

EFFECT OF THE KARNATIC MUSIC RAGA "NEELAMBARI" ON SLEEP ARCHITECTURE

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(Received on April 3, 1997)

Abstract : The raga Nelambari in the classical Indian Karnatic system of music is said to be able to induce sleep and also have some sleep promoting qualities. This hypothesis was scientifically tested using sleep polysomnography with eight healthy subjects who listened to either Neelambari (test) raga or Kalyani (control) raga. There was no difference in sleep architecture or in subjective feeling of quality of sleep. The anecdotal references to the quality of sleep promoting effects of Neelambari probably reflect a conditioned response since most lullabies in South India are sung in Neelambari raga.

Key words : music sleep polysomnography

INTRODUCTION

Drinking a glass of milk, taking a warm bath, listening to music and reading a book are some of the strategies which people resort to in order to induce sleep. In every community the world over, children are put to sleep by singing lullabies. Relaxing music is used to promote sleep in elderly hospitalized patients in critical care units (1). In a community based study 96% of the subjects showed improvement of sleep related problems when they listened to music just prior to bedtime (2).

Classical Indian Karnatic music has codified the various ragas which are to be

played at particular times of the day (3). Many ragas have a similar counterpart with different names in the Hindustani style of classical music. These ragas are believed to have properties which are known to evoke certain emotions. The raga Amirthavarshini is said to bring forth rain, Punnagavarali to attract snakes, Neelambari to induce sleep and so on. Lullabies sung in the villages of South India are based on Nelambari raga. In most Hindu temples of South India the presiding deity is lulled to sleep at night with this raga. Neelambari is said to induce sleep quickly and also promote a more sound and relaxed state of sleep. However, this has not been scientifically proved so far. This experiment

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was conceived with the aim of testing whether the raga Neelambari has sleep promoting effects and/or whether it alters the sleep architecture of individuals. The subjective feelings on the quality of sleep produced were also studied.

METHODS

Eight healthy male volunteers who had no knowledge of classical Indian Karnatic music were selected as volunteers. All agreed to spend three nights in the sleep laboratory. They were not informed of the aim of the study but were told that they would be volunteers for a study on sleep patterns in healthy people. This was done to prevent bias. Written consent was obtained from all of them. All subjects were asked to come two hours prior to their usual bedtime to the sleep laboratory. The first night was an acclimatization night where subjects slept with the electrodes on but no recording was done (4). On the second and third nights either Neelambari raga or Kalyani raga (used as a control) were played from the time the subjects entered the lab till one hour and a half hours after lights off. The music was played in an adjacent room and the volume adjusted so that it could be heard clearly.

Sleep was monitored using a computerized polysomnography system (Healthydyne International Technologies), throughout the night. Electronen-cephalography (EEG), electrooculography (EOG), electromyography (EMG) and electrocardiography (ECG) were used for staging sleep. Selection of sites for placement of electrodes and number of electrodes used were according to the

standardized procedure for sleep studies (5). EEG electrodes were placed according to the standards set by the American Sleep Disorders Association. All sleep data was stored on optical disks and scored manually by the investigator who was blind to the raga played on that night. Scoring was done according to the Reschtaffen and Kales manual (6) for scoring sleep records. An epoch by epoch scoring method was followed with an epoch length of thirty seconds. Sleep onset was taken as the first epoch of stage two sleep when there was continuous period of sleep for four minutes. Sleep onset latency is the time from lights out to sleep onset. Rapid Eye Movement (REM) latency is the elapsed time from sleep onset to the first epoch of REM sleep.

Subjects were asked to fill out a questionnaire regarding the quality of sleep in the morning after the study. This also included a four point scale ranging from zero (did not sleep at all) to three (slept extremely well). Slept fairly poorly (one) and slept pretty well (two) were the other two points on the scale. At the end of the three nights they were asked to state their preferences on the type of music they like to hear and also whether they could identify the raga played. Subjects were also asked to record whether they felt refreshed in the morning after the study. They had to indicate whether they received any formal training in Indian classical music. At the end of the study, subjects were told of the aim of the study and asked to guess which night they heard Neelambari. Statistical analysis was done using a software package "Statistix". Paired Student's "t" test was used to compare both groups. A probability value of $P \leq 0.05$ was considered significant.

RESULTS

The mean age (range) of the volunteers was 32 (26–60) years. All subjects said they liked listening to music with all but one preferring to listen to Indian light music. Western classical music was enjoyed by only one person. None of them had received any formal training in Karnatic music and therefore they could not identify either of the ragas. The results show that there is no significant difference between the two groups (Table I) for any of the sleep variables studied. The sleep efficiency (S.D) was 78.84% (18.24) for Neelambari and 82.19% (11.38) for the Kalyani night. There was no statistically significant difference between the two. In the morning after the study all subjects admitted feeling refreshed after all the three nights. The average rating score for quality of sleep was 2.12 for both nights. When asked to guess which night they heard Neelambari two volunteers refused to answer and out of the remaining six three guessed correctly.

TABLE I : Sleep polysomnography variables of healthy subjects after listening to Neelambari Raga.

Variables	Control (minutes)	Neelambari (minutes)
Total sleep time	347.7±50.43	331.1±75.91
REM time	64.69±35.31	54.12±30.79
Non REM time	279.4±42.72	273.9±58.26
SWS time	49.19±22.92	39.25±22.91
Sleep onset latency	19.81±11.66	25.12±20.96
REM onset latency	111.0±58.95	100.2±55.29

All values are mean ± SD of eight subjects.

Total sleep time is the time spent in REM sleep and Non REM sleep. Slow wave sleep (SWS) time is the total time spent in Stage 3 & 4 Non REM sleep.

DISCUSSION

There are many stories in Indian folklore describing the mystical properties of ragas. This study proves that the raga Neelambari does not induce sleep or alter any sleep parameter when compared to the control raga. There was no difference in the quality of sleep and sense of refreshment felt the next day. The anecdotal information on the ability of this raga to induce sleep is probably linked to persons who are already biased, due to knowledge of Karnatic music or who have been exposed to this raga in childhood as a part of the sleep time activity. In this study none of the subjects had prior knowledge of the aim of the study and also did not know classical Karnatic music. Hence they were completely unbiased. A full night polysomnography without any music being played was considered unnecessary as the study did not aim to prove the effect of music *per se* on sleep onset or sleep architecture, but aimed at the effect of the specific raga (Neelambari) on sleep architecture. Kalyani raga was chosen as the control raga since it was crucial that the control raga not have soporific qualities or evoke feelings of sadness, anger etc. This raga is not known to have sleep inducing or preventing characteristics and hence was chosen as the control raga in this study.

Studies comparing the effects of music and white noise on sleep have proved that even in Stage 1 NonREM sleep entire physiological consciousness may be higher when listening to music than white noise (7). It was thought that the mental set towards the two differed. Human sleep studies have also proven that there are EEG

power spectrum component changes associated with the relaxant effects of pleasant music (8). These changes may also be personality trait related. Persons who have been lulled to sleep in childhood with a lullaby sung in Neelambari may respond in a positive manner. Repeating this study with a test group comprising of such subjects who have listened to Neelambari as a part of their

sleep activity in childhood may throw some more light on this aspect.

ACKNOWLEDGMENTS

The author thanks Dr. P. Athiyaman, Programme Executive, All India Radio, Pondicherry for his help in procuring the audio cassettes and the artists for rendering the music played for the study.

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