

# Adaptation of Morningness-Eveningness Questionnaire (MEQ) in Bengali Language

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## ABSTRACT

**Background:** Morningness-Eveningness Questionnaire (MEQ) has been used to assess working efficiency of an individual. The self-reporting MEQ is available in English language, and its applicability to Indian scenario is limited to educated/ English proficient individuals only. Since, majority in India still depend on the regional languages for communication, it is difficult to make live translation of the questionnaire while administration and results may also vary due to tester's language proficiency. The present study focused on adapting MEQ in Bengali language.

**Method:** The English version of Morningness-Eveningness Questionnaire (MEQ) was a self-assessment questionnaire consisting of 19 questions to measure whether a person's peak alertness was in the morning, evening or in between. The translation of the questionnaire was done using forward-backward-translation method by six experts in Bengali language, and was content validated by thirty native Bengali speakers. The speakers were asked to rate the questions on a 5-point rating scale with 1 being very familiar and 5 being not at all familiar. All the questions rated as 1 or 2 were considered for the Bengali version of MEQ, while those rated as 3 or above were reframed and revalidated.

**Result:** The Bengali version of the MEQ has good reliability (Cronbach's alpha 0.74). Item analysis revealed it as a good consistent scale for estimating the circadian type of the participants. Participants were classified into 5 Circadian types based on the cut-off scores. Majority of participants are intermediate type, followed by Morningness.

**Conclusion:** The application of MEQ will help in management of tinnitus

**Keywords:** Tinnitus, Circadian rhythm, Morningness – Eveningness questionnaire, Tinnitus, Lifestyle and health, Cognitive and psychological aspects.

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## INTRODUCTION

Any biological function that exhibits an endogenous, untrainable oscillation lasting around 24 hours is said to have a circadian rhythm. Both animals and plants exhibit it. Morningness refers to those individuals who prefer daytime activity with peak performance and alertness associated with the early-morning hours. Eveningness is the opposite of it wherein peak performance and alertness would be seen in evening times<sup>1</sup>.

According to one study the perceived intensity of tinnitus is closely correlated with circadian rhythm Morningness-eveningness, or chronotype<sup>2</sup>. It is an individual trait that refers to sleep-wake behaviour (preferred bed and waking hours), as well as periods favoured for optimal cognitive and physical performance and psychological elements, such as affect (e.g., the feeling, emotions)<sup>3</sup>. Fruit flies and humans share a genetic makeup. In fruit flies, a gene creates a protein that builds up in cells overnight and dissolves throughout the day. Your sleep and cognitive functions may be impacted by this procedure<sup>4</sup>.

MEQ is a rapid, accurate method that can be used to group people into various circadian types. Morningness-Eveningness Questionnaire (MEQ) was developed by contains 19 questions in English language<sup>1</sup>. The questionnaire examines a person's sleep-wake behaviour, preferred times for peak cognitive and physical performance and to psychological aspects, such as affect (e.g., the feeling, emotions). MEQ is a crucial instrument that provides a quick approach to evaluate a person's attentiveness and sleep-wake cycle when they have speech and hearing issues.

The questionnaire must be in the respondents' native language because it is a self-reporting one. India has a fairly small population of people who can read and write English, and the majority still communicate mostly in regional languages. As a result, managing any English inventory is challenging and may produce incorrect results. These factors make it crucial to adapt the MEQ to native Indian languages, keeping this in mind it was adapted in Kannada language by the authors of Kannada MEQ article<sup>2</sup>. The current study concentrated on doing so in Bengali.

MEQ can help us understand the impact the illness has on their daily life and also find best time for intervention. As most of speech and hearing disorders involve sensory processing, cognition and learning strategies, MEQ will clearly have an impact on these aspects. For example, MEQ when applied to individuals with tinnitus may help explain individual variability, and also identify in whom the tinnitus affects work life and in whom it affects sleep and relaxation.

The aim of the study was to culturally adapt & translate the Morningness-Eveningness Questionnaire (MEQ) to Bengali language.

## METHOD

The Study was carried out in two phases:

- Adaptation of questionnaire-MEQ- in Bengali language.
- To obtain representative score of Bengali MEQ among group of native Bengali speakers.

**Development of the Questionnaire:** For the present study, the questionnaire was translated to Bengali language using forward-backward-translation. It was supervised by a native Bengali speaker who is an Audiologist too. The translators (six native Bengali speakers) were asked to rate the questions on a 5-point rating scale with '1' being 'not at all similar' to original sentences in English and '5' being 'similar to original sentence' in English. All the questions which were rated as '1' or '2' retained, Questions rated '3' or '4' is reframed and resubmitted for content validation.

For content validation of the adapted questions in Bengali language, the questionnaire was provided along with English version to thirty native Bengali speakers who had English language fluency too. Participants of the study were informed to give their inputs and the responses were collected and incorporated in the final questionnaire. Care was taken that the participants who were involved in content validation were not included during final standardisation of the questionnaire.

The questionnaire after content validation was checked for internal consistency/reliability by applying item analysis and descriptive statistics on results obtained from group of participants. The modified questionnaires, was given to participants and were informed about main aim of the study and asked attentively and honestly answer all the questions, and that it will take 15 minutes to complete. The Bengali version of MEQ was administered on 104 Bengali speakers, age range of 19-75 years in pen and paper method. Participants of the current study were educated and they were comfortable with speaking, comprehending, reading and writing in the Bengali language. An exclusion criterion for the study was participants with psychological disorder, People having difficulties during their sleeping time. All the filled in questionnaire from 104 participants were collected and tabulated in an excel sheet for statistical analysis.

## RESULTS AND DISCUSSION

**Demographic Information:** The study was conducted by collecting the responses from 104 native Bengali speakers who were within the ages of 19-75 years ( $31.2 \pm 9.02$ ) and majority of the participants were male (Figure 1).

**Total Scores of the Bengali-MEQ:** The total scores of the questionnaire rated by all the participants ranged from 18 to 83. The descriptive measures of each of the items of the MEQ questionnaire is given in Table 1. It shows that mean values varied from 2.19 to 3.61 between all the questions.

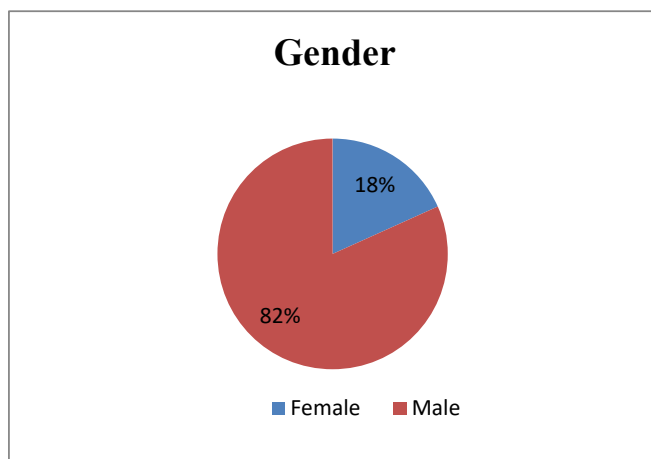


Figure 1: Gender Distribution.

Table 1: Descriptive statistics.

	Range (Min – Max)	Mean $\pm$ Sd	Variance
Item 1	0 - 5	3.61 $\pm$ 1.18	1.404
Item 2	0 - 5	2.76 $\pm$ 1.15	1.325
Item 3	1 - 4	2.82 $\pm$ 1.08	1.174
Item 4	1 - 4	2.67 $\pm$ 1.19	1.426
Item 5	1 - 4	2.50 $\pm$ 1.03	1.068
Item 6	1 - 4	2.41 $\pm$ 1.02	1.060
Item 7	1 - 4	2.71 $\pm$ 1.03	1.081
Item 8	1 - 4	2.83 $\pm$ 0.95	0.915
Item 9	1 - 4	3.19 $\pm$ 0.82	0.681
Item 10	1 - 5	3.51 $\pm$ 1.26	1.592
Item 11	1 - 4	3.14 $\pm$ 1.02	1.057
Item 12	1 - 4	2.19 $\pm$ 1.08	1.186
Item 13	1 - 4	2.79 $\pm$ 1.18	1.405
Item 14	1 - 4	2.47 $\pm$ 1.05	1.106
Item 15	1 - 4	3.14 $\pm$ 0.99	0.998
Item 16	1 - 4	2.08 $\pm$ 1.01	1.031
Item 17	1 - 5	3.68 $\pm$ 0.98	0.976
Item 18	1 - 5	3.42 $\pm$ 1.47	2.169
Item 19	0 - 6	4.04 $\pm$ 2.08	4.337

**The Scores for Subtypes of Circadian Rhythm:** The original questionnaire classifies individuals into 5 different circadian types<sup>1</sup>. Various circadian types based on the score are given in the Table 2.

The percentage of subjects belonging to each of these types was calculated for Bengali MEQ in Figure 2.

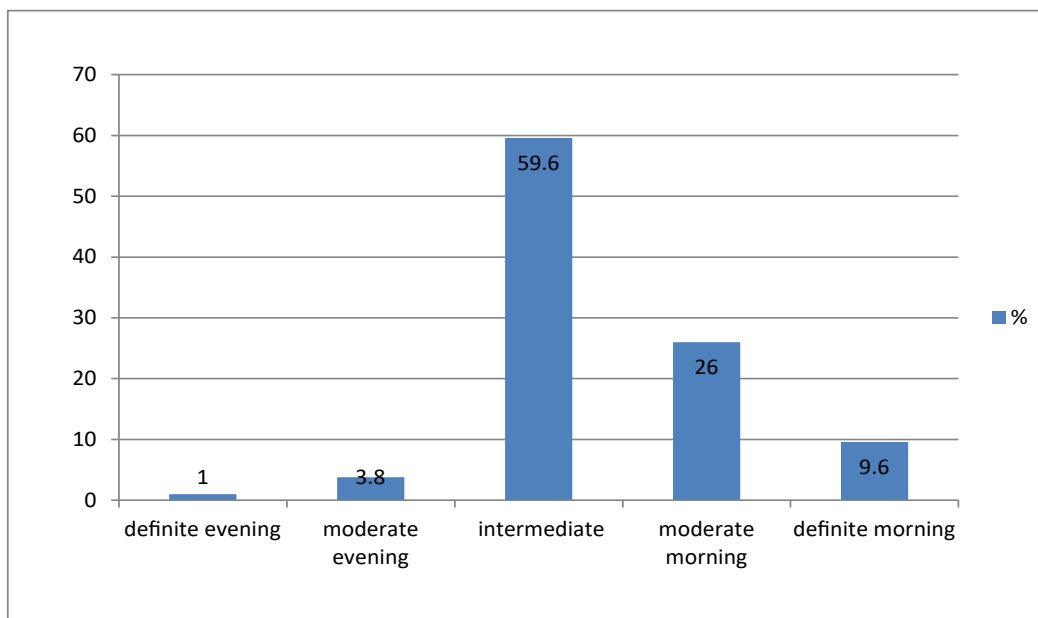
The classification included definite evening, moderate evening, intermediate, moderate morning and definite morning. Out of 104 participants 59.6% were categorized as intermediate type, 26% were categorized as moderate morning type, 9.6% were categorized as definite morning type, 3.8% were categorized as moderate evening type

and only 1% was categorized as definite evening type. Scores of the participant's reveals that majority of them were Intermediate type of People.

**Item Analysis:** Reliability Statistics assesses the degree of reliability/ internal consistency of a scale and the number of items represented in the scale. Scale is considered to be good or satisfying if the value of Cronbach's alpha is greater than or equal to 0.70<sup>5</sup>. For the present study, item analysis was performed in order to measure the reliability of the MEQ scale and result shows Adapted version Bengali-MEQ has a Cronbach's alpha score of 0.745, indicating good reliability of the scale (Table 3).

**Table 2:** Circadian Types.

Score	Circadian types
16 – 30	Definite Evening
31 – 41	Moderate Evening
42 – 58	Intermediate
59 – 69	Moderate morning
70 – 86	Definite Morning



**Figure 2:** Representation of Percentage of participants falling under different circadian rhythms.

**Table 3:** Item-Total Statistics.

	Cronbach's Alpha	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1		52.43	73.78	0.645	0.706
Item 2		53.27	76.22	0.536	0.716
Item 3		53.22	82.21	0.251	0.739
Item 4		53.37	82.33	0.210	0.743
Item 5		53.54	81.45	0.311	0.735
Item 6		53.63	87.30	-0.002	0.756
Item 7		53.33	82.36	0.258	0.739
Item 8		53.21	81.87	0.319	0.735
Item 9		52.85	81.11	0.439	0.728
Item 10	0.745	52.52	81.57	0.226	0.742
Item 11		52.90	80.76	0.351	0.732
Item 12		53.85	79.96	0.368	0.730
Item 13		53.25	81.51	0.252	0.739
Item 14		53.57	83.58	0.189	0.744
Item 15		52.90	84.47	0.155	0.746
Item 16		53.96	84.69	0.139	0.747
Item 17		52.36	79.06	0.471	0.724
Item 18		52.62	74.21	0.470	0.719
Item 19		52.00	68.87	0.437	0.726

The observed Cronbach's alpha remained almost the same even after the deletion of any one of the items in the MEQ scale which reflects the extent of reliability of the developed material. In comparison, Turkish version of MEQ possessed the Cronbach's score of 0.78 and the Japanese version of MEQ, a Cronbach's alpha score of 0.70<sup>6,7</sup>.

Item total statistics in Table 3 contains information regarding mean, variance, corrected item total correlation and reliability if the respective item is deleted. The scale has higher Cronbach's alpha scores of 0.756 when the item 6 was deleted. Higher item total correlation score was observed for items 1 and 2, while lower total item

correlation score was seen in item 3, 4, 6,7,10,13,14,15 & 16. The minimum value for the item-total correlation is 0.3 and the maximum is 0.8. From the Item-total correlation outputs of MEQ-K, it was observed that some of the items have failed to meet the criteria.

The factorability of the 19 MEQ items was examined. Kaiser-Meyer-Olkin measure of sampling adequacy was 0.679, which is just above the commonly recommended value of 0.6, and the Bartlett's test of Sphericity was significant ( $p < 0.0001$ ). Item 12 in the MEQ was deleted since it didn't meet the minimum criteria of having a primary factor loading of 0.4.

Factor analysis outputs had 7 extracted factors and 19 items were loaded in each of these factors. 6 items were loaded in factor 1, 3 items were loaded in factor 2, 2 items were loaded in factors 4, 5 & 6 and finally 1 item was loaded in factor 7. Factors 1-3 had the loaded items related to timings for waking and sleeping, rest of the factors had items related to physical difficulties of the individuals.

The study conducted by Kannada MEQ authors reported that alterations in circadian rhythm can lead to gastrointestinal diseases, cardiovascular diseases, cancer, diabetes and metabolic disturbances, pregnancy complications<sup>2</sup>. It is also stated that there is no evidence till now of the influence of circadian rhythm on longevity<sup>8</sup>. Circadian rhythm has an effect on the latency of the auditory brainstem response (ABR) and the latency depends on the oral temperature. Author also mentioned that reduction in 1 degree C in oral temperature is associated with an increase of 200 microseconds in the latency of wave V of ABR<sup>10</sup>.

Researchers have identified a biological circadian clock in the hearing organ also, the cochlea. This circadian clock controls how well hearing damage may heal and opens up a new way of treating people with hearing disabilities. A study reported that mice which were exposed to moderate noise levels during the night suffered from permanent hearing damage compared to the same noise level during the day<sup>10</sup>.

Since circadian rhythm is an emerging field of study in relation to health sciences, it is essential to have few reliable and standard scales to measure the circadian types/patterns in normal as well as in disorder population. Morningness-Eveningness Questionnaire most widely used scales to measure the circadian rhythms. MEQ is translated to many languages like French, Spanish, German and Indian languages<sup>11</sup>.

## CONCLUSION

The English language literate population of India is very less with majority still depending on the regional languages for communication. The objective of the current study is to adapt & translate the Morningness-Eveningness Questionnaire (MEQ) to Bengali language. Literature shows research on circadian rhythm and its

effect on various health related conditions like cancer, academics, cognition, blood pressure, are appeared less.

Morningness-Eveningness Questionnaire is framed in a preferential manner, where the respondents were asked to specify when they would prefer to wake up or begin sleeping rather than when they actually do. The speakers were asked to rate the questions on a 5-point rating scale with 1 being not at all similar to original sentences in English and 5 being similar to original sentence in English. The sum gives a score ranging from 16 to 86; scores of 41 and below indicate "evening types", scores of 59 and above indicate "morning types", scores between 42-58 indicate "intermediate types"<sup>1</sup>. Based on the scores obtained in the questionnaire, the subjects can be categorized into morning type, intermediate type and evening type.

As described circadian rhythms are physical, mental, and behavioral changes that follow a 24-hour cycle. These natural processes respond primarily to light and dark and affect most living things, including animals, plants, and microbes. Circadian rhythm can be affected by lifestyle, heredity, cosmos spin and seasonal factors<sup>10</sup>. Two first factors have physically direct effects on circadian rhythm and health, while other factors influence on them mentally. After all, all of them lead to cancer, cardiovascular diseases and metabolic obesity.

The Bengali version of MEQ has Cronbach's alpha of 0.74 which reveals it's a reliable tool. Item analysis results shows scale is consistent. Results of the study are similar to other Indian versions. Majority of Participants are Intermediate People followed by Morningness. MEQ can be used clinically to measure severity of tinnitus.

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