

A Reliability Study of The Turkish Version of The Morningness-Eveningness Questionnaire

Zekine PÜNDÜK, Hakan GÜR, İlker ERCAN

SUMMARY

Purpose: To investigate the reliability of the Turkish version of the self-assessment morningness-eveningness questionnaire (MEQ).

Methods: A Turkish version of the MEQ, which was originally designed by Horne and Östberg (1976), was given to 618 (291 women and 327 men) volunteers, aged 18 to 57 (23.0±5.4 years). Participants were recruited from the university student population and staff who were not night-shift workers. Exclusion criteria included sleep disorders and a history of medical and psychiatric diagnoses. The participants completed the questionnaire twice, 15-20 days apart. The reliability was assessed by Cronbach's and Pearson's r coefficient.

Results: MEQ scores were 51.9±9.0 (range 22-73) and 52.4±9.5 (range 21-72) for the 1st and 2nd applications, respectively, and did not differ significantly between the two applications. Of the 618 subjects interviewed, 149 were self-reported as morning types at the 1st application and 169 as morning types at the 2nd application; 79 as evening types at the 1st application and 87 as evening types at the 2nd application; and 390 as intermediate types at the 1st application and 362 as intermediate types at the 2nd application. Cronbach's α was 0.785 and 0.812 for the 1st and 2nd applications, respectively, and the test-retest reliability coefficient was 0.84 ($p<0.0001$).

Discussion: The Turkish version of the MEQ shows high reliability. Nevertheless, further evaluation using different subject groups such as the elderly, athletes and shift workers is required to confirm the reliability and validity of the Turkish version.

Key Words: Morningness, eveningness, circadian rhythms, individual differences

INTRODUCTION

Biological changes due to dark and temperature in human metabolism during 24 hours are known as "circadian" or "diurnal" rhythms (Brown 1982). These rhythms which last for 24 hours effect mood and psychological performances besides physiological state (Horne and Östberg 1976). As body temperature is higher than the morning, metabolism is stimulated in the afternoon according to stimulus theorem. Consequently, performance and mood are in better conditions in the afternoons (Horne and Östberg 1976). There are similar differences in memory performance; short-term memory performance is higher in morning hours (Folkard 1980, Monk and Weitzman 1983), but long-term memory performance is better in the afternoons (Folkard 1980). In contrast, working rate of the memory, ability of problem solving and mental arithmetic performance are at the highest levels at midnight (Folkard 1980). Various studies revealed that psychological conditions like sleep, happiness and sadness improved four hours after awakening (Monk and Pollak 1985) and anxiety level reached the top point at the evenings (Thayer 1989). It was reported that various performance levels in various time periods were present at different works and skills. This observation was true for cognitive functions, as well (Smith 1992). Gupta reported that (1991) results of intelligence tests were higher in evening hours (19:00) than morning hours (09:00).

Physiological and psychological changes

related with daily rhythms differ in parallel with individual variances. These variances have been defined as "morningness" and "eveningness" characteristics in early 1900s (O Shea 1900). Freeman and Hovland (1934) initiated systematic approach and Kleitman (1939) first used "circadian type" definition for individual differences. Kleitman divided circadian types into two categories as "morningness type" and "eveningness type". He also defined a third category as "intermediate type", but reported the latter to be less important.

According to circadian type classification, morningness types were reported to go to sleep and get up earlier, feel themselves better in morning hours and show higher performances in the mornings. In contrast, eveningness types were reported to go to sleep later, wake up with difficulty, feel themselves better in the afternoons and show higher performances in afternoon hours (Kerkhof 1985, Tankova and Buella 1994).

Östberg evaluated differences in nutritional habits and body temperatures of "morningness" and "eveningness" individuals by using "Self-Assessment Questionnaire to Determine Morningness-Eveningness Types in Human Circadian Rhythm" (1973a). In another study, he applied the same questionnaire to shift workers (Östberg 1973b). Some new questions were added and some questions were removed in reconstitution of English version in order to provide consistency with English culture (Horne and Östberg 1976). Most of the questions were shortened for better understanding and many answers of "I do not know" were replaced with "I can not decide". Reliability study of English version for American society was performed by Posey and Ford (1981). Later translation to Japanese was realized by Ishihara and colleagues (1986) and Almirall and Sanchez-Turret translated the original questionnaire into Spanish (1990). Compliance and standardization studies were completed as well.

To discriminate morningness and eveningness individuals from each other may lead to understand the peak hours of physical and psychological performance and sleep and awakening preferences of these people. We could not find any resource in Turkish which aims to differentiate morningness and eveningness

individuals. In this study we aimed to evaluate the reliability of Turkish version of "Self-Assessment Questionnaire to Determine Morningness-Eveningness Types in Human Circadian Rhythm". We thought this questionnaire would be useful in various disciplines like experimental, clinical or industrial psychology.

METHODS

Sampling

The questionnaire was independently translated into Turkish by four different lecturers from Uludağ University Educational Faculty Department of English. Then the translations were reviewed in collaboration with the translators, a lecturer from Uludağ University Educational Faculty Department of Turkish Language and Literature and the investigators. The differences in translations were expressed in joint statements. Following completion of translation procedure, a pilot study was performed in a group of 15 subjects in order to evaluate the comprehensiveness. Then the questionnaire was applied on study population.

The study population included 618 (291 females and 327 males) subjects. The majority of them were students and employees of Uludağ University. Their ages were between 18-57 years (23.0 ± 5.4). None of them was a night shift worker. There was not any medical and/or psychological health problem or sleep disorder.

Data Handling Instruments and Procedure

Self-Assessment Questionnaire to Determine Morningness-Eveningness Types in Human Circadian Rhythm (Horne and Östberg 1976)

This questionnaire includes 19 questions in likert type. There are four possible answers to each question. The answers are prepared in a comprehensive form. Time tables are used for answers of 1st, 2nd and 10th questions. This time tables are divided into 7 hours' intervals and expressed as subdivisions last for 15 minutes. Answer choices for other questions are prepared as fill in boxes. Subjects get various points according to their answers to each question; their points vary between 1-4 for questions 3, 4, 5, 6, 7, 7, 8, 9, 13, 14, 15 and 16, between 1-5 for

TABLE 1. Distribution of Circadian Types According to Total Points of Subjects in 1st and 2nd Application of the Questionnaire.

Circadian type	Total Points Interval		Total n (%)
Definitely morningness	70-86	1st Application	9 (2)
		2nd Application	11 (2)
Close to morningness	59-69	1st Application	140 (22)
		2nd Application	158 (26)
Intermediate type	42-58	1st Application	390 (63)
		2nd Application	363 (58)
Close to eveningness	31-41	1st Application	68 (11)
		2nd Application	73 (12)
Definitely eveningness	16-30	1st Application	11 (2)
		2nd Application	14 (2)
N			618

questions 1, 2, 10, 17 and 18, between 0-6 for questions 11 and 19 and between 0-5 for question 12. According to their total points, the subjects are divided into five different categories of circadian rhythm; 70-86 points "definitely morningness type", 59-69 points "close to morningness type", 42-58 points "intermediate type", 31-41 points "close to eveningness type" and 16-30 points "definitely eveningness type". Validity of original questionnaire and classification of circadian types are defined and tested with the changes in body temperature.

*The questionnaire is given to the same subjects 15-20 days later under the same circumstances. This time interval is long enough to prevent significant level of recalling and short enough to expect measurable changes.

Statistical Analysis

The results were evaluated with version 11.0 of SPSS statistical program. In order to determine the relationship between points from both applications and elements Pearson correlation matrix analysis was used. Reliability of inner coherence was evaluated via Cronbach's alpha coefficient. Tukey test was used in order to assess collectability characteristics of scale questions. Comparison of points from 1st and 2nd applications was performed with matched t-test. Levels of p below 0.05 were accepted as statistically significant.

FINDINGS

Total points of the subjects in both applications were not significantly different (51.9 ± 9.0 , 22-73 and 52.4 ± 9.5 , 21-72, respectively). When total points of the subjects were evaluated for circadian types, most of them are found to be in intermediate class (63% in 1st application and 58% in 2nd application). Close to morningness types were in the second place (Table 1).

Reliability level of the scale between questions is summarized in Table 2. Cronbach's alpha coefficient was 0.785 in 1st application and 0.812 in the second. Both applications were significantly meaningful. The scale had collectability characteristic ($p < 0.001$). Incollectability characteristic was at $p < 0.05$ significance level (Table 3).

Reliability analyses of all questions in both applications are presented in Table 3. All questions other than the 16th one were positively and significantly correlated.

Reliability coefficients (Cronbach's alpha values): 0.785 for the 1st and 0.812 for the 2nd application.

Correlation levels of the 16th question were -0.130 and -0.197 for the 1st and 2nd applications respectively. When 16th question was excluded, corrected Cronbach's alpha values were 0.794

TABLE 2. Results of Reliability Analyses of 1st and 2nd Applications of the Scale.

Source of change	Sum of Squares	Degree of freedom	Mean of Squares	F value	p value
Between subjects	2667 (2926)	617 (617)	4.3 (4.7)		
In subjects	14469 (13604)	11124 (11124)	1.3 (1.2)		
Between measurements	4149 (3693)	18	231 (205)	248.05 (229.90)	0.000
Residuals	10320 (9911)	11106 (11106)	.92 (.89)		
Incollectability	660 (781)	1	661 (781)	759.32 (949.74)	0.000
Compliance	9660 (9130)	11105 (11105)	.86 (.82)		
Total	17137 (16530)	11741 (11741)	1.5 (1.4)		
Mean	2.73 (2.76)				

Reliability coefficients (Cronbach's alpha values): 0.785 for the 1st and 0.812 for the 2nd application.

and 0.825 for the 1st and 2nd applications respectively. These findings demonstrated that Cronbach's alpha values were not affected from exclusion of 16th question. As a result, we concluded that there was no need for exclusion of that question.

Relationship between total points from 1st and 2nd applications was in an advanced state ($r=0.84$ according to Pearson correlation matrix). As the relationship between total points from both applications was inadequate to perform test-retest reliability, consistency of answers for each question in both applications was evaluated and summarized in table 4.

compare these coefficients with Japanese ($r=0.702$, Ishihara et al. 1986) and Spanish ($c2=60.25$, Adan and Almirall 1990) versions, it may be concluded that reliability of Turkish version is higher.

DISCUSSION

When total points of the subjects are taken into consideration, there is not any statistically significant difference between two applications. According to these points, 24-28% of subjects are morningness, 58-63% of subjects are intermediate and 13-14% of subjects are eveningness types. These results are consistent

TABLE 3. Reliability Analyses of Articles in 1st and 2nd Applications of the Subjects.

Articles	Mean of scale when the article is excluded	Variance of scale when the article is excluded	Total correlation of article-scale	of scale when the article is excluded
Art. 1	48.9 (49.5)	73.1 (80.4)	.510 (.538)	.766 (.796)
Art. 2	49.5 (50.0)	74.3 (82.5)	.505 (.459)	.768 (.800)
Art. 3	49.6 (50.1)	77.1 (83.7)	.287 (.355)	.779 (.805)
Art. 4	49.6 (49.9)	75.8 (82.6)	.432 (.484)	.772 (.800)
Art. 5	49.2 (49.8)	76.4 (83.9)	.344 (.365)	.776 (.804)
Art. 6	49.4 (49.9)	76.7 (84.9)	.302 (.285)	.778 (.806)
Art. 7	49.2 (49.7)	77.7 (85.1)	.341 (.341)	.778 (.806)
Art. 8	49.8 (50.3)	75.9 (84.7)	.365 (.328)	.775 (.806)
Art. 9	48.9 (50.0)	75.6 (81.6)	.376 (.449)	.774 (.800)
Art. 10	49.1 (49.7)	74.9 (82.7)	.348 (.357)	.776 (.804)
Art. 11	47.6 (48.3)	63.8 (70.4)	.482 (.519)	.768 (.798)
Art. 12	50.1 (50.6)	77.7 (85.0)	.139 (.172)	.791 (.816)
Art. 13	49.5 (49.9)	75.1 (81.1)	.317 (.388)	.778 (.813)
Art. 14	49.4 (49.9)	76.8 (83.3)	.179 (.265)	.789 (.810)
Art. 15	49.1 (49.6)	73.0 (80.1)	.467 (.510)	.768 (.796)
Art. 16	50.4 (51.0)	83.3 (92.2)	.130 (.197)	.794 (.825)
Art. 17	48.6 (49.2)	73.3 (79.4)	.450 (.550)	.769 (.794)
Art. 18	48.9 (49.4)	73.7 (81.1)	.529 (.566)	.766 (.796)
Art. 19	48.5 (49.1)	63.1 (67.7)	.620 (.666)	.751 (.781)

TABLE 4. Correlation Levels Between Points of the Subjects in 1st and 2nd Applications.

Articles	Total (n=618)
Art. 1	.77
Art. 2	.58
Art. 3	.61
Art. 4	.58
Art. 5	.52
Art. 6	.68
Art. 7	.50
Art. 8	.58
Art. 9	.61
Art. 10	.68
Art. 11	.58
Art. 12	.63
Art. 13	.60
Art. 14	.53
Art. 15	.63
Art. 16	.50
Art. 17	.67
Art. 18	.62
Art. 19	.72

with reliability study of Spanish version which performed with 908 subjects (330 females and 578 males) whose ages were between 17-50 (24.9 ± 6.4). Reported percentages were 20% for morningness, 61% for intermediate and 19% for eveningness types in this study (Adan and Almirall 1990). In another study on 2135 subjects with Spanish version, 60% for intermediate type was similar with our findings, but 16% for morningness and 25% for eveningness types were inconsistent (Adan and Natale 2002). Mean age of participants of the latter study was 48 (17-78), and age factor may be responsible from this difference. Social and cultural differences between two populations may be another possible mechanism.

Cronbach's alpha coefficients of the two applications (0.785 and 0.812, respectively) express a high level ($p < 0.0001$) of statistical significance for reliability of the scale. We can say that the scale has a high rate for inner consistency. When we compare these coefficients with Japanese ($r = 0.702$, Ishihara et al. 1986) and Spanish ($c2 = 60.25$, Adan and Almirall 1990) versions, it may be concluded that reliability of Turkish version is higher.

When correlation values of questions are evaluated for all participants, 7th and 16th questions have the lowest ($r = 0.50$) and 1st question has the highest ($r = 0.77$) level. It may be observed that all questions of Turkish version other than the 16th one are positively and significantly correlated. This article aims to learn best hours for physical activity and deals with habits of regular exercising. Exercising is not as common as Western communities in Turkey. So this question may be assessed as "inadequate" or "unnecessary" for the participants. As a consequence, 16th article should be taken into consideration when this questionnaire is applied to people with various occupations or exercising habits. We hope that provision of consistency with Turkish way of life will raise the reliability of this questionnaire.

As a conclusion, we think that retest reliability of Turkish version of this questionnaire is high enough. But, 16th article needs special consideration for further studies. Nevertheless, further evaluations which use different subject groups like the elderly, shift workers and athletes are needed to confirm the reliability of this questionnaire.

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