

RAGAS CAN MODULATE CIRCADIAN RHYTHMS

P.Barathi *

Biological rhythms control much of the body's normal functions, including performance, behavior, sleep and endocrine rhythms. These functions are primarily regulated by the circadian clock, a cluster of nerves located on the hypothalamus in the brain. The circadian clock relies on environmental cues to regulate its function, primarily light cues from the day/night cycle. Abrupt shifts in routine, such as shift changes, or travel resulting in jet lag can alter the sleep cycle and have a detrimental effect on normal circadian rhythms. Additionally season changes, which are accompanied by a decrease in the number of daylight hours, can negatively impact the function of the circadian clock, primarily the secretion of melatonin to induce sleep. If the alterations in biological rhythms are strong enough they may lead to mood disorders including mild depression and seasonal affective disorder.

There are two major categories of biological rhythms, endogenous, and exogenous. Endogenous rhythms come from within and are regulated by the organism itself, for example the body temperature cycle. Exogenous rhythms are the result of external factors, such as a change in the seasons, or the transition from day to night. Environmental stimuli that help to maintain these cycles are called *zeitgebers*, which comes from German and translates as "time givers." *Zeitgebers* include sunlight, noise, food, and even social interaction, all cues that help the biological clock maintain a 24-hour day.

There are four categories of biological rhythms that extend beyond just classifying them based on internal and external sources. This system maintains that criteria, but extends to include the duration of the cycle as a defining factor. The resulting categories are circadian rhythms, diurnal rhythms, ultradian rhythms, and infradian rhythms.

Circadian rhythms: Circadian rhythms are defined as endogenous rhythm patterns that cycle on a daily (approximately 24 hour) basis under normal circumstances. The circadian cycle regulates changes in performance, endocrine rhythms, behavior and sleep timing (Duffy, Rimmer, & Czeisler, 2001). More specifically these physiological and behavioral rhythms control the waking/sleep cycle, body temperature, blood pressure, reaction time, levels of alertness, patterns of hormone secretion, and digestive functions. Due to the large amount of control of the circadian rhythm cycle it is often referred to as the *pacemaker*.

Two specific forms of circadian rhythms commonly discussed in research are morning and evening types. There is a direct correlation between the circadian *pacemaker* and the behavioral trait of morningness-eveningness (Duffy et al., 2001). People considered morning people rise between 5 a.m. and 7 a.m. go to bed between 9 p.m. and 11 p.m., whereas evening people tend to wake up between 9 a.m. and 11 a.m. and retire between 11 p.m. and 3 a.m. The majority of people fall somewhere between the two types. Evidence has shown that morning types have more rigid circadian cycles evening types, who display more flexibility in adjusting to new schedules (Hedge, 1999). One theory is that evening types depend less on light cues from the environment to shape their sleep/wake cycle, and therefore exhibit more internal control over their circadian rhythms.

MOOD DISORDERS AND BIOLOGICAL RHYTHMS

Mood disorders are characterized by opposite polar moods: depression, which involves extreme feelings of sadness and dejection, and mania, which involves unrealistic feelings of excitement and joy. There are a variety of unipolar mood disorders, which involve mania or depression, and bipolar disorders, which are characterized by both mania and depression.

SLEEP AND DEPRESSION

The circadian clock is responsible for controlling sleep patterns. Melatonin secretion from this region of the brain actually induces sleep. Commonly depressed patients experience a wide variety of sleep disorders. It should come as little surprise then that there is a connection between disruptions of the circadian cycle and depressive disorders. Generally a decreased amount of deep sleep per night comes just before the onset of depression. Therefore a drastic change in sleep schedule caused by extensive occurrences of jet lag, or multiple shift changes may result in a disruption of circadian rhythm function. In these instances it is possible for the circadian clock to induce REM sleep 15 to 20 minutes

* Dr.P.Barathi, M.D.,
Prof of Physiology, Music Therapist
e-mail : iyer.bharthi@gmail.com

earlier in the sleep cycle, resulting in decrease in the amount of deep sleep, and ultimately leading to the beginning stages of depression (Butcher, Mineka, & Hooley, 2004).

In order to help prevent disruptions in the circadian sleep cycle it is important to maintain a regular sleep schedule, which includes retiring and waking at approximately the same time each day, and sleeping a consistent number of hours each night. This is especially important for people with morningness tendencies because their circadian cycles are less adaptable to changes in behavior.

SEASONAL AFFECTIVE DISORDER

In recent years psychologists have recognized the impact of seasonal changes on mood and behavior. Seasonal affective disorder (SAD) is a unipolar mood disorder in which patients are highly responsive to the total amount of light available in the environment. Individuals who suffer from seasonal affective disorder show signs of depression during the fall and winter months when there are fewer hours of sunlight each day. Disturbances in mood are the main psychological component of seasonality (Ennis & McConville, 2004).

Persons suffering from seasonal depression generally show an increase in appetite and hypersomnia, which oddly is opposite of the behavior normally associated with most other forms of depression. This behavior is consistent with research conducted on animals and may be related to baser survival instincts. The explanation behind this theory is that like some animals people may have a natural tendency towards increasing fat stores in the body during the winter, as well as sleeping more often in order to preserve energy levels.

Several more recent studies suggest that sufferers of seasonal affective disorder display disturbances in their circadian cycles, as indicated by less consistent rhythm patterns. A common therapy used to treat seasonal affective disorder is light exposure therapy (Oren & Rosenthal, 1993). Though the effects of light exposure are not completely understood it has been shown that the presences of either natural or artificial light seems to work towards correcting circadian disturbances caused by seasonality.

CONCLUSION

There are four types of biological rhythms that regulate cycles within the body. The primary type, circadian rhythms, controls performance, endocrine rhythms, behavior and sleep timing, and is regulated by the circadian clock, a collection of nerves located on the hypothalamus. Diurnal Rhythms are a specialized form of circadian rhythms, which are closely synchronized with day and night cycles. Both cycles have a duration of approximately 24 hours. Ultradian rhythms are biological rhythms, which operate on a shorter time scale than circadian rhythms, feeding schedules for example. Infradian rhythms are those with cycles longer than 24 hours, the most commonly studied example is the human menstrual cycle.

Although all of these biological rhythms are controlled internally there are a number of external factors that are capable of influencing their regularity. Some of the most prominent examples are exposure to light, specifically the changes caused by seasonal transitions, alterations in work shift which change sleeping schedules, jet lag, and caffeine. With the exception of light affects the other influencing factors cause sleeping patterns to change. Due to the fact that circadian rhythms can only shift one to two hours each day drastic changes in sleep patterns can have a detrimental effect on the circadian clock.

Seasonal changes cause an alteration in the amount of light that individuals are exposed to. During the months where the days are shorter, primarily in the winter, circadian patterns are disrupted. The reason is that the circadian clock is programmed to release melatonin to induce sleep, a function that is initiated by darkness. Because the sun sets earlier in winter months this reaction begins occurring earlier in the evening, which results in a disrupted sleep pattern, a common problem for depressed patients. Individuals with Seasonal affective disorder are more likely to experience the affects of this change, and are prone to an increased amount of sleep, known as hypersomnia, and an increased appetite.

There is still a great deal that is not known about the relationship between biological rhythms and mental and physical health disorders, however there is enough existing evidence to support further study in this field. By gaining a better understanding of the rhythms and environmental factors that influence them it is possible to begin making connections to mood disorders. Once the link can be traced it is possible that new treatments may develop which are designed to correct disruptions in biological rhythms, or perhaps even prevention methods, which help to avoid major disruptions.

THE MOODS EXPRESSED BY ETHNIC INDIAN RAGAS

Music and mood can never be separated, since all music expresses, strongly or softly, a certain emotion or a mixture of emotions. In music psychology, eight clusters of moods devised by Hevner are being used popularly, viz., majestic,

passionate, happy or joyous, humorous, tranquil, yearning or longing, sad or mournful, and solemn or sober. Music listeners experience some sort of affective responses, which can be employed for therapeutic or healing purposes.

In Indian musical tradition, a musical mode is known as a raga, each raga being associated with a particular emotion, time of day, and season of the year. The moods inherent in ragas have been depicted through paintings, known as ragamala pictures.

Nine primary moods or 'rasas' (meaning juice or sap) are in vogue in Indian classical music.

The nine 'rasas' include:

- 1) Sringara -love, joyful, happy.
- 2) Karuna -sadness, longing, grief, resigned acceptance.
- 3) Shanta – peace, tranquility.
- 4) Vira -noble, dignified, energetic, warrior like
- 5) Adbhuta -wonder, surprise, astonishment
- 6) Hasya -laughter, humor
- 7) Abhyanka –fear, terror
- 8) Krodha -anger
- 9) Vibhatsa –disgust, revulsion

Let us glean an insight into some of the moods expressed by Indian ragas, their favoured time and season for listening, etc.:

Rag Kedar (Hindustani)- is a serious and contemplative raga which is represented in ragamala paintings as an ascetic in meditation, and is meant to be played on a winter night.

Raga Shri (Hindustani)- conveys a mood of love and is meant to be heard on a late afternoon in winter.

Rag Bilawal (Hindustani)- 'Shanta Rasa' - Serene, quiet, peaceful, meant to be played in the early hours of the morning.

Rag Bhairavi (Hindustani)- 'Gambhir' – Serious, Timing - Evening.

Sri Ragam (Carnatic) - evokes devotion/bhakti and is an 'auspicious raga'.

Rag Darbar (Carnatic) - conveys a majestic mood.

Ragas Behag and Khamas (Carnatic) - exude Sringara rasa.

Some interesting facts about the moods pertaining to Indian ragas

Rags Sankarabaranam and Kalyani represent the ascetic-erotic duality of Lord Siva: The paradoxical duality of Lord Siva, ascetic-erotic, creative-destructive, good-evil, is also represented musically, as is evident in the following two Thaats prevalent in Hindustani music- Bilawal Thaat and Yaman Thaat. Kukubh Bilawal (Sankarabaranam in Carnatic music) portrays a light and mood-elevating atmosphere, while simultaneously inducing a state of tranquility- akin to Siva's ascetic state. Hindola, an offspring of Yaman Thaat (Kalyani in Carnatic music) evokes the rasa of Sambhoga Sringara, i.e. love tainted with eroticism, signifying Siva's erotic nature. Kalyani differs from Sankarabaranam only because of Ma2, all the notes being similar. Ma1 in Sankarabaranam has a frequency value of 498 cents, while Ma2 in Kalyani has a value of 590 cents, a small interval of less than 100 cents making all the difference between the emotions evoked by both the ragas.

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