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Comparison of Short Term Memory Efficiency (Visual and Audio) at Circadian Rhythm (Chronopsychology)

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Abstract

This study compares the students' short term memory (visual and audio) at circadian rhythm at the different hours of a day. An ex post facto research had been designed and 104 subjects (52 girls, 52 boys) from two times schools were chosen. Every sex gender was divided into 4 groups (13 students on each group) and in different hours of the day (8, 11, 14 and 16) who were tested. The data was analyzed with "F" and Test, and showed that short term memory efficiency between two sexes was of significance difference. The boys showed upper performance in visual STM, but the girls were upper at 16, and the boys at 8 and 11. Biological rhythms in distribution and planning of mental activity are of high importance.

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Keywords: Short term memory; Circadian rhythm; Chronopsychology.

1. Introduction

Biologic activities have significant effect on mental performance organization. Paying attention to significant changes of mental performance is the first step to enjoy individual capabilities. Considering wide research and paying attention to the biologic and mental rhythms and it is one of the important actions for optimum utilization of capabilities of persons and promotion of educational quality. Living creatures have a mechanism called biologic clock. The said mechanism assists the living creatures in connection with evaluation and responding biologic variations. The findings indicate that for special biologic process, there are alternative times for activities and such activities are a cycle of basic features of living creatures. The findings show that human capabilities vary during different hours of a day, week, month and seasons. In order to study mental activities process of human within the psychology, the subject of time of psychology was considered. Regarding to the fact that there is very close relationship between biologic activities with mental process, changes of biologic activities have effect on mental activities particularly they change mental performance and efficiency during the week and month and this is the most important factor which has much effect on learning of individuals. The factor is the time. May be we can say that the factor of time can have effect on all other factors. In learning process, the rhythms are seriously considered (Reinberg and Ghata 1982; Sanders, 1999). It has been well-documented that humans can perceive the passage of

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time without referring to an external clock or stopwatch, whether duration to be perceived was longer (long-term time perception) or shorter (short-term time perception) (Kenichi, Kuriyama, Makoto, 2003).

Living beings are exposed to many different environmental influences. Many of them change regularly throughout the day. The two most important factors are the change of light and darkness and of temperature. Other factors change throughout the year and manifest themselves in what we call seasons. The term “circadian” is composed of the Latin words *circa* (nearly) and *dies* (day) referring to the fact that the clocks are generating rhythms with a period of about 24 h, even in constant light or temperature. Circadian rhythms are ubiquitous in human physiology and behavior (Golden., Johnson, and Kondo, 1998; Kazdin, 2000).

Disruption of circadian rhythm can impair memory. Circadian rhythms play an important role in memory functions, as indicated by behavioural studies in rodents and man. *Circadian rhythms play an important role in memory function, as indicated by behavioral studies in rodents and man. Circadian rhythm disruption could provide a model for impaired memory functions. Cognitive performance can show circadian variation that could interfere with potential effects of circadian rhythm disruption on memory functions (Reijmers, Leus, Burbach, Spruijt, Ree, 2001)*, and are generated by a central pacemaker, the suprachiasmatic nucleus (SCN) in the anterior hypothalamus, and are synchronized to the external environment. Current understanding of the sleep–wake cycle indicates that human sleep and wake behaviours are generated by a complex interaction of endogenous circadian and sleep homeostatic processes. The homeostatic process of sleep accumulates as a function of prior wakefulness.

In chronobiological studies, it was reported that short-term time perception seems to fluctuate across the day (Aschoff, 1987). Under the free-running condition, produced time has been reported to change along with core body temperature, which is a possible marker of circadian rhythm. During the subjective day, produced time decreased from the morning into the night. It means short-term time perception may be modulated by a circadian oscillator (Barreto, 1997; Aschoff, 1987).

Manly et al. (2002) report an interesting finding of a time-of-day effect on the ability to withhold automatic responding, but without considering the potential confound of homeostatic processes with increasing time awake. Investigations using a forced desynchrony protocol show separate and interactive effects of time-of-day and wake duration factors across a number of different outcome measures including mood, alertness and short-term memory. Wyatt, Ritz-De Cecco, Czeisler, and Dijk (1999) found separate effects of time-of-day and wake duration across a range of performance tasks including short-term memory, Digit Symbol Substitution Task, Psychomotor Vigilance Task (slowest 10 percent), and subjective alertness, although interaction between the two factors was limited to alertness.

BIOLOGIC GLANCES ON ORGANIZING ONE DAY:

The activities which a person can perform in regular and organized condition and to have the most result for human are explained here:

- 7 to 8 a.m.: Facing with the natural or artificial light is increased for 15 minutes, has energetic effect.
- At 9 a.m. : It is the best time for organizing, planning, creative thinking, writing.
- At 11 a.m.: It is the best time for planning on a meeting. Most people have the optimum consciousness at this time and proving skills on daily working such as short term memory.
 - At 1 to 2: It is the best time for having lunch.
 - At 2 to 3 p.m.: Temperature of the body is decreased and the person feels sleepy.
 - At 3 p.m.: Performance of repeated activities is in the high level.
 - At 4 p.m.: The human consciousness returns.
 - At 5 p.m.: At this time speed of the coordinated and rhythmic actions and reactions is also high.
 - At 8 to 10 p.m. : The level of consciousness is still high.
 - At midnight: It is the best time for sleeping and adjusting the biologic clock.

Folkard and his colleagues (1980) suggest that short term memory in morning is higher than afternoon and he showed that memorizing information in morning is easier than in afternoon. Popple and his colleagues (1970) believe that the reaction time for audio-visual activities between 17 to 20 is maximum but Bineh and Lamber (1993) believe that the best efficiency of vision is in morning and hearing is in afternoon (Quoted Sharify, 1998).

Various psychophysiological factors have influences on human time perception. In particular, working memory loads, time of day, body temperature, and mood were known as important modifiers of time perception (Kenichi et al,2003). The purpose of this study is to determine the *efficiency of short term memory at circadian rhythm*

TOOLS:

The measurement tools for short term hearing memory, is the numerical children memory (Wechsler) as well as visual short term memory. For measuring visual short term memory, the visual test (2000) performed under supervision of Ashayeri and Javadi, was used and it includes 21 pictures and each picture has two cards. In the first card, the picture is complete and full and in the second card the picture is not full and none complete then they ask from the student to look at the full picture (for 5 seconds) then look at the non complete picture to tell the shortage parts.

Table 1. ANOVA for comparison of STM effect in circadian rhythm in student

	Sum of squares	df	Mean squares	F	Sig.
Between groups	59/46	3	19/82	1/25	---
Within groups	1654/54	104	15/91		

This table doesn't show any different between STM in *circadian rhythm* in students.

Table 2:ANOVA for comparison of visual STM effect in circadian rhythm

	Sum of squares	df	Mean squares	F	Sig.
Between groups	332/212	3	10/737	1/173	---
Within groups	439/538	48	9/157		

This table doesn't show different between visual STM in *circadian rhythm* in students.

Table 3: ANOVA for comparison of audio STM effect in *circadian rhythm*

	Sum of squares	df	Mean squares	F	Sig.
Between groups	36/212	3	12/07	1/535	---
Within groups	377/538	48	7/865		

This table doesn't show different between visual STM in *circadian rhythm* in boys.

Table4:ANOVA for comparison of visual STM effect in boy's *circadian rhythm*

	Sum of squares	df	Mean squares	F	Sig.
Between groups	87/288	3	29/096	6/188	0/01
Within groups	225/692	48	4/702		

This table shows different between visual STM in *circadian rhythm* in boys.

Discussion

In the present study, short-term time production showed significant diurnal fluctuations in boys, in which remarkable over-production in the morning at 10 (and decreased until 13) and again increases in the evening at 16. Between short term memory efficiency in two sexes displayed significant difference. And boys have upper performance than girls in visual STM efficiency. Girls were up at 16 and boys at 8 and 11. Biological rhythms in distribution and planning of mental activity are very important. It is different from other studies. The findings indicate that for special biologic process, there are alternative times for activities and such activities are a cycle of basic features of living creatures. The findings show that human capabilities vary during different hours of a day. In order to study mental activities process of human within the psychology, the subject of time of psychology was considered. Regarding to the fact that there is very close relationship between biologic activities with mental process, changes of biologic activities have effect on mental activities particularly they change mental performance.

Considering the wide researches as well as psychological and biological rhythmic is one of the important actions for enjoying the optimum capability of people in promoting educational qualification. Also considering some factors such as sex and age in distribution of mental activity, is very important and it is necessary for making balance on mental activity (in connection with learning lessons) on the basis of natural variations of mental efficiency. The maximum and minimum efficiency should be considered and educational programming should be planned on this basis. Also other factors such as early morning and late afternoon, sleeping and waking up cycle, nutritional factors should be also considered. In the present study, short-term memory showed significant diurnal fluctuations, in which remarkable over-production in the morning decreased towards the evening in boys.

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