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HUMAN BRAIN;
PHYSIOLOGICAL ALTERATIONS OCCURRING UNDERLYING PROCESS OF AGING

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ABSTRACT… Aging is an irreversible and universal phenomenon of every living organism's life. Many recent studies provide evidences that is strictly related to decline in cognitive function impairment but along with various causes behind these abnormal changes, change in brain !unction and structure is one of the most important factors are being widely used to study the hypothesis that 'the deficits in and temporal order memory are closely related. Increase in age causes reduction in memory processing tasks, which involve information storage and processing. In other explanation it is mentioned that frontal activity, differences underlying aging is associated with recruitment of brain areas and neural circuit efficiency reduction. In case of young subjects increase in activity mean shorter reaction time but in older subjects results are opposite.

Key words: Aging, Positron Emission Topographic studies, frontal functioning, primates.

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STATEMENT OF NOVELTY
Aging is accompanied by the decline in brain physiology, particularly decline in the response and adaptation. The current paper reviews the physiological alterations occurring in human brain during the process of aging.

INTRODUCTION
Aging is an irreversible and universal phenomenon of every living organism's life. With the advent of age abnormal and reversal changes occurs in our body most of them are deleterious in nature such as loss in hearing ability, taste, loss of teeth, and reduction in sens1tivlly to growth factors, loss of lean tissues, reduction in reaction time, whitening of hairs. Similar changes occur also in our brain such as reduction in reaction time, neurochemical alterations, synaptic degeneration, gray and white matter atrophy[1,2]. Aging is strictly related lo decline in cognitive function impairment but along with various causes behind these abnormal changes, change in brain function and structure is one of the most important factors.

BRAIN FUNCTION ALTERATIONS
Recent studies (Raz[2], 2000; Parkin and Java[3], 2000; Cabeza[1], 2001; Calautti[4] el *al.,* 2001) provided evidences that normal aging do not have very much damaging effect on brain activity. It may be due to the reason that there is no direct relationship between brain activity and brain structure. Brain imaging techniques are most authentic way to relate brain with behavioral changes. Instead of this fact that there is large amount of work carried out on change in brain structure, change in brain functioning is relatively a young field of research. Here are some reviews of the studies carried out to explain the relatedness of change in brain structure to the cognitive functioning.

NEUROIMAGING STUDIES OF BRAIN FUNCTIONING
These studies are carried out in both rest and cognitive tests performing situations in older adults. At rest, differential sensitivity to frontal lobes is found along with consistent decrease in metabolic rates and regional blood flow in cerebral areas. Which is similar to the findings in middle age adults?[5,6] There is limited number of experiments carried out to explain age-related differences in the patterns of brain activation during attention[7], visual perception.[8,4]

TEMPORAL-ORDER AND ITEM MEMORY IN RELATION TO NEURAL ACT IVATION

(PET) positron Emission Topographic studies are being widely used to study the hypothesis that 'the deficits m frontal functioning and temporal order memory are closely related'. It is well known that change in frontal lobe structure and function is related to the memory problems.[9] Structural MRI studies or volumetric changes in brain reveals that contraction in frontal lobe volume is most prominent.[10] Content memory which is also called as 'Item Memory' depends on frontal cortex more than content memory (Temporal Order Memory).[11] As context memory is more closely associated with the brain parts that are greatly affected by aging so context memory is more sensitive to aging It is now verified that the tests used to check frontal alterations no more reflects content memory Due to this fact PET is used to directly link frontal alterations with item and temporal memory In both old and young adults.[12] Higher memory performance was confirmed in young adults by behavioral results. Further investigation proves that during temporal order retrieval in young adults the right prefrontal cortex is more activated than item retrieval.[13] This finding has no contradiction with the evidences provided by early studies in human and primates that prefrontal lesion has affects more on temporal memory than item memory.

CHANGE IN MEMORY TASKS AND BRAIN ACTIVITY WITH AGE

Increase In age causes reduction in memory processing tasks which Involves information storage and processing.[3] In young individuals while performing working memory tasks depending upon stimulus regions in posterior parietal cortex and in medial and lateral prefrontal are tend to be activated. Verbal tasks and spatial tasks are associated with left and right hemisphere activity respectively.[14] But in case of aged subjects while performing spatial and verbal tasks left and right hemispheric activity occurs and frontal regions lateralization is less dear.[14,15] In addition to these hemispheric differences in young adults, while considering task-dependent differences there are large differences in the activity of dorso and ventrolateral PFC.[16,17]

According to the two-stage model of working memory, dorso and ventrolateral PFC are mainly concerned with manipulation or stored item and maintaining information respectively during tasks of working memory[18,19] but there is variable age related differences in both regions. As compared to temporal storage in working memory the elders are more inaccurate in tasks related to executive control and manipulation[20] in brain activity the greatest difference is found In dorsolaterat region but task-related activity in ventrolateral and dorsolateral regions of PFC whereas during various working memory tasks the difference in activation Is only located in dorsolateral.[21,22,23]

Experimentally investigations were made by studying aging effects on retrieval, encoding, storage and various other stages of working memory. The only difference was found in retrieval stage, as minimum degree of activation is made in dorsolateral region of PFC.[23] However, age such ago related differences are not verified by other studies.[24]

In all latter reports differences were observed in ventrolateral region of PFC and MTL consistently. These are the areas with lesser or no activation at all in older subjects. Al the end there is no valid evidence about the reduction in activity in particular region in PFC.

AGING AND HIGH DEMAND MEMORY TASKS

To describe increase or decrease in prefrontal regional activity in older subjects one explanation comes from 'prefrontal-effort hypothesis. The pattern that was found in younger adults during both working[25] and episodic memories[26] was the difference in activity of left prefrontal region by recruitment of additional resources during high demand tasks. More activation occurs in prefrontal region when tasks difficulty increases. It term PageJ3 term as compensation on neural level because older adults prevent from declining 1n their performance of prefrontal by recruiting extra regions.[27] The supportive arguments were made that there is similar reduction in prefrontal activity by attention division and by aging. It supports that available attention resources claim equal effect by high cognitive processing and by age.

Another study was made in which performance during single and dual-tasks were compared and it was revealed that during dual-tasks left PFC is activated poor performers of both old and young subjects but not in good young subjects.[28] In addition to this an experiment was made among difficult or temporal order and simple or recognition tasks. The results shows that right PFC is more activated than left one 1n young subjects and in old subjects the results are totally opposite but in case of posterior regions there is no age related difference was found.[1] The final evidence is provided by the findings in which it was revealed that longer reaction lime and poorer performance is accompanied by reduction in frontal activity.[23,27,29]

In other explanation it is mentioned that frontal activity, differences underlying aging is associated with recruitment of brain areas and neural circuit efficiency reduction.[22,29] Over posterior regions the inhibitory control of frontal region is attributed by neural efficiency reductton.[22,27,30] During short term memory tasks In older subjects there is weaker inhibitory action as compared to the younger subjects.[31] According to this concept usefulness of increase in activity are not always but sometimes in cognitive functioning it is detrimental. Between reaction time and brain activity the neural circuit with reduced efficiency may reflect as positive correlation by slowing down cognitive processes. The evidence to this concept is provided by a study in which association between occipital and medial temporal as well as portal regions to the reaction time was studied. In case of young subjects increase in activity mean shorter reaction time but in older subjects results are opposite.[32]

CONCLUSION

In conclusion, aging involves deleterious changes in our brain and our all body as well. Most evidently global decrease occurs in PFC while performing high demand cognitive tasks and during rest. But the changes involving decrease ore not universal sometimes it may involve increase such as in case of activation in task-related elderly subjects. There is no clear evidence about the relationship of posterior *region* brain activity and aging. Reduction in neural efficiency reflects decrease and to compensate high demanding ·tasks the recruitment of extra regions reflects high frontal activity.

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“The weathers keep on changing;
the life carries on.
ENJOY it.”

Shuja Tahir