

(RESEARCH ARTICLE)



Information searching activity based on the body's circadian rhythm (morning-evening)

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Abstract

Introduction: Organisms, including humans, have an internal biological clock that helps them adjust to the regular rhythm of the day. We aimed to study the effect of body's circadian rhythm (morning-evening), (biological clock) in searching for information on different people.

Methods: The present study is of a fundamental applied type that has been performed by quasi-experimental method. The statistical population of the study consisted of 69 medical students of Qom University of Medical Sciences who were selected by purposive sampling method. The data of this study were used in two stages of completing the general health questionnaire, morning and evening sleep type, observing the behavior of completing search tasks and log analysis using collected images from users and then were collected in Camtasia studio software. Then, recorded data were collected and analyzed by Excel software and SPSS-24 software.

Results: The results showed that people who slept in the evening had better information searching in a shorter time than people who slept in the morning and between. Analysis of the samples searching and retrieval behavior showed that they performed a total of 1574 strategies and techniques in the searching process. In fact, the samples chose their searching according to the type of their task.

Conclusion: None of the sleeping types can affect the tests and cause cycles. Based on the genetic changes that occur, humans have different characteristics changing from time to time and create individual and functional differences. The range of individual differences is much wide.

Keywords: Information searching; Sleep type; Searching behavior; Circadian rhythm; Body clock; Circadian clock

1. Introduction

Chronobiology, or the science of studying time, studies biological melodies and cyclical changes. These biological sounds, which are cyclical changes in physiological processes such as consciousness, body temperature, changes in growth hormone concentrations, cortisol and potassium, occur regularly at certain times of the day[1].

Daily melody has been studied more than any other biological melodies. The sequence of events may be short-term, long-term or internal and external.

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Those tunes that continue with a normal frequency and a regular routine such as waking time, eating time, and activity and are permanent and originate from the body itself are called internal tunes [2].

The main and congenital group of cells consists of tissues that are resistant to change against environmental factors due to their main function, which is to maintain time continuity. Internal biological tunes are derived from internal biological clocks, which include the sleep-wake cycle and the daily body temperature cycle [3].

The group of sounds whose phase and frequency are affected by external factors are called external sounds. These tunes are very unstable and can be changed in different amplitudes or stages by manipulating irrelevant variables [1].

External biological sounds are derived directly from the environment or other external influence. Another expression for this biological melody is a direct effect. An example of external biological melody is flying sparrows in a high spotlight when the lights are on.

Such tunes have a geophysical counterpart, which in this example is a new presence counterpart. Most of the existing tunes are a combination of both internal and external tunes, which include both fixed internal and external variable elements in the event of changes in tone. The harmony of an organism with both internal and external environments is essential for maintaining its health and survival.

In humans, the length of these cycles is known as the period, which can range from small one-second fractions such as nerve conduction velocity to 24-hour periods (daily melody) or longer periods of 28-30 days (menstrual or Emotional cycle) or periods that occur with seasonal changes once or twice a year.

A tune for a 24-hour of solar day is called a daily tune, and tunes with shorter periods of 24-hour are also called a daily tune, and tunes with periods shorter than one day or Less than 20 hours a day and more than 28 hours, longer than a day, can also occur.

Researchers at Harvard University have recently concluded that human functions can be associated with periods of twenty-three and a half hours or periods of twenty-four hours and sixty-five hundredths (the second period most common for Mars) [4].

Advances in new technologies have forced users to search using electronic resources without time and space constraints. At present, databases as a source for scientific research have provided access to all quantitative and qualitative information, so due to the situation of users and the many problems they face in finding information, mainly in addition to information literacy and skills, depends on the need for users' genetic status.

The findings of the present study, are important because it can provide appropriate practical solutions to address the shortcomings and limitations of the use of information resources, situations and genetic changes and lifestyle of individuals in the future policies and plans of students.

What compels users to the right position for research is their position and genetic variation. The purpose of this study is the existence of the basis of genetic changes in body clock (biological clock) in searching for information of different people and drawing a pattern of these changes and determines to what extent genetic changes in body clock are fruitful in information seeking and information search behavior and which one of these changes and sleep behavior in search of information to achieve can reach the desired results.

2. Methods

The present study is a fundamental applied study. This study was performed on 69 medical students of Qom University of Medical Sciences who were selected by purposive sampling. The data of this study were collected in two stages of completing the general health questionnaire, morning and evening sleep type and in the second stage using recorded images of users in Camtasia studio software to observe the behavior of completing search tasks and log analysis. The recorded data were collected and analyzed in Excel software and by SPSS-24 software. All performance variables, except the quality of the final results, were extracted from transaction log files using Camtasia studio software during the searching, which included:

- The time spent searching was defined as the time when the participants looked directly at the searching page or were actively searching.

- The total number of internet addresses visited.
- The number of observed viewed was defined as a clicked URL from the search results page.
- The number of the results of the requested pages in each session or in other words, the number of times the user has a request from the search engine, which indicates the level of user interaction with the system.
- The number of unique queries per session that might indicated the level of the user interaction [5].
- Query Length, defined as the number of words in a query, is a string of characters entered into a web browser search box, which probably represents the scientific complex levels of the researchers.
- The length of time that each search results page is reviewed in a search session.
- The review time of each selected document was defined as the time of clicking on the URL of the results page of a search engine and returning to the search engine [6]. The length of time the user spends browsing the documents can be related to the full awareness of the users.
- The average bounce rate per visit to each site: The average of visits that the user exits immediately after entering the page, this means that the information required by the user was not on that page and the user leaves the page quickly.

2.1 Searching Strategy

- Direct searching: Direct entry to the database electronical address,
- Login to the university home page
- Indirect searching: Start searching from Google and...
- Combined searching: Searching using two strategies
- Structured navigation: Following the results on the same page, using back and forth buttons, use the back button to go to the page
- Scattered Navigation: Following the results in a new tab [7].

2.1.1 Combined Navigation

The combined use of structured and dispersed strategies of Morning and Evening Type Questionnaire (MEQ); Validity and Reliability: It is a self-report tool that is used to measure morning and evening types. This questionnaire consists of 5 questions selected from a 19-item questionnaire. Sleep and wake time questionnaire questions, when the person has the best feeling, which has been used in various studies and its reliability has been reported to be about 0.72 [8].

The scoring method is in Likert scale. General Health Questionnaire (GHQ-28, developed by Goldberg and Hiller in 1979 and its questions were extracted based on the factor analysis method of the initial 60-item form, which includes 4 subscales of physical symptoms, Anxiety and sleep disturbance, social dysfunction, acute depression and included 10 psychological problems [9].

This questionnaire used three methods of retesting, halving and Cronbach's alpha to assess validity. The results of this study indicated that the coefficients of validity were 0.70, 0.93 and 0.90, respectively, according to the three tests. This questionnaire will automatically show the same psychometric properties by each culture. According to the studies, the validation of the 28-item public health questionnaire has been done a lot in Iran.

Descriptive statistics and method of calculating frequency, percentage and standard deviation have been used to analyze the data obtained from tests and log analysis. Required tables and graphs were drawn. In order to determine the normality of data distribution, Kolmogorov-Smirnov test was used and to determine the significance of the relationship between research variables, Pearson inferential statistics, non-parametric chi-square test and analysis of variance were also used.

Descriptive statistics, frequency calculation method, percentage and standard deviation were used to analyze the data obtained from the questionnaires and log analysis, and the required tables and graphs were drawn. To determine the significance of the relationship between the research variables, inferential statistics and non-parametric chi-square tests and repeated measures analysis of variance were used.

3. Results

Based on the analysis of the data of the present study, the following results were obtained, which were listed in the relevant tables as follows.

Table 1 Frequency distribution of morning and evening sleep type

Group	Frequency	Frequency percentage
Morning sleep	16	23
Evening sleep	8	12
intermediate	45	65
Total	69	100

Table 1 shows that the highest frequency is related to the intermediate group with a frequency of 45 people (65%), of which 12% of users are in the night, 65% are in the middle, and 23% of the samples are in the morning. Among them, 16 people had morning sleep, 8 people had evening sleep and 45 people had intermediate sleep, and in terms of age, the youngest was 17 and the oldest was 30 years old.

Table 2 Frequency distribution of general health in medical students of Qom Frequency group percentage

Group	Frequency	F. Percent
0-07	26	38
8-14	17	25
15-21	11	16
22-28	9	13
29-35	5	7
36-42	1	1
Total	69	100

Table 2 shows that the frequency distribution of the general health questionnaire among students of the University of Medical Sciences is divided into 4 groups, with the highest frequency belonging to the 0-0 group with 38% frequency and the lowest belonging to the 34-34 group with 1% frequency.

Table 3 Information retrieval process based on genetic changes

Rhythm Frequency	Morning		Evening		Intermediate		P. value
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
True or false answer	7	43.8	4	44.4	22	50	0.236
Downloading	13	81.3	8	88.9	33	75.0	0.62
Unique search	9	56.3	1	11.1	10	22.7	0.041
Direct entrance to the university	1	6.3	0	0	7	15.9	0.297
Login with the browser	5	31.3	2	22.2	18	40.9	0.508

Table 3 showed that in the process of communication between information retrieval and sleep type, it can be said that people with intermediate sleep type were more successful in their search than in the evening and morning sleep and gave better answers. Regarding the downloading of information in the information retrieval process, it can be said that 88.9% of people with evening sleep type had a significant difference compared to other people, but there was no statistically significant difference. Regarding the unique search, it can be said that people were able to retrieve information better with the morning sleep type, and this difference was significant, and statistically there was a significant difference with P-value 0.041. In connection with the search through the university, it can be said that people with intermediate sleep type were able to retrieve information better, but it was not statistically significant.

Table 4 Information retrieval process based on search guidance based on genetic variation

Body Rhythm Frequency Information Retrieve	Morning Type		Evening Type		Intermediate Type		P-value
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Google Translator	4	25	1	11.1	6	13.6	0.519
Direct Entrance	1	6.3	5	55.6	18	40.9	0.017
Specialized phrases	8	50	5	55.6	18	40.9	0.649
Change in phrases	8	50	2	22.2	21	47.7	0.307
Intermittent search	7	43.8	5	55.6	18	40.9	0.705
Related Search	6	37.5	2	22.2	20	45.5	0.778
Suggested phrase	10	62.5	5	55.6	18	40.9	0.532
Delete background	7	43.8	4	44.4	13	29.5	0.48
Change search term	9	56.3	3	33.3	19	43.2	0.699
Login with the new tab	11	68.8	8	88.9	36	81.8	0.411
Back to new page	9	56.5	5	55.6	18	40.9	0.686

The results in Table 4 also showed that 25% of people with morning sleep type used Google translation and had better information retrieval, and 55.6% of people with evening sleep type who searched directly were related and statistically significant (P-value 0.017). %55.6 of the evening sleep type and 50% with the morning sleep type were able to recover using specialized expressions, but the relationship was not significant. Regarding the relationship between information retrieval process and sleep type, it can be said that 47.7% of the people with intermediate sleep type and 50% with morning sleep type were able to access accurate information by changing the search term, but this relationship was not also significant. In intermittent searching, it can be said that in 55.6% of people with evening sleep type had a more successful recovery and this relationship was not significant. In related phrases and search, it is also important that 45% of people with intermediate sleep type had more successful recovery, but the relationship was not also significant. In the suggested expressions and its relationship with sleep type, it can be said that 62.5% of people with morning sleep type were able to recover better and this relationship was not significant. Regarding the change in search terms and information retrieval and sleep type, it can be said that 56.3% of people with morning sleep type were able to recover, but this relationship was not significant. Entering the new page and contact with the sleep type, it can be said that 88.9% of people with the evening sleep type were able to recover better, but the relationship was not significant. It is important to return to the old search page, that 56.5% of people with morning sleep type and 55.6% of people with evening sleep type used this function.

Table 5 also showed that 77.8% of people with evening sleep type browsed the pages and there was a relationship between the recovery process and sleep type and this relationship was significant with p-value: 0.049. 43.8% of people with morning sleep type read search pages and had successful data retrieval, but the relationship was not statistically significant. In a combined search, it can be said that 50% of people with a morning sleep type used different search options. In the search for the title specifically, 61.4% of people used the intermediate sleep type and there was a relationship between the information retrieval process and the sleep type, but it was not significant. Fifty percent of the people with the morning sleep type were able to succeed in the information retrieval process from the bold words, but

this relationship was not significant. 34.1% of people with intermediate sleep type and 33.3% of people with morning sleep type were able to use advanced search in the information retrieval process, which was not significant.

Table 5 Information retrieval process based on search steps based on genetic variation

Body Rhythm Frequency Searching Stages	Morning Type		Evening Type		Intermediate type		P-value
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Paging	11	68.8	7	77.8	15	34.1	0.049
Study	7	43.8	3	33.3	16	36.4	0.294
From hybrid operators	8	50	3	33.3	16	36.4	0.552
Title	9	56.3	4	44.4	27	61.4	0.637
Total title	5	31.3	5	55.6	19	43.2	-
General title of the pages	3	18.8	1	11.1	10	22.7	0.481
Bold words	8	50	3	33.3	21	47.7	0.639
Choice based on cognition	4	25	2	22.2	15	34.1	0.674
Select a title	7	43.8	2	22.2	14	31.8	0.515
Save in file D	16	100	9	100	44	100	-
University selection	7	43.8	6	66.7	14	31.8	0.325
advanced search	5	31.3	2	22.2	15	34.1	0.526

4. Discussion

In the theory of biodynamic of the body, there are three cycles with definite time periods, emotional cycle, mental cycle, physical cycle. Some cycles are daily, some are smaller and less than 24 hours, and some are more than 24 hours, or monthly, seasonally or annually. Researchers believe that even many complex human functions, such as intelligence, emotion, and physical skills, are repetitive. Because the amount of hormones in the body changes, so does the human biological clock, and validate this theory more [10].

The user plays an essential role in information retrieval, the higher the user is emotionally, physically, mentally, the better he can certainly extract the information. The biggest difference in Qom University of Medical Sciences students was in the intermediate subjects, then the subjects with morning sleep type and finally evening sleep type were included, but there was not a significant relationship between all of the sleep types with the tests.

So, it can be said that none of the sleep types can affect the tests and cause the cycles to occur. Based on the genetic changes that occur, humans have different characteristics that change and create individual and functional differences. The range of individual differences is very wide [11], tests have become an objective and quantitative tool that is used to measure a sample of certain situations and behaviors and should be quantified [12].

Colthaw [13] believes that users experience some kind of anxiety or uncertainty at the beginning of the searching process and after realizing their information need, and in fact, they search to eliminate this lack of confidence and anxiety. Therefore, the user enters the information seeking process with a negative feeling. According to the findings of the present study, especially when the user is faced with a difficult search task or is in the early stages of the search and has more concentration and relaxation and enough sleep, will have less reaction time and a higher level of consciousness.

The task of data retrieval systems at this time is to eliminate or reduce this level of alertness and higher accuracy, as seen in the present study, the user was confronted with suggestions from the Google search engine, suggestions for expanding search and related links. However, if the brigade was morning sleep and had insufficient sleep, it had a lower level of consciousness than the person who was faced with the brigade in the evening.

Following the retrieval of information, the user was satisfied with the first search results and the items that seemed to match his information needs, his level of awareness increased to the last step, the pages he wants to select was the most relevant pages and saved the results for later use in various forms. So, information retrieval is a process that involves the user's emotional aspects and changes according to his mental, emotional and physical state. And it again affects the user's cognition, mind, psyche and body [14].

Based on the results, biological clocks have direct effects on personality dimensions. Maghsoudloo's study showed that people who have a morning cycle are more prone to psychosis than others [15].

The analysis of the subjects' search and retrieval behavior showed that the subjects performed a total of 1574 strategies and techniques at the beginning of the search. In fact, the subjects chose their search strategy according to the type of the task. For example, in the article search task, most of the subjects used the browser and search engine directly to search for the article, i.e. the subjects' behavior (strategy and techniques) at this stage was different according to the type of tasks.

The findings also show that most users preferred to use Google Chrome browser and Google search engine to start the search. Therefore, the results of this study were in line with the findings of recent research in this field [16], because its findings also indicate that users and web researchers use search engines to search instead of using thematic guides.

The results of this study are also consistent with the research findings [17] that in their research findings, most participants used Google Chrome browser in search. While in the study [18] the findings related to the use of search engine by graduate students of Shahid Chamran University, thematic guide and shared databases of the university showed that students use shared databases the most compared to Google and search engines. They have subject guidelines that are consistent with the present article in this regard.

5. Conclusion

In this research, using the collected data and analyzing them, it gives us very accurate and comprehensive models that increase the validity and accuracy of the results. In order to obtain the diversity of biological clock, the morning-type sleep test was performed on the samples. Using this model is necessary to provide services in all areas, especially in the field of health, and will improve the quantity and quality of efficiency.

Based on the genetic changes that occur, humans have different characteristics that change and create individual and functional differences. The range of individual differences is very wide. When the user was confronted with the suggestions of the Google search engine, such as phrases to expand the searching and related links, if the sample had a morning sleep type and had insufficient sleep, it had a lower level of consciousness than the person who faced the brigade in the evening.

Therefore, paying attention to sleep regulation hours and paying attention to the body rhythm to prepare it for academic, intellectual, educational, research and other related activities can be important and should be considered. Because it can be a roadmap for planners in all areas, especially the health sector, by designing various softwares.

Using this model and recognizing the level of consciousness of people in society, the strengths, weaknesses and strengths of society can be examined. These patterns can be based on the type of sleep provided and the body biology clock and by providing information, can improve the national planning of different systems, especially the health system, and in the near future lead to the improvement of necessary behaviors in these and related matters.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest has been reported by the authors.

Statement of informed consent

The Authors informed the participants at first from the research and the outcomes of it before performing the study and told them that their information will be kept secret and just the research results will be published generally. Information such as: I consent to participate in the present research plan and know that there will be no direct benefit to me and that their participation was completely voluntary. The Authors confirmed that it will be their right to withdraw from the study at any time without any implications. Then, the participants were completely informed because of ethical approval in the present study.

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