

# Morningness- Eveningness Circadian Rhythms in Shift Workers



**Usha Sahu**

Assistant Professor,  
Deptt. of Zoology,  
Govt. V.Y.T.P.G. Autonomous  
College, Durg

**M. Roy**

Assistant Professor  
Deptt. of Zoology,  
Govt. College,  
Utai, Durg

## Abstract

The result of MEQ shows that the subjects could be assigned following types of chronological cycle: Definitely morning type (DMT), Moderately morning type (MMT), Intermediate or Neither type (NT) and Moderately evening type or more towards evening type (MET) and Definitely evening type (DET). There is a weak relation between age and chronotype of sampled people. With increasing age especially after age of forty years, morningness increases. There is a remarkable deviation from the well established Dogmatic Gaussian distribution of chronotype in present study. In the sample Morning type (73%) dominated over Neither type (26%) and Evening type (1%). Though BMI of evening type is higher than morning type in studied sample, it is difficult to say that it is only due to chronotype. Other factors may also contribute. Further study is needed for it.

**Keywords:** Morningness- eveningness, Chronotype, Age, BMI.

## Introduction

Morningness and eveningness refers to chronotype in human beings. In chronobiology the cyclical phenomenon in living organism and their adaptation to solar and lunar rhythms are examined. Human beings are diurnal creature, active in day time and sleeping at night. However many of us especially shift workers are required to adjust our self to different patterns of activity and sleep as part of our daily life. Such disturbance in circadian cycle may have influence on behavior.

## Objective of the study

Main purpose of the study is to know about a person's (shift workers) peak alertness is in morning, in the evening or in between and whether age has any effect on chronotype of people or does shift work modulate the in general Indian pattern of early chronotype?

## Methodology

Random sampling was done. Sample included 200 male employees working in all the three shifts in Bhilai Steel plant, Bhilai for five or more years. They were asked to fill a Self Assessment Questionnaire (MEQ, Horne and Ostberg, 1974) to determine morningness and eveningness. The timings of different shift were as follows:

| Shift                        | Timings             |
|------------------------------|---------------------|
| A Shift (Morning Shift)      | 6:00 am to 2:00 pm  |
| B Shift ( Noon or Day Shift) | 2:00 pm to 10:00 pm |
| C Shift ( Night Shift)       | 10:00 pm to 6:00 am |

MMT), Intermediate or Neither type (NT) and Moderately evening type or more towards evening type (MET) and Definitely evening type

Pattern of shift rotation for workers was from C to B, from B to A and from A to C shift.

Besides, body weight, age and height of workers were also recorded.

## Observation, Result and Discussion

Age of sample individuals was between 30 years to 59 years. Maximum samples were between 40 to 59 years of age. This shows most of them are working as shift worker since several years.

The result of MEQ shows that the subjects could be assigned following types of chronological cycle: Definitely morning type (DMT), Moderately morning type ( (DET).

**Occurrence of Chronological Types**

| Chronological type | Number | %     |
|--------------------|--------|-------|
| MMT                | 137    | 66.5% |
| NT                 | 52     | 26%   |
| DMT                | 08     | 4%    |
| MET                | 02     | 1%    |
| DET                | 01     | 0.5%  |

**Graph: Occurrence of Different Chronotype**

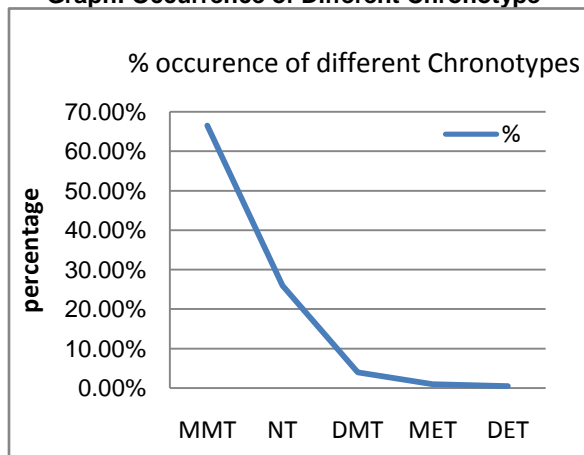


Table suggest that most the people included in the sample were of morning type (MMT&DMT = 145, 72.5%) and least were of evening type (MET&DET= 03, 1.5%). A significant number of people were neither morning type nor evening type or intermediate type (NT= 52, 26%)

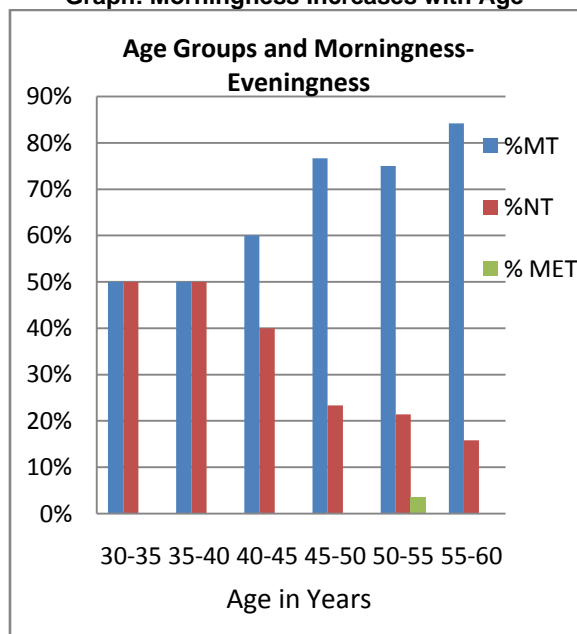
**% Occurrence of Different Chronotype**

| Age in years | %MMT   | %NT    | %DMT   | %MET  |
|--------------|--------|--------|--------|-------|
| 30-35        | 50%    | 50%    |        |       |
| 35-40        | 50%    | 50%    |        |       |
| 40-45        | 53.33% | 40%    | 6.66%  |       |
| 45-50        | 73.33% | 23.33% | 3.33%  |       |
| 50-55        | 75%    | 21.43% |        | 3.57% |
| 55-60        | 74.69% | 14.79% | 10.52% |       |

| Age in years | %MT    | %NT    | % MET |
|--------------|--------|--------|-------|
| 30-35        | 50%    | 50%    | ----  |
| 35-40        | 50%    | 50%    | ----  |
| 40-45        | 60%    | 40%    | ----  |
| 45-50        | 76.66% | 23.33% | ----  |
| 50-55        | 75%    | 21.43% | 3.57% |
| 55-60        | 84.21% | 15.79% | ----  |

.When the sample was analyzed age wise, it is evident that people aged between 30 to 40 years of age were in equal in Morning type and Neither type. As the age increased the % of people showing morningness increased as compared to neither type. The morning type of chrono type was highest in the age group 55-60. It was total 84.21% as compared to neither type which were 14.79%.

**Graph: Morningness Increases with Age**



The occurrence of morningness and eveningness attribute exclusively in population of shift workers has not yet been studied adequately. However there are few reports that have tried to correlate shift work and chronotype. Kleitman (1963) documented that adaptability to shift work varies as a function of chronotype among shift workers. The distribution of chronotype in Indian sub continent show remarkable deviation from the well established dogmatic Gaussian distribution (10% Morning type, 10% Evening type and 80% Intermediate type) based on human population in temperate region (Horne and Ostberg 1976; Ashkenazi *et al.*1997). Pati 2001 has mentioned that in hot and dry tropical climatic conditions, the distribution of Morning type Evening type and Intermediate type is 75%, 09% and 16% respectively. Result of present work correspond (72.5% Morning type, 26% Neither type and 1.5 % Evening type) more to Pati *et.al* 2001. than Gaussian distribution. Deshmukh *et. al.* 2014 also reported similar results (Morning type 79.33%, Neither type 20% and Evening type 0.66%).

Human beings tend to show greater morningness with advancing age (Carrier *et.al.* 1997, Her *et.al.* 1998, Taillard *et.al.* 2004, Paine *et.al.*2006, Achari and Pati 2007). The present study is carried out on shift workers working in all three shifts with weekly rotation. The result slightly deviates from the results of Achari *et. al.*2007 ( 71.43% morning type, 20% intermediate type and 8.5% evening type as compared to70.5% Morning type, 26% Neither type and 3.5 % Evening type in the present study).

As far as BMI is concerned the evening type persons showed higher BMI than morning type and neither type. As morningness and BMI varied by age, partial correlation analysis was carried out. It showed that morningness and BMI were negatively related. However BMI is only marginally significant (p=0.7) in morning type and evening type chronotype. No significant difference was found between Morning

type and neither type chronotype. Deshmukh *et.al.* (2014) found that age and BMI are not good predictors of morningness and eveningness trait but Lili Wang (2014) concluded that chronotype can induce differences in BMI and it was primarily due to the evening type.

#### Chronotype and BMI

| Chronotype                     | Mean BMI | SD   |
|--------------------------------|----------|------|
| Morning type                   | 24.56    | 4.56 |
| Neither type/Intermediate type | 25.25    | 5.91 |
| Evening type                   | 27.8     | 5.25 |

#### Conclusion

The distribution that has been detected in present study is approximately a J-shaped pattern characterized by maximum preponderance of morningness followed by intermediateness and eveningness. This pattern could also be described as negatively skewed or just opposite to chronotype of western temperate population. It may be due to environmental condition especially temperature and early sunrise and also may be due to cultural difference of our society which advocates "early to bed and early to rise, makes a man healthy, wealthy and wise". This can also be concluded that the result of present study on shift workers with all the three shifts and weekly rotation do not deviate abruptly from the generalized chronotype of Indian sub-continent i.e. people still manage to maintain the original chronotype in spite of shift work. It may possibly be due to regularization of the shift rotation for several years.

As far as age is concerned, from the result it is evident that the % of neither type decreases with increasing age and morning type increases as the age increases.

There is a weak relation between age and chronotype of sampled people. With increasing age especially after age of forty years, morningness increases. There is a remarkable deviation from the well established Dogmatic Gaussian distribution of chronotype in present study. In the sample Morning type (73%) dominated over Neither type (26%) and Evening type (1%).

Though BMI of evening type is higher than morning type in studied sample, it is difficult to say that it is only due to chronotype. Other factors may also contribute. Further study is needed for it.

#### References

1. Achari K.V. and Pati A.K. 2007. Morningness eveningness preference in Indian school students as function of gender, age and habitate. *Biol. Rhythm Res.* 38:1-8.
2. Ashknazi I.E., Reinberg A.E. and Motohashi Y. 1997. Inter-Individual Differences in the flexibility of human temporal organization: Pertinence to get lag and shift work. *Chronobiology Int.* 14: 99-113.
3. Carrier J, Monk T.H., Buysee D.J. and Kuper D.J. 1997. Sleep and morningness-eveningness in the middle years of life (20-59). *J. Sleep Res.* 6:230-237.
4. Deshmukh S.D., Verma A., Tiwari P. and Sharma A. 2014. Possibility of usage of age, BMI and B.S.A. as predictor of morningness-eveningness in human beings. *International Journal of Resent Scientific Research.* 7(7):1322-1326.
5. Horne J.A. and Ostberg O. 1976. A Self Assessment Questionnaire to determine Morningness-Eveningness in Human Circadian Rhythm. *International Journal of Chronobiology.* 4: 97-110.
6. Hur Y.M., Bouchard T.J. and Lykken D.T. 1998. Genetic and Environmental Influence on Morningness-Eveningness. *Per.Indiv. Differ.* 25:917-925.
7. Kleitman N. 1963. *Sleep and wakefulness. Second Edition, University of Chicago Press.*p. 552.
8. Lili Wang, 2014. *Social Behavior and Personality, Society for personality research,* 42(2), 313-320.
9. Pati A.K., Chandrawanshi A. and Reinberg A. 2001. *Shift Work: Consequences and Management. Current Science* 81: 2-52.
10. Sarah-Jane Paine, Philippa H.Gander and Noemie Travier (2006). *The Epidemiology of moeningness/Eveningness: Influence of Age, gender, Ethnicity and Socio-economic Factors in Adult (30-49). Biological Rhythm Research.* 21(1):68-76.
11. Taillard J., Philip P., Chastang J.F. and Bioulac B. 2004. Validation of Horne and Ostberg Morningness- Eveninhness Questionnaire in a Middle-aged Population of French Workers. *J.Biol.Rhythms.* 19:76-86.