Short Communication

Morningness–eveningness preferences in Portuguese adolescents: Adaptation and psychometric validity of the H&O questionnaire

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ABSTRACT

Throughout development individuals vary in their circadian preferences. One of the most notable changes occurs during adolescence when individuals tend to become progressively more evening-oriented. This is a critical age period to be studied given that eveningness preferences seem to relate with physical, psychological and social problems, whereas the most morning-oriented individuals tend to be protected against these problems. The aim of this study was to adapt and present the psychometric validity of the Morningness–Eveningness Questionnaire (Horne & Östberg, 1976) to Portuguese adolescents (12–14 years old). To this end, 300 adolescents responded to the questionnaire which was initially translated, re-translated, and then subject to a think-aloud procedure. Overall, the psychometric measures were positive. We found no significant effect of sex on the circadian preferences and a tendency for increased eveningness as age progresses, especially in males. We discuss our results in light of the existing literature.

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1. Introduction

Humans have time-of-day fluctuations (peaks and troughs) that affect various aspects such as cognitive performance (e.g., Schmidt, Collette, Cajochen, & Peigneux, 2007), social behavior and intellectual performance (e.g., Goldstein, Hahn, Hasher, Wiprzycka, & Zelazo, 2007), mental and physical health (e.g., Randler, 2011). This is an individual difference and people can be classified as morning, intermediate, or evening-types (e.g., Gelbmann et al., 2012), corresponding to peaks of performance in the morning, middle of the day, or evening, respectively. The morningness–eveningness preference (or chronotype) gradually changes throughout development, and is determined by genetic, biological and social factors (Roenneberg et al., 2004). Other factors also influence circadian rhythms, such as the geographical location (e.g., rural vs. suburban vs. urban; Randler, 2011), light exposure and sports (Gelbmann et al., 2012), and even season of birth (Natale & Di Milia, 2011).

During childhood, most individuals show strong morning tendencies, but a shift towards eveningness occurs in adolescence, approximately between 12–14 years (Díaz-Morales, de León, & Sorroche, 2007; Tonetti, Fabbri, & Natale, 2008). This tendency for higher eveningness continues throughout adolescence, peaking around the 20s (e.g., Roenneberg et al., 2004). However, this peak tends to occur earlier for females (17 years old), than for males (around 21 years old; see Tonetti, Fabbri, & Natale, 2008), because pubertal manifestations also occur earlier in the former (for a review, see Adan et al., 2012). Other studies have reported somewhat different results indicating that females are more morning-oriented than males (Randler & Díaz-Morales, 2007; Roenneberg et al., 2004), or that there are no significant differences between the sexes (e.g., Díaz-Morales, de León, & Sorroche, 2007; Russo, Bruni, Lucidi, Ferri, & Violani, 2007).

Understanding the morningness–eveningness preferences in adolescence is important for developmental reasons and also because of their influence in various areas as summarized next. The mismatch between chronotype and the schedule organization of the daily activities (including school activities), affects negatively the adolescents' social behavior, and their physical and mental well-being (Hahn et al., 2012). Additionally, adolescents with eveningness preference are most likely to develop mood and anxiety problems (Gau et al., 2007; Randler, 2011), to reveal attentional difficulties and to get involved in substance use (e.g., Gau et al., 2007), to have more aggressive behaviors and more frequent behavioral problems of clinical significance (e.g., Goldstein, Hahn, Hasher, Wiprzycka, & Zelazo, 2007), to report irregular sleep–wake schedules (e.g., Mateo, Díaz-Morales, Barreno,

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Prieto, & Randler, 2012; Russo, Bruni, Lucidi, Ferri, & Violani, 2007), and to have higher suicidality (e.g., Gau et al., 2007). These adolescents have also showed poorer academic performance and lower interpersonal skills (e.g., Goldstein et al., 2007). On the other hand, morning-oriented adolescents seem to be protected for adolescent psychopathology (see Gelbmann et al., 2012), and are less impulsive and more persistent which positively influences school achievement (e.g., Adan, Natale, Caci, & Prat, 2010). These data clearly establish the relevance of studying this individual characteristic in this age group.

Tools to evaluate the chronotype in children (aged between 4–11 years), and the age group between 15–94 years already exist in Portugal, namely the Children's Chronotype Questionnaire (CCTQ; Couto et al., 2014) and the Morningness–Eveningness Questionnaire (MEQ; Silva et al., 2002), respectively. However, no instruments to measure it in adolescents (12–14 years old) exist for our population. Given the wide importance of understanding this variable as just briefly reviewed, such an instrument is essential. The goal of this study was to translate and adapt the MEQ (Horne & Östberg, 1976) for Portuguese adolescents (henceforward aMEQ), providing preliminary psychometric validity data as well as various cut-off points.[2]

2. Method

2.1. Participants

The sample was composed of 300 (167 female) adolescents aged 12–14 years ($M = 13.17$, $SD = 0.74$) recruited from several schools (80% public and 20% private schools) from the district of Aveiro (Portugal). The study was authorized by the Portuguese Directorate-General for Education and by the school directors. Informed consent was obtained from the parents of the participants and also from the adolescents before participation.

2.2. Instrument

Morningness–Eveningness Questionnaire (Horne & Östberg, 1976). This questionnaire is composed of 19 items aimed to measure whether a person's peak of alertness occurs in the morning, the afternoon/evening or in an intermediate time of the day. Fourteen questions present four response options and five questions require responses using hourly scales. Scores range from 16 (eveningness) to 86 (morningness) points. The original questionnaire was translated to European Portuguese by 2 researchers highly proficient in English and then reviewed by an English professor. Next, 24 adolescents (13 female) aged 12–14 years ($M = 12.75$, $SD = 0.85$) participated in a think-aloud protocol in small group sessions which resulted in small vocabulary adjustments to improve comprehension of the aMEQ. These procedures ensure the content validity of the instrument.

2.3. Procedure

The questionnaire was administered in groups of 10–26 participants under the supervision of one of the authors in sessions lasting approximately 20 min.

3. Results

On average, the aMEQ score was 52.49 ($SD = 7.66$), and ranged between 29 and 76 points. The scale was left skewed with −.297

(error = .141), and kurtosis was .486 (error = .281); however, the Kolmogorov–Smirnov Z of .967 revealed a good fit with a normal distribution curve ($p = .307$).

The percentages of participants characterized as being of the morning, intermediate and evening-types are presented in Table 1 using different cut-off points typically used: mean $\pm$ 1SD, percentiles 10 and 90, and the less restrictive percentiles 20/80. These data are presented for the entire sample, and also separately for the female and male participants. The majority of the adolescents are of the intermediate type, followed by the morning-type; the evening-type was the least frequent in our sample.

Using the classification based on the cut-off points of 20/80 for each sex, a chi-square test revealed no statistically significant differences in the proportion of morning, intermediate, and evening-types, $\chi^2(4, N = 300) = .550, p = .760, C = .043, p = .760$. A t test for independent samples using the total aMEQ score, also revealed a non-statistically significant difference between males ($M = 52.77$, $SD = 7.42$) and females ($M = 52.26$, $SD = 7.86$), $t(298) = .574, p = .567$. To further explore sex differences we submitted the results of each item to a Mann–Whitney U test. Significant results were obtained in the following items: item 3, where males mentioned to be more dependent of an alarm clock if they needed to wake up at a given time in the morning ($U = 8013.5, p < .001$); item 6, with males reporting to have more appetite during the first half hour after waking up in the morning ($U = 8704.5, p < .001$); item 13, with males noting they would sleep later than usual if they were free to do so after going to sleep later than usual the night before ($U = 8847.5, p < .01$); item 10, were females reported feeling tired and needing to sleep earlier than males ($U = 8371, p < .001$); and, item 12, with females reporting to feel more tired if they went to bed at 11 pm than males ($U = 9328, p < .01$).

Regarding age, Pearson's correlation suggests that morningness decreases with age, although the result did not reach statistical significance ($r = -.034, p = .556$). When this analysis was performed separately for each sex, we also obtained non-significant correlations in both cases (lower $p = .261$), although the relation between age and chronotype was positive for females ($r = .016$) and negative for males ($r = -.098$).

According to Cronbach's alpha value, the reliability of the scale was .692, a level that can be considered marginal (according to Nunnally & Bernstein, 1994, an adequate value should be >.70). Considering that the validity of Cronbach's alpha as a measure of reliability has been questioned (e.g., Osburn, 2000) we also calculated the Composite Reliability (CR) as defined by Fornell and Larcker (1981) and suggested by Marôco (2014). aMEQ obtained a CR of 0.702, a suitable indicator of construct reliability confirming that all items are consistent manifestations of a latent factor (Hair, Anderson, Tatham, & Black, 1998).

Table 1
Percentages of participants identified with the morning, intermediate, and evening-types. Data are presented for the overall sample and separately for females and males according to different cut-point options.

	Criteria	Cut-off points	Morningness–Eveningness Preferences		
			Morning	Intermediate	Evening
Overall sample	mean $\pm$ 1SD	45/60	17.3%	69.0%	13.7%
	Perc 10/90	43/61	14.7%	76.0%	9.3%
	Perc 20/80	46/59	21.7%	62.0%	16.3%
Females	mean $\pm$ 1SD	44/60	18.6%	70.7%	10.8%
	Perc 10/90	43/61	15.0%	76.0%	9.0%
	Perc 20/80	46/59	22.2%	62.3%	15.6%
Males	mean $\pm$ 1SD	45/60	15.8%	71.4%	12.8%
	Perc 10/90	42/61	14.3%	76.7%	9.0%
	Perc 20/80	47/59	21.1%	60.2%	18.8%

Note: The cut-points for the males and females were determined using the data from the participants of each sex. "Perc 10/90" and "Perc 20/80" refer to percentiles 10/90 and 20/80, respectively.

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[2] We should note that the MEQ is used extensively as a self-report questionnaire to assess circadian preferences, as recognized by researchers (e.g., Tonetti et al., 2008). However, other instruments exist to assess this characteristic in adolescents as can be seen in publications of the area (e.g., Hahn et al., 2012; Mateo et al., 2012; Randler, 2011).