

## Morningness and Eveningness Questionnaire in Telugu (MEQ-T)

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### Abstract

A circadian cycle is an endogenous, healthy process that regulates the cycle of sleep and waking. A sleep cycle disturbance could cause a number of different health problems. Depending on their morning and evening characters, people vary. By administering the trans-adapted morningness and eveningness questionnaires, the purpose of the present was to assess the various personality types. The study included a total of 300 participants, who were aged from 20 to 35 years. All participants were asked to read the questions carefully and mark the appropriate responses. Reliability tests, intraclass, interitem correlation, and an ANOVA with a post hoc test were all used to statistically analyze the data that was obtained. A Cronbach alpha ( $\alpha = 0.94$ ) was found in the results, indicating very good correlation between the items. The results of an ANOVA and a post hoc analyses indicated that there is a highly significant difference between morning and evening types. Finally, the author concluded that using the morningness and eveningness questionnaire in Telugu is highly reliable. Further investigation of language variations and gender is required.

**Keywords:** Morningness; Eveningness; Telugu; Reliability; Circadian cycle

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### 1. Introduction

A circadian rhythm, also known as a circadian cycle, is a normal, endogenous process that controls the sleep-wake cycle and occurs roughly every 24 hours. It can be used to describe any endogenous (originating inside an organism) process that reacts to the environment (entrained by the environment). These 24-hour rhythms, which are controlled by a circadian clock, have been frequently seen in animals, plants, fungus, and cyanobacteria.

A self-assessment questionnaire Morningness-Eveningness questionnaire was initially developed by Horne and Östberg (1976). The main purpose is to measure whether a person's circadian rhythm (biological clock) produces peak alertness in the morning, in the evening, or in between. The original study showed that the subjective time of peak alertness correlates with the time of peak body temperature; morning types (early birds) have an earlier temperature peak than evening types (night owls), with intermediate types having temperature peaks between the morning and evening chronotype groups. The MEQ is widely used in psychological and medical research and has been professionally cited more than 4,000 times.

Selection criteria for tinnitus therapy and individual evaluation heavily weigh the effects of sleep disorders on mood disturbance and cognitive impairment.

Sleeping disorders affect almost 5% of Indians over the age of 50. The majority of people in India such as Women (6.5%) and men (4.3%) experience psychiatric disorders like depression and anxiety in social situations.

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Indian men with severe/extreme nocturnal sleep issues were more likely to experience severe depression (4%), severe anxiety (3%), or both.

Sleep deprivation either acute or chronic leads to fatigue, daytime sleepiness, clumsiness, weight loss or gain and other symptoms. Sleep deprivation also have a negative impact on cognition and brain functions. It can be mostly seen in people who travels across time zones, people who works in shifts, young executives and mothers of young babies etc.

Sleep deprivation leads to physical and mental health issues such as decreased productivity, accidents, increased risk of death from various conditions such as high blood pressure, early ageing, diabetes and anxiety disorders. Few studies proved that less than six hours sleep a night have higher blood levels of inflammatory proteins than those who get more sleep.

Zacharia, Palaniswamy, James and Mohan (2014) developed Morningness-Eveningness scale in Kannada language which reveals 0.870 indicates good reliability. By comparing responses on the Korean MEQ to objectively recorded sleep-wake rhythms, Lee et al. (2014) assessed the validity of the Korean MEQ and confirmed its reliability. The total scores from the Korean MEQ had a Cronbach's alpha of 0.77, and the test-retest reliability intraclass correlation coefficient was 0.90 ( $p < 0.0001$ ), according to the results. The entire cohort's reported sleep-wake timing and Korean MEQ score had a significant negative correlation ( $p < 0.0001$ ) between them. Between ME types, there was a statistically significant difference in bedtime, wake time (on both work and leisure days), and the mean sleep-wake rhythm acrophase ( $p < 0.01$ ). Randler et al., (2016) compared German Morningness and Eveningness scale between adolescents and adults where results showed that younger children are more morning oriented and become rapidly evening oriented during puberty, ages 25-30 showed stable morningness and eveningness. Seasonal effects were observed. People showed later bed time preference during summer. Morales and Randler (2017) adapted Morningness and Eveningness stability scale improved into Spanish showed good internal consistence of 0.72-0.85. Morning affect was positively predicted by morning chronotype ( $R^2=0.41$ ) and distinctness was negatively predicted by sex and age ( $R^2=0.80$ ). This study also provides evidence for the factor structure of a new measure of Morningness-Eveningness based on a rigorous psychometric evaluation. According to a study by **Randler, Fabl, and Kalb (2017)** on the development of morning and evening temperaments from infancy to early adulthood, children under the age of one year were 70% morning types and only 1% evening types, while children over the age of sixteen were only 5% morning types and 19% evening types. **Hajaghazadeh et., al (2019)** done a study on nurses reveals 60% of nurses are intermediate type, morning (24.2%) and evening (15.8%). **Srinivasan (2021)** used a morningness and eveningness scale to assess the effects of COVID-19 online classes on 18–20-year-olds. The results show that out of 897 population samples, 8.13% of the subjects had definite eveningness, 14.93% had moderate eveningness, 17.38% fell into the intermediate category, 22.4% had moderate morningness, and 37.11% had definite morningness. **Aryal, Bhattarai and Prabhu (2022)** developed and standardized of morningness and eveningness questionnaire in the Nepali language which reveals Cronbach's alpha score and an interclass correlation of 0.73 which is considered good reliability.

## 2. Material and methods

The original questionnaire was translated into Telugu Language using forward-backward translation method by an experienced linguist and was given to 10 Telugu native speakers to for content validation.

**Table 1** Various circadian types based on the score

| Score | Circadian type            |
|-------|---------------------------|
| 16-30 | Definite Evening          |
| 31-41 | Moderate Evening          |
| 42-58 | Intermediate/Neither Type |
| 59-69 | Moderate Morning          |
| 70-86 | Definite Morning          |

The final developed questionnaire was given to 300 participants in the age range of 20 to 35 years and asked them to read and rate the questions on a 5-point rating scale in with 1 being familiar and 5 being not familiar. The responses were taken in both online and offline mode. All the participants were instructed to read the questions and mark the appropriate option. All the participants are healthy day workers however, participants with sleep disturbances, altered

mental status, psychological issues and night shift workers are excluded from the study. The responses were recorded and used for further analysis. Various circadian types were classified based on the total score obtained from the question scores. The circadian types are given in the table 1.

## 2.1. Statistical analysis

Reliability, intra class correlation, interitem correlation and ANOVA followed by post hoc tests was done to check the reliability and significance between chrono types.

## 3. Results

Cronbach's Alpha test was performed to check the overall correlation between items where the alpha score was  $\alpha=0.94$  which reveals excellent correlation between items. ANOVA analysis reveals  $F=2329.75$  (4, 295)  $p=0.000$  ( $p<0.001$ ) this indicates a high significant difference between all the items.

Overall present study showed an excellent correlation which states that the test is most reliable and can use effectively. In addition, the overall correlation of MEQ-T in other languages, such as Korean  $\alpha=0.77$  (Lee et., al. 2014), Kannada language  $\alpha=0.870$  indicates good reliability (Zacharia, Palaniswamy, James and Mohan, 2014), Nepali language  $\alpha=0.73$  indicates good reliability (Aryal, Bhattarai and Prabhu, 2022).

### 3.1. Inter item correlation

Overall, the inter-item correlation reveals items Q6, Q7, Q12, Q13, Q14, Q16, Q17, Q18 and Q19 showed good correlation ( $r=0.15$  to  $0.50$ ), Q1-Q12, Q14, Q16 showed no correlation ( $r<0.15$ ) and rest items showed a greater correlation ( $r>0.50$ ) between all the items. The whole data was tabulated in the table 2.

**Table 2** Inter item correlation between all the items

|     | Q1    | Q2    | Q3    | Q4    | Q5    | Q6    | Q7    | Q8    | Q9    | Q10   | Q11   | Q12   | Q13   | Q14   | Q15   | Q16   | Q17   | Q18   | Q19   |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Q1  | 1.000 | 0.812 | 0.687 | 0.635 | 0.552 | 0.094 | 0.656 | 0.693 | 0.664 | 0.618 | 0.537 | 0.125 | 0.603 | 0.084 | 0.583 | 0.047 | 0.590 | 0.593 | 0.652 |
| Q2  |       | 1.000 | 0.757 | 0.642 | 0.649 | 0.405 | 0.715 | 0.775 | 0.677 | 0.687 | 0.607 | 0.400 | 0.656 | 0.362 | 0.630 | 0.347 | 0.716 | 0.680 | 0.680 |
| Q3  |       |       | 1.000 | 0.614 | 0.626 | 0.388 | 0.712 | 0.749 | 0.700 | 0.604 | 0.504 | 0.451 | 0.675 | 0.348 | 0.562 | 0.329 | 0.677 | 0.675 | 0.660 |
| Q4  |       |       |       | 1.000 | 0.670 | 0.356 | 0.753 | 0.640 | 0.614 | 0.637 | 0.520 | 0.363 | 0.532 | 0.280 | 0.509 | 0.218 | 0.618 | 0.550 | 0.535 |
| Q5  |       |       |       |       | 1.000 | 0.476 | 0.680 | 0.687 | 0.564 | 0.612 | 0.587 | 0.480 | 0.579 | 0.408 | 0.446 | 0.389 | 0.589 | 0.527 | 0.510 |
| Q6  |       |       |       |       |       | 1.000 | 0.465 | 0.353 | 0.214 | 0.382 | 0.406 | 0.703 | 0.374 | 0.800 | 0.256 | 0.723 | 0.452 | 0.279 | 0.224 |
| Q7  |       |       |       |       |       |       | 1.000 | 0.697 | 0.623 | 0.680 | 0.524 | 0.471 | 0.609 | 0.430 | 0.511 | 0.365 | 0.674 | 0.594 | 0.527 |
| Q8  |       |       |       |       |       |       |       | 1.000 | 0.707 | 0.632 | 0.586 | 0.403 | 0.636 | 0.375 | 0.577 | 0.271 | 0.628 | 0.586 | 0.582 |
| Q9  |       |       |       |       |       |       |       |       | 1.000 | 0.492 | 0.547 | 0.277 | 0.536 | 0.233 | 0.563 | 0.090 | 0.615 | 0.520 | 0.583 |
| Q10 |       |       |       |       |       |       |       |       |       | 1.000 | 0.577 | 0.366 | 0.582 | 0.354 | 0.537 | 0.263 | 0.683 | 0.621 | 0.498 |
| Q11 |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.290 | 0.585 | 0.374 | 0.580 | 0.236 | 0.617 | 0.505 | 0.581 |
| Q12 |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.372 | 0.664 | 0.273 | 0.698 | 0.486 | 0.381 | 0.258 |
| Q13 |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.411 | 0.585 | 0.264 | 0.678 | 0.533 | 0.682 |
| Q14 |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.225 | 0.685 | 0.439 | 0.246 | 0.203 |
| Q15 |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.198 | 0.562 | 0.532 | 0.570 |
| Q16 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.292 | 0.235 | 0.123 |
| Q17 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.650 | 0.563 |
| Q18 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 | 0.624 |
| Q19 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 1.000 |

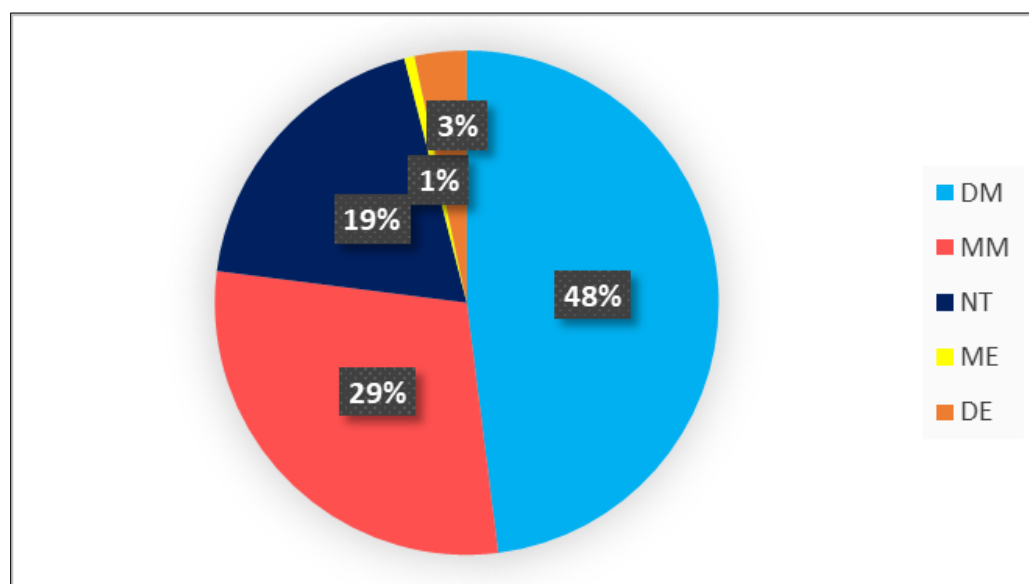
The present study showed high inter item correlations which are in agreeing with Morales and Randler (2017) adapted Morningness and Eveningness stability scale improved into Spanish showed good internal consistence of 0.72-0.85. morning affect was positively predicted by morning chronotype ( $R^2=.41$ ) and distinctness was negatively predicted by sex and age ( $R^2=.80$ ).

### 3.2. Various types of Morningness and Eveningness

Out of all the participants the majority are Definite Morning type (48%), the other types such as Moderate Morning (29%), Neither Type (19%), Morning Evening (0.66%) and Definite Evening (3.33%) respectively. This indicates the accuracy of the questionnaire in finding various types. The data was given in the table 3 and graph 1. The study results are also similar with Srinivasan (2021) as the definite morning types percentage are increased.

**Table 3** Percentage of various types of morningness and eveningness

| Type | Percentage (%) |
|------|----------------|
| DM   | 48%            |
| MM   | 29%            |
| NT   | 19%            |
| ME   | 0.66%          |
| DE   | 3.33%          |



**Figure 1** The percentage of various types

### 3.3. Item Total Correlation

The overall mean observed was 72.80 with an SD of 13.95 and 194.69 variance, according to table 4 which also shows the scale mean, scale variance, item total correlation, and Cronbach's alpha if item deleted. If item 19 was deleted, a higher alpha score of 0.941 was found. The results of the corrected item total correlation show that the item Q2 (0.80) had a higher score than the item Q15 (0.55), and that the obtained data falls within the (0.3-0.8) Pallant's 2005 stated normative range.

**Table 4** Statistics of item total correlation

| Items | Scale Mean<br>if Item Deleted | Scale Variance<br>if Item Deleted | Corrected Item -total<br>Correlation | Cronbach's Alpha if<br>Item deleted |
|-------|-------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|
| Q1    | 68.16                         | 182.36                            | 0.56                                 | 0.940                               |
| Q2    | 68.54                         | 172.73                            | 0.80                                 | 0.936                               |
| Q3    | 69.37                         | 177.88                            | 0.75                                 | 0.937                               |
| Q4    | 69.28                         | 181.15                            | 0.63                                 | 0.939                               |
| Q5    | 69.46                         | 176.18                            | 0.70                                 | 0.938                               |
| Q6    | 69.82                         | 168.63                            | 0.77                                 | 0.936                               |
| Q7    | 69.38                         | 178.97                            | 0.74                                 | 0.937                               |
| Q8    | 69.39                         | 176.31                            | 0.74                                 | 0.937                               |
| Q9    | 69.19                         | 182.64                            | 0.58                                 | 0.940                               |
| Q10   | 68.46                         | 175.44                            | 0.66                                 | 0.938                               |
| Q11   | 67.7                          | 168.06                            | 0.59                                 | 0.940                               |
| Q12   | 68.88                         | 166.90                            | 0.771                                | 0.936                               |
| Q13   | 69.34                         | 178.45                            | 0.68                                 | 0.938                               |
| Q14   | 69.87                         | 167.96                            | 0.725                                | 0.937                               |
| Q15   | 69.23                         | 181.83                            | 0.553                                | 0.940                               |
| Q16   | 69.67                         | 174.74                            | 0.614                                | 0.939                               |
| Q17   | 68.63                         | 172.34                            | 0.745                                | 0.937                               |
| Q18   | 68.41                         | 176.43                            | 0.612                                | 0.939                               |
| Q19   | 67.51                         | 171.78                            | 0.567                                | 0.941                               |

### 3.4. Comparison between Different Types

ANOVA followed by Post Hoc (Bonferroni) was done to compare the types which showed that there is a high significant difference ( $P < 0.001$ ) between all the types. the data was given in the table 5.

**Table 5** Comparison between types

| Type (i)  | Type (j) | Mean difference (i-j) | Std error | Sig.  |
|-----------|----------|-----------------------|-----------|-------|
| <b>DM</b> | MM       | 22.14                 | 0.38      | 0.000 |
|           | NT       | 31.94                 | 0.44      | 0.000 |
|           | ME       | 47.04                 | 2.00      | 0.000 |
|           | DE       | 57.57                 | 0.91      | 0.000 |
| <b>MM</b> | DM       | -22.1                 | 0.38      | 0.000 |
|           | NT       | 9.80                  | 0.48      | 0.000 |
|           | ME       | 24.9                  | 2.01      | 0.000 |
|           | DE       | 35.4                  | 0.94      | 0.000 |
| <b>NT</b> | DM       | -31.94                | 0.44      | 0.000 |
|           | MM       | -9.80                 | 0.48      | 0.000 |

|           |    |        |       |       |
|-----------|----|--------|-------|-------|
|           | ME | 15.12  | 2.02  | 0.000 |
|           | DE | 25.6   | 0.966 | 0.000 |
| <b>ME</b> | DM | -47.07 | 2.00  | 0.000 |
|           | MM | -24.93 | 2.01  | 0.000 |
|           | NT | -15.12 | 2.02  | 0.000 |
|           | DE | 10.50  | 2.18  | 0.000 |
| <b>DE</b> | DM | -57.57 | 0.91  | 0.000 |
|           | MM | -35.43 | 0.94  | 0.000 |
|           | NT | -25.62 | 0.96  | 0.000 |
|           | ME | -10.50 | 2.18  | 0.000 |

#### 4. Discussion

Due to the need for such a questionnaire (MEQ) in native languages to differentiate various circadian types, Despite the fact that 10.62% of Indians speak English as a first language, it is still necessary to use questionnaires in the person's native language in order to ensure that they understand. This is because India is a multicultural and multilingual country. The primary purpose of this research is to trans adapt and standardize the Morningness-Eveningness Questionnaire in Telugu (MEQ-T). Previous research has demonstrated that sleep disturbances have an impact on health and can result in serious health risks like decreased productivity, accidents, and a higher risk of death from conditions like high BP, early aging, diabetes and anxiety disorders. Sleep deprivation can also result in a number of disorders that speech, language, hearing and cognition. Because of this, it is important to screen early by using this questionnaire (MEQ-T) to identify cases of sleep deprivation and provide early management.

The MEQ-T showed Cronbach's of 0.94 which is excellent correlation and can be used with the Telugu speaking population. There is a high significant difference found between different types. In addition, the overall correlation of MEQ-T in other languages, such as Korean  $\alpha=0.77$  (Lee et., al. 2014), Kannada language  $\alpha=0.870$  indicates good reliability (Zacharia, Palaniswamy, James and Mohan, 2014), Nepali language  $\alpha=0.73$  indicates good reliability (Aryal, Bhattarai and Prabhu, 2022). The present study showed a high internal consistence which is in favor with Morales and Randler (2017). Item total correlation found to be in prescribed normative range. Item deleted Cronbach's increases but due to the necessary of the questions they were remained same.

#### 5. Conclusion

The results of the current study's trans-adaption and standardization of the MEQ-T revealed an excellent correlation ( $\alpha=0.94$ ), indicating that this tool is reliable and effective for use with Telugu-speaking populations to distinguish Morningness -Eveningness types. With regard to comparisons with other languages, this tool also produced excellent correlation. The range of disorders and work types could not be covered in this study.

#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

There is no conflict of interest.

### Statement of informed consent

The author informed every individual participant of the study about the study and its goals.

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### Author's short Biography



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