF	Supplementary eye field
SI	Sustantia innomina
SMA	Supplementary eye field
SRT	Serial reaction time task
STS	Superior temporal sulcus
Sub c	Subcoeruleus
SWS	Slow wave sleep
VaD	Vascular dementia
5 – HT	Seotonin

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INTRODUCTION

Introduction

Sleep has been regarded as largely negative phenomena in which Conscious and vigilance are switched off however it is now clear that sleep include different phases, during which there may be considerable neurophysiological activity within various brain regions.A normal period of sleep may last for between 6 – 10 hours during which a number of clinical and neurophysiological changes identify different stages of sleep , including electroencephalography (EEG) , electromyography(EMG), eye movement, and autonomic changes **(Chadwick, 2001).**

Sleep may be divided into two phases, REM sleep is most often associated with vivid dreaming and high level of brain activity. The other phase of sleep , NREM sleep or slow wave sleep (SWS) , is usually

associated with reduced neuronal activity ; thought content during this state in human is , unlike dreams, usually non visual and consist of ruminative thoughts. **(McCarly, 2007).**

The question of " sleep dependent memory consolidation " is a complex one. Each term in the phrase – sleep, dependent, memory, and consolidation – begs for clarification. For a start the term 'memory' cover a wide range of memory types, which differ in the kind of information stored, the brain structure mediating this storage, and, in humans whether the information is accessible to conscious awareness . The most accepted taxonomy divides human memory first into declarative memory and non - declarative, based on their accessibility to conscious recall, and then into finer and finer subdivisions of these basic categories. Similarly the term "memory consolidation" refers to a poorly defined set of processes which take an initial , unstable memory representation and convert it into that is both more stable and more effective . Many of the steps in this consolidation cascade occur preferentially or even exclusively during periods of sleep. More recently the concept of "memory reconsolidation " has resurfaced to

describe yet another aspect of post encoding memory modification **(Stickgold and Walker, 2007).**

Sleep stages differentially affect memory consolidation. Where as SWS support in particular, but not exclusively, the consolidation of hippocampus - dependent declarative memory, REM sleep seems to benefit preferentially , but not exclusively , consolidation of memory aspects, not directly mediated by hippocampal function (procedural , and emotional memory) **(Marshall and born, 2007).**

Memory formation depend on brain plasticity – lasting structural and / or functional neural changes in response to stimuli (such as experiences). If sleep is to be considered as a critical mediator of memory consolidation , then the evidence of sleep – dependent plasticity would greatly strengthen this claim . Indeed , there now a wealth data describing sleep - dependent brain plasticity at a variety of different levels in both animals and human , complementing evidence of sleep dependent changes in behavior.

The detrimental effect of sleep deprivation on the underlying brain activity using a visuo – motor

adaptation task – the only such study to date have been investigated . This study offer an early indication that sleep deprivation not only disrupts consolidation but the underlying neural mechanisms that support it as well **(Stickgold and Walker, 2007).**

Dementia denotes a deterioration of intellectual, or cognitive function, with little or no disturbance of consciousness or perception **(Victor et al, 2001)** For patients with dementia, sleep disturbance will reduce quality of life, and some reports suggest that, it is associated with cognitive and functional decline **(Moran et al, 2005).**

In the filed of sleep research, neuroimaging has provided interesting insight about human sleep physiology by presenting functional brain maps in different sleep stages. That are in part corroborated by previous Animal experimental data , and by giving support to a role of sleep in learning and memory **(Dang – Vu et al, 2007).**

A disrupted sleep – wake cycle may contribute to cognitive impairment in elderly and AD patients.

Particularly excessive day time sleepiness , even healthy elder subjects, may increases the risk of cognitive impairment (i.e. attention / concentration , and difficulty in orientation to time and persons , and prospective memory) **(Swaab, 2007).**

Aim of the work