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## PSYCHOMETRIC PROPERTIES OF THE ROMANIAN VERSION OF THE COMPOSITE SCALE OF MORNINGNESS IN HEALTHY ADULTS

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### **ABSTRACT**

*Morningness/eveningness is an attribute of human beings reflecting whether they are alert and prefer to be active early or late in the day. This paper aimed to introduce and preliminarily validate the Romanian translation of the Composite Scale of Morningness (CSM), as well as to set the cut-off points. Healthy, voluntary and unpaid students and adults (N=205), aged between 18 and 69, completed the questionnaire. Results showed that men scored higher than women, and the total score tended to increase with age. Cut-off scores were determined for three age groups: under 30, above 45 and intermediate. Internal validity was 0.875 and two components were extracted from the thirteen items. The questionnaire showed comparable psychometric properties to the existing versions in other languages.*

**KEYWORDS:** *diurnal preference, morningness-eveningness, chronotype, circadian rhythms.*

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## INTRODUCTION

Morningness-eveningness, also known as diurnal preference or chronotype, is a prominent inter-individual variable in circadian rhythms and is related to biological and behavioural differences among humans (Brown, Kunz, Dumas, Westermark, Vanselow, & Tilmann-Wahnschaffe, 2008; Smith, Reilly, & Midkiff, 1989). There are three major circadian types: morning, intermediate and evening. While the morning type (“lark”) wakes up spontaneously early in the morning, is more active in the first part of the day and tends to go to bed early in the evening, the evening type (“owl”) has trouble waking early in the morning and tends to be more active in the second part of the day. Those that fall between these behaviours are intermediate or neither type individuals (Horne & Ostberg, 1976). Most people are neither evening, nor morning types, but lie somewhere in between; estimates vary, but up to half of a given population may fall into the morning or evening classification (Paine, Gander, & Travier, 2006).

Previous data suggests that evening types are prone to addiction (alcohol and coffee), are more often habitual smokers (Adan, 1994; Mecacci & Rocchetti, 1998; Taillard, Philip, Chastang, Diefenbach, & Bioulac, 2001) and display higher levels of anxiety than intermediate or morning types (Díaz-Morales & Sánchez-López, 2008). Both clinically depressed and bipolar disorder patients were found to be more evening oriented than age- and sex-matched controls (Drennan, Klauber, Kripke, & Goyette, 1991; Mansour, Wood, Chowdari, Dayal, Thase, Kupfer et al., 2005) and it has been proposed that eveningness is a rather a pre-morbid trait than a characteristic of the depressive state (Drennan, et al., 1991). Eveningness was also linked with a higher risk of reporting depressive symptoms in healthy individuals (Hidalgo et al., 2009). Nevertheless, the interplay between chronotype and psychopathology may be more subtle and complex, as a recent study revealed that patients having the co-morbid alcohol use and bipolar disorders were more often of the morning type as compared with those with bipolar disorder only (Hatonen, Forsblom, Kiesseppa, Lonnqvist, & Partonen, 2008).

Diurnal preference is investigated using a number of validated questionnaires, such as the Composite Scale of Morningness (Smith et al, 1989). Previous studies have indicated that there are differences in the Composite Scale scores and the subsequent categorization of chronotypes, implying that it is of importance to validate translations of the questionnaire for different cultural and age groups (Caci et al., 2005; Smith et al., 2002).

### **Purpose of this study**

To validate the Romanian translation of the Composite Scale of Morningness (CSM) and set the cut-off points for the Romanian population.

## MATERIALS AND METHODS

### Participants

The study was approved by the Ethics Committee of “Iuliu Hațieganu” Medicine and Pharmacy University and by the Institutional Review Board of “Babes-Bolyai” University, Cluj-Napoca. Participants were undergraduate psychology students from Cluj-Napoca and adults recruited from their acquaintances, as well as from people presenting to their general practitioner in Baia Mare. Excluded were people suffering from major conditions, such as cardiac (severe heart failure, unstable angina), dermatologic (psoriasis), gastrointestinal (inflammatory bowel disease), neurologic (stroke, Parkinson disease, epilepsy, traumatic brain injury), pulmonary (obstructive sleep apnoea, persistent asthma, chronic obstructive pulmonary disease), psychiatric (chronic or acute psychosis, depressive or bipolar disorder, dementia, mental retardation), endocrine (hypo- or hyperthyroidism, diabetes mellitus) conditions.

### Instruments

A questionnaire containing the Romanian translation of the Composite Scale of Morningness (Smith, et al., 1989), as well as demographic questions, were used. The scale had to be translated into Romanian. It was then back-translated into English by two bilingual Romanian-English speakers to ensure translation quality. The CSM consists of thirteen items, most of them having four choices, with a Likert-type response format. They were taken from two of the first diurnal preference scales: nine from the widely-used Morningness-Eveningness Questionnaire (Horne & Ostberg, 1976) and four from the Diurnal Type Scale (Torsvall & Akerstedt, 1980). The CSM was developed in an attempt to extract what was considered to be the best items from those pre-existing questionnaires (Smith, et al., 1989). Scores are obtained by summing each item score and can range between 13 (extreme evening) and 55 (extreme morning). Since then, it has been translated into several languages and appeared to be reliable across student samples (Adan, Caci, & Prat, 2005; Caci, Nadalet, Staccini, Myquel, & Boyer, 1999; Díaz-Morales & Sánchez-López, 2004; Greenwood, 1994; Smith, et al., 1989) and stable over time (Caci, Nadalet, Staccini, Myquel, & Boyer, 2000; Greenwood, 1994).

### Procedure

Participation was voluntary and anonymous. Participants received an invitation letter explaining the nature of research and ethical requirements for confidentiality, and were given a web link where to fill the questionnaire. Alternatively, those unable to use the Internet were given a printed form. Before receiving the invitation, the subject was presented the list of the exclusion criteria. They were also asked to

further recruit adult participants from their acquaintances using snowball sampling. Completing the survey was considered implied consent to participate in this study. Each participant was asked whether to complete again the survey was allowed; those who agreed were contacted by email after 6 months, given an individual identification code and invited to complete the CSM. The data in the present study were collected in a wider investigation, where a thorough battery of self-assessment questionnaires was applied.

### **Statistical analysis**

Total scores are expressed as means, standard deviation (SD) and range. Distribution shapes were assessed for normality with the Shapiro-Wilk test. The reliability of the scale was estimated by Cronbach's  $\alpha$  coefficient. Gender differences on item scores were tested by the two-sample Wilcoxon rank-sum test since the item responses are on an ordinal scale. To examine the statistical significance of the differences, Mann-Whitney U-test was used, with  $p < 0.05$  considered significant. Data analysis was performed using the SPSS (version 16.0.2).

### **RESULTS**

Two hundred and five individuals participated in this study. Most of the respondents were women (65.4%), came from the urban areas (80.0%) and were graduates or were currently attending a faculty (47.8%). Two participants did not fill their ages; therefore they were excluded from the analysis.

In the total sample, mean age was 35.14 (SD = 14.45). Males were found to be significantly older than females ( $z = -5.60$ ,  $p < 0.001$ ,  $r = -0.38$ ). As age was not normally distributed, the Mann-Whitney U-test was used to compare the differences between genders. The mean morningness score was 37.36 (SD = 7.24) in the total sample and was not normally distributed. Males scored higher and the difference was significant ( $z = -4.45$ ,  $p < 0.001$ ,  $r = -0.31$ ). Table 1 presents further details by gender. We also performed an ANCOVA analysis using total score as a dependent variable with sex as a fixed factor and age as a covariate. There was a significant effect of age on total score ( $F = 48.64$ ,  $p < 0.0001$ ,  $r = 0.43$ ), but not of sex ( $F = 1.84$ ,  $p = 0.17$ ,  $r = 0.09$ ). Mean total scores tended to get higher with the age, being lower in the under 30 group and higher in the above 45 one. The correlation between age and total score was 0.50 and was significant at the 0.01 level (1-tailed; Spearman's rho).

Table 1  
*Summary of the descriptive statistics and reliability for age and diurnal preference.*

		<b>Total Sample</b>	<b>Males</b>	<b>Females</b>	<b>Mann-Whitney U test</b>
		<b>N=203</b>	<b>N=70</b>	<b>N=133</b>	
<b>Age</b>	Mean	35.14	42.78	31.11	z = -5.60
	SD	14.45	13.81	13.13	p < 0.001
	Range	18-69	19-69	18-68	r=-0.38
	Shapiro-Wilk's test	z=0.89 p<0.001	z=0.94 p=0.002	z=0.84 p<0.001	
		<b>n=205</b>	<b>n=71</b>	<b>n=134</b>	
<b>CSM</b>	Mean	37.36	40.05	35.94	z=-4.45
	SD	7.24	6.66	7.16	p < 0.001
	Range	15-54	15-49	19-54	r=-0.31
	Shapiro-Wilk's test	z=0.97 p=0.001	z=0.89 p<0.001	z=0.98 p=0.19	
	Skewness	-0.55	-1.45	-0.22	
	Kurtosis	0.06	2.87	0.18	
	$\alpha$ Cronbach	0.875	0.866	0.870	

The internal validity of the CSM was 0.875. Corrected Item-Total Correlation ranged from 0.244 to 0.761 with a median of 0.591. Item 7 demonstrated the lowest corrected item-total correlation (0.244) and the highest improvement in  $\alpha$  Cronbach if deleted (0.882). No items were found to have an undue influence on the reliability of the scale as a total.

Using the criteria proposed by the authors of CSM, (percentile10/percentile90 rule; Smith et al, 1989), the cut-off scores were 27 for the evening type, 46 for the morning type and 28-45 for the intermediate type. Similar cut-off scores were set for three age groups: under 30, above 45 and intermediate (30-45). As the mentioned rule is highly sample dependent, we also calculated the cut-off scores for percentile25/percentile75 (see Table 2).

Table 2  
*Cut-off points of CSM for percentiles 10 and 90 and age groups.*

<b>Age</b>	<b>10</b>	<b>25</b>	<b>75</b>	<b>90</b>
<b>&lt;30</b>	25	29	39	42
<b>30-45</b>	29	34	43	45
<b>&gt;45</b>	35	39	46	48
<b>18-69</b>	27	33	43	46

Principal component analysis was performed using the orthogonal rotation (varimax) method. The Kaiser-Meyer-Olkin Measure of sampling adequacy was

0.881 and all the KMO values for individual items were  $>0.73$ , well above the acceptable limit of 0.5. Bartlett's test of sphericity  $\chi^2(78) = 1068.09$ ,  $p < 0.001$ , indicated that correlations between items were sufficiently large for the analysis. Two components had eigenvalues over Kaiser's criterion of 1 and in combination explained 52.24 of the variance. Table 3 shows the rotated matrix of the scale.

Table 3

*Rotated Component Matrix for CSM. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 3 iterations. Loadings  $< 0.4$  are not shown.*

Item	Component	
	1	2
11	0.727	
10	0.663	
3	0.661	
5	0.644	
12	0.632	
6	0.585	
8	0.492	0.465
4	0.460	
2		0.793
7		0.773
9	0.541	0.648
1	0.480	0.606
13	0.545	0.553

## DISCUSSION

Our research introduces the Romanian version of a widely used diurnal preference scale and validates it in a sample of students and middle-age adults. We found the scale to have a good internal consistency with the Cronbach's  $\alpha$  coefficient in the interval of 0.83 and 0.90, reported by other studies (Adan, et al., 2005; Caci, et al., 1999; Díaz-Morales & Sánchez-López, 2004; Greenwood, 1994; Smith, et al., 2002; Smith, et al., 1989). As previously reported, we identified item 7 ("At what time in the evening do you feel tired and, as a result, in need of sleep") to demonstrate the lowest-total correlation and item 9 ("One hears about «morning» and «evening» types of people. Which one of these types do you consider yourself to be?") the highest one, too (Adan, et al., 2005; Caci, et al., 1999; Greenwood,

1994). Although a relatively small number of participants completed again the questionnaire, its 6-months temporal stability was fairly similar to that reported in larger samples (Caci, et al., 2000).

Although most authors reported the absence of a gender effect on morningness (Adan, et al., 2005; Caci, et al., 2000; Greenwood, 1994; Smith, et al., 1989), a recent meta-analysis of 52 studies reported a significant overall effect of gender with females being significantly more morning oriented than males (Randler, 2007). Contrary to these results, we found men to score significantly higher than women, but this can be due to age, as males were significantly older in our sample. Moreover, age, but not sex, appeared to strongly influence the total composite score. Although the construct of morningness has been considered as one-dimensional, in most of the studies and in ours, two or three factors are valid (Adan, et al., 2005; Caci, Deschaux, Adan, & Natale, 2009; Caci, et al., 1999; Díaz-Morales & Sánchez-López, 2004; Pornpitakpan, 1998; Smith, et al., 1989).

Investigations in chronobiology and chronopsychology have provided important differential results, especially between the extreme morning and evening groups. Evening types started their waking day at a lower body temperature than morning-type ones, their temperature increased throughout the day reaching its peak in the late afternoon (Baehr, Revelle, & Eastman, 2000; Bailey & Heitkemper, 2001; Mongrain, Lavoie, Selmaoui, Paquet, & Dumont, 2004). Circadian type was strongly related to the melatonin acrophase, with morning types having a more rapid decline in melatonin levels after the peak than evening types (Gibertini, Graham, & Cook, 1999). Moreover, the latter showed a delay in their early-morning peak of salivary cortisol and higher cortisol levels in the first hour after awakening (Bailey & Heitkemper, 1991; Kudielka, Federenko, Hellhammer, & Wust, 2006). Cognitive performance and thinking style might also be under the influence of chronotypes (Fabbri, Antonietti, Giorgetti, Tonetti, & Natale, 2007; Roberts & Kyllonen, 1999; Schmidt, Collette, Cajochen, & Peigneux, 2007), as well as personality traits (Mecacci & Rocchetti, 1998). There is some controversy over the genetic origins of chronotypes, with some studies showing links between chronotype and polymorphisms in clock genes (Carpen, von Schantz, Smits, Skene, & Archer, 2006; Carpen, Archer, Skene, Smits, & von Schantz, 2005; Katzenberg et al., 1998), and some not (Pedrazzoli et al., 2007; Robilliard et al., 2002; Voinescu, Thome, & Orăsan, 2010).

Our understanding of the complex factors that underlie chronotype, and the consequences of diurnal preference, is still in its infancy, but if the diurnal preference is a stable characteristic that can be better explained by endogenous factors, then an accurate chronotype assessment might help the everyday medical practice by tailoring individual examination and treatment to optimize both diagnostics and therapy. Education, sport or work scheduling are other areas that might particularly benefit from assessing the morningness/eveningness (Smith, et al., 2002).



## LIMITATIONS

No biological markers were used in this study. Diurnal preference was self-assessed with psychological instruments that are not as reliable as objective measurements. Moreover, the number of patients recruited was rather limited, and the distribution of the participants was skewed, with over-representation of females and youngsters. As the sample responding the questionnaire was self-selected, it was not possible to calculate a response rate or comment on the characteristics of those who chose not to take part.

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