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A Hindi version of the Composite Scale of Morningness

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Abstract

Background—Several pen and paper measures of human circadian preference are available in English, but none are available in Hindi, hampering research in circadian behavior among Hindi speaking populations in India and elsewhere. The present study describes a Hindi version of the Composite Scale of Morningness (CSM), a self reported questionnaire widely used to assess morningness/eveningness (M/E). M/E has been used a proxy for circadian phase in lieu of cumbersome and expensive laboratory studies.

Method—The thirteen item English version of the CSM was translated into Hindi and independently back translated into English. Inconsistencies between the original and back translated versions were then resolved. Both versions were next administered to bilingual persons at Delhi, India (N = 130). After intra-class correlations between the Hindi and the English versions were examined, the Hindi version was administered to community based participants representing different age groups (N = 310).

Results—There was satisfactory intra-class correlation (ICC) between the total scores for the Hindi and the English versions of the CSM (Cronbach's alpha = 0.873), with variation for individual items scores. Total CSM scores in the second sample suggested a significant association with age, consistent with published reports with the English CSM, i.e., morningness tendencies were more likely to be reported by older adults. Significant associations with gender or educational status were not observed.

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Conflict of interest

There is no conflict of interest of any of the authors.

Conclusions—The Hindi CSM is a brief questionnaire that provides behavioral measures of diurnal preference. It is freely available for research in Hindi speaking populations.

Keywords

Circadian rhythm; Morningness-Eveningness; Composite scale; Hindi Version of CSM

1. Introduction

Many human biological functions such as body temperature, heart rate, blood pressure, and hormonal levels in plasma show a definite periodicity with a cycle length of approximately 24 hours. Similarly, psychological and behavioral variables such as mood, alertness, drowsiness, and task performance also manifest a circadian variation. Like the biological variables, they appear to be driven by an endogenous circadian pacemaker and are kept on track in their timing by external time cues or zeitgebers, such as daylight (Kuller, 2002). The Horne and Ostberg (Horne and Ostberg, 1976) Morningness/Eveningness Questionnaire (MEQ) is the most widely used pen and paper subjective tool for measuring M/E. The MEQ was originally validated in a young adult population (18-32 years) (Horne and Ostberg, 1976), and subsequent surveys have confirmed a distribution that is skewed toward eveningness in this age group (Chelminski et al., 1999; Adan and Natale, 2002). The MEQ has been used in several different ethnic groups; e.g., among Japanese students (Ishihara et al., 1986), Turkish individuals (Punduk et al., 2005), and Spanish adults (Diaz Morales and Sanchez-Lopez, 2004). These studies show that M/E is distributed normally in the population. A study in India by Achari and Pati (2007) on large number of school students reported extremely low prevalence of evening type. Díaz-Morales et al. (Diaz-Morales and Gutierrez Sorroche, 2008) reported significant gender differences in a Spanish speaking population; similar results were reported in other samples (Adan and Natale, 2002) but in New Zealand, Paine et al. (Paine et al., 2006) reported that M/E preference is independent of ethnicity, gender, and socioeconomic status. However Randler (Randler, 2011) reported that among adolescents there is significant gender differences on morningness/eveningness. (It has also been reported consistently that clinically stable outpatients with Bipolar I disorder (BP1) tend to have lower M/E scores, i.e., are more likely to be evening types compared with controls (Mansour et al., 2005; Ahn et al., 2008; Wood et al., 2009). Boudebessé et al. (2013) validated the French version of the 11-item Circadian Type Inventory in patients with BD and healthy controls. Principal components analysis revealed a two-factor structure (FR: flexibility/rigidity scale corresponding to rhythm stability; LV: languid/vigorous scale corresponding to rhythm amplitude).

The MEQ is composed of 19 items, some of which are specific to British undergraduate culture. Therefore, it is relatively difficult to standardize in other languages and cultures. The Composite Scale of Morningness (CSM), is a shorter version that was derived by Smith et al. (Smith et al., 1989) based on the M/E scales of Horne and Ostberg (Horne and Ostberg, 1976) and (Torsvall and Akerstedt, 1980) after detailed psychometric analysis. It consists of 13 validated, multiple response items that can be self-administered. The total score obtained by adding the scores on all items is used to estimate M/E; with a higher score indicating greater morning-type circadian orientation. The majority of M/E studies have

been conducted in temperate climates, where the lengths of days and nights show marked variation by season (Drennan et al., 1991; (O'Connor and Davis, 1992; Rosenthal et al., 2001; Taillard et al., 2004; Park et al., 2007; Selvi et al., 2007; Diaz-Morales and Gutierrez Sorroche, 2008; Kripke, 2008; Matchock and Mordkoff, 2009). Since daylight is an important zeitgeber, it is of interest to estimate M/E patterns in more tropical climates such as India, where the duration of days and nights are relatively stable throughout the year. Such studies have not been conducted in India to our knowledge, presumably because standardized scales in Hindi are unavailable. A Hindi version of the CSM would thus be useful to address this and similar questions.

2. Materials and Methods

2.1. Outline of the study

We translated the CSM into Hindi and back translated it. A corrected back translated version and the original English versions were administered separately to Indian individuals bilingual in Hindi and English. Finally, the Hindi version was administered to a second, community based sample of Hindi speakers living in the Delhi metropolitan region. We sampled participants from different age groups.

2.2. The Composite Scale of Morningness (CSM)

The CSM consists of 13 multiple choice questions with 4 or 5 possible responses to each question. The scores for each question run from 1 to 4 or 5 with higher numbers representing more of a morning-type orientation. The total score from the sum of all question scores represents the M/E score. Individuals with higher total scores are more likely to be morning types. Approximately 10 minutes are required to administer the entire questionnaire. English and Hindi versions of the CSM are given in full (with scoring key) in the Appendix.

2.3. Samples

2.3.1. First sample—This sample comprised of two types of participants bilingual in Hindi and English (total $n = 130$): (i) high school students enrolled at two schools in the Delhi region. All the students were in Grade 9 ($n = 47$); (ii) female first year nursing college students enrolled at the Post-Graduate Institute for Medical Education and Research (PGIMER) at RMLH, New Delhi ($n = 83$).

2.3.2. Second sample—This sample consisted of two groups who completed the Hindi version alone: (i) young adults following a door to door survey of a local, community ($n = 104$); (ii) middle aged adults ($n = 160$) attending free Yoga classes in a Government run Yoga institute. Individuals who agreed to participate were screened for absence of any medical and psychiatric illness using a self report health questionnaire.

2.4. Translation and back translation

The English version of CSM (Smith et al., 1989) was translated into Hindi independently by doctoral level research officers ($n = 3$). Two psychiatrists who did not participate in the initial translations then back translated the Hindi scales into English. The original version and the back translated versions were reviewed together by the translators and back

translators. Discrepancies in the original English and the back translated versions were discussed and resolved consensually.

2.5. Administration to bilingual persons

Half the participants completed the original English version of the CSM, followed by the Hindi version approximately 15 days later; the order was reversed for the rest of the participants who completed the English version approximately 15 days after the Hindi version.

2.6. Administration of the Hindi version alone

Participants in the second sample completed the Hindi CSM alone.

The study was approved by the Dr Ram Manohar Lohia Hospital (RMLH) Ethics Committee. All participants provided written informed consent.

3. Statistical analysis

Intra-class correlations were used to examine correlations between Hindi and English versions of the CSM. Multivariate analyses were used to analyze associations with demographic variables. The Statistical Package for Social Sciences (SPSS version 18) (SPSS, 2009) was used for all analyses.

4. Results

4.1. Demographic details

Consistent with the sampling design, the mean number of years of schooling differed across groups. There were also differences in gender distributions (Table 1).

4.2. Intra-class correlations

Among participants in the first sample who completed the Hindi and the English versions of the CSM ($n = 130$), there was significant intra class correlation for total scores (Cronbach alpha value = 0.873). Item-wise intra-class correlations between the Hindi and the English versions of the scale were also analyzed (Table 2). The highest intra-class correlation (ICC) was noted for question 11 (0.780) (Q. 11: If you always had to rise at 6:00 am, what do you think it would be like?). The lowest intra-class correlation was noted for question 7 (0.474) (Q.7: At what time in the evening do you feel tired and, as a result, in need of sleep?).

4.3. Associations between demographic variables and total CSM scores

To evaluate the possible impact of age, gender and education on M/E as measured by the Hindi version, we conducted linear regression analyses using all the participants ($n = 440$), with total CSM scores as the outcome and age, gender and educational status as independent variables. Age was the only significant predictor (β 0.244, $p < 0.001$, CI (95%) 0.054, 0.124); it was inversely associated with CSM scores. In other words, older participants were more likely to be morning types. There were no significant associations with regard to gender, duration of education or group status. We also analyzed total CSM scores in relation

to age using Analysis of Variance (ANOVA). The mean circadian rhythm scores of nursing students, middle aged controls and community based controls were almost similar but high school students scored significantly lower than these groups ($F = 7.976$, $p < 0.0001$); indicating more evening types among the high school students.

4.4. Factor analysis

We conducted Principal Component analysis (varimax rotation) of the Hindi scale and two factors were extracted. Factor 1 (items 1,2,7,9,10,11) explained 18.4% variance and second factor (items 3,4,5,12) explained 17% variance. The factor 1 is similar to as found by Diaz-Morales and Gutierrez Sorroche (2008), so first factor can be called morningness and second sensitivity as it includes questions like feeling tired, alertness, recover your senses etc),.

5. Discussion

The reliability of the Hindi version of the CSM appears satisfactory in relation to the original English version (Cronbach $\alpha = 0.854$). This estimate is comparable to ICC for two Turkish versions (Cronbach's alpha estimates 0.712 and 0.812, respectively) (Punduk et al., 2005) and a Spanish version (0.82), (Diaz Morales and Sanchez-Lopez, 2004); (0.873) (Voinescu et al., 2010). Though the total CSM score is typically used for research studies, item-wise intra-class correlations between the Hindi and the English versions of the scale were also analyzed. The item-wise ICC values varied with individual items. The ICC ranged from 0.47 (Question 7) to 0.78 (Question 11). For the Spanish version. (Diaz-Morales and Gutierrez Sorroche, 2008), it varied between 0.25 (item 7) and 0.66 (on item 1). In another study of the Spanish CSM, Voinescu et al. (Voinescu et al., 2010) reported the lowest internal consistency on item 7 in the Spanish version (0.244). In view of this variation, we do not recommend the use of individual items as predictors of ME in studies involving the Hindi version of the CSM.

Similar to earlier studies, we did not find significant associations between educational status and total CSM scores when results from the Hindi version were analyzed. Though significant group-wise differences were not detected when the first and the second samples were analyzed together, the high school students had significantly lower CSM scores than the other groups, i.e., the school students were more likely to be evening type. It should be noted that schools in Delhi begin early, between 7 am to 8 am, and early rising is therefore necessary for school children of all age groups. It has been reported that during adolescence, there is a greater tendency to eveningness, possibly because of developmental changes at puberty, effects of peer group pressures and personal habits (Carskadon and Acebo, 1993). The differences are attributable at least in part, to developmental changes in the mechanisms regulating sleep timing (Dahl et al., 1995). There is a trend for individuals to become more morning type in later adulthood (Gander et al., 2004) (Dumont and Carrier, 1997), typically beginning at around age 50 years (Torsvall and Akerstedt, 1980); (Bliwise et al., 2005). Our observations using the Hindi version of the CSM are consistent with these observations (Diaz-Morales and Gutierrez Sorroche, 2008). We did not observe significant associations between gender and CSM scores, consistent with some but not all prior studies (Bohle et al., 2001), and (Taillard et al., 2004; Diaz-Morales and Gutierrez Sorroche, 2008).

Smith (Smith et al., 1989) recommended that cutoff values below the 10th percentile for the total CSM score be used to delineate evening types and scores above the 90th percentile for morning types. Using these criteria, the majority of our subjects belonged to the intermediate type. The cut-off points corresponding to the 10th and 90th percentiles 10 and 90 in our sample were 36 and 49, respectively. Following Smith's recommendations, those with a Hindi CSM score of 36 and below would be considered as evening types, those with scores between 36 to 49 would represent intermediates and scores above 49 would be considered morning types.

In conclusion, we report on the Hindi version of the CSM scale across different age groups among Indians. In this study we could not calculate test retest reliability of the Hindi version of the scale. High school students were more likely to be evening types, and age was a significant variable associated with CSM scores.

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Table 1

Demographic variables and CSM scores.

	First sample	Second sample		
	High school students (n = 47)	Nursing school students (n = 83)	Young adults (n = 150)	Middle aged adults (n = 160)
Mean age (SD)	15.06 ± 0.60	21.05 ± 1.67	30.97 ± 14.60	41.5 ± 11.93
Gender (male/female)	26/21	0/83	101/49	41/119
Mean years of schooling (SD)	9.0 ± 0	12.87 ± 1.23	9.39 ± 4.13	14.47 ± 3.10
Mean CR Score (SD)	39.33 ± 5.44	43.12 ± 4.13	42.94 ± 5.78	43.43 ± 5.17

Participants in the first sample completed the English and the Hindi CSM. Participants in the second sample completed the Hindi version only.

Table 2

Item-wise intra-class correlations (ICC) between the Hindi and English versions of the Hindi CSM.

	Total CSM score (Hindi version)	Total CSM score (English version)	Cronbach's alpha (95% CI)
Question 1	4.17 ± 1.02	4.01 ± 0.98	0.731 (0.634- 0.803)
Question 2	3.35 ± 0.87	3.30 ± 0.76	0.498 (0.316- 0.632)
Question 3	2.62 ± 0.81	2.67 ± 0.86	0.676 (0.559-0.763)
Question 4	2.60 ± 0.79	2.69 ± 0.88	0.647 (0.519-0.741)
Question 5	2.81 ± 0.65	2.96 ± 0.83	0.602(0.457- 0.708)
Question 6	3.17 ± 0.79	3.36 ± 0.76	0.609 (0.467-0.713)
Question 7	3.36 ± 0.94	3.25 ± 1.05	0.474(0.283- 0.614)
Question 8	3.23 ± 0.96	3.28 ± 0.92	0.545 (0.379-0.666)
Question 9	3.16 ± 1.00	3.17 ± 0.85	0.534 (0.364-0.658)
Question 10	3.07 ± 0.94	2.80 ± 0.96	0.662(0.539- 0.752)
Question 11	3.05 ± 0.98	2.95 ± 1.02	0.780 (0.700- 0.839)
Question 12	3.70 ± 0.62	3.67 ± 0.67	0.632 (0.498-0.730)
Question 13	3.25 ± 0.81	3.18 ± 0.88	0.634 (0.501-0.732)
Total score	41.92 ± 5.21	41.56 ± 5.57	0.873 (0.816–0.913)

CI: confidence interval. Scores shown as (Mean ± SD),