Personality and Individual Differences 54 (2013) 298–301

Contents lists available at SciVerse ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Short Communication

The stability of the morning affect scale across age and gender

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ARTICLE INFO

Article history:
Received 26 May 2012
Received in revised form 10 August 2012
Accepted 19 August 2012
Available online 15 September 2012

Keywords:
Age
Circadian rhythm
Gender
Morningness
Morning affect

ABSTRACT

A limitation of the morningness–eveningness literature is the assumption that morningness is a 'fixed' construct. Morningness–eveningness scales are often developed on young adult samples, yet studies report that eveningness peaks in young adults with a shift to morningness from the age of 25 to 35 years of age. This age related change in morningness–eveningness may explain why these scales have limited success when applied in older samples. We tested this argument by developing a measurement model based on the Composite Scale of Morningness using a sample aged <30 years of age. Tucker's congruence coefficient and confirmatory factor analysis indicated this solution was not a good fit in three older age groups. In contrast, we repeated this assessment using the 'morning affect' scale. This scale comprises items that measure morningness preference only. Model fit indicators suggested the 'morning affect' scale was a good fit across four age groups and gender.

1. Introduction

Morningness and eveningness (ME) represents a continuum along which individuals may be placed to reflect their preference for activity either earlier or later in the day (Natale & Cicogna, 2002). This behavior may also be influenced by a genetic component (Dijk & Archer, 2010). Many studies have focused on improving the psychometric properties of ME scales (Caci, Deschaux, Adan, & Natale, 2009; Smith et al., 2002) and setting cut-off points to identify extreme types (Natale & Cicogna, 2002). A remaining limitation is the assumption that ME is 'fixed' at some point in time and therefore, that scales that are typically developed on young student samples can be used with older groups. There is mounting evidence that ME scores are age dependent and it may be desirable to develop measures that are not biased by age (Caci et al., 2005; Paine, Gander, & Travier, 2006).

Studies that draw upon adolescent samples demonstrate a shift from morningness to eveningness until approximately 20 years of age (Roenneberg et al., 2004). An evening orientation is reported in many studies of young adults (Adan, Caci, & Prat, 2005; Chelminski, Ferraro, Petros, & Plaud, 1997) and subsequently, a shift back to morningness is reported in several countries (Di Milia & Muller, 2012; Paine et al., 2006). In Australia and France this change is reported to begin at approximately 25 and 35 years of age, respectively (Caci et al., 2009; Di Milia & Bohle, 2009).

ME scales are typically developed using convenience samples of university aged students and many have a strong female bias. For example, in a study of the Composite Scale of Morningness (CSM) in six countries the mean age ranged from 19 to 23 years and females accounted for 61–79% of the samples (Smith et al., 2002). Similarly, in a five nation study the mean age ranged from 18 to 23 years and females comprised 60–74% of the samples (Caci et al., 2005).

The age and gender bias associated with ME studies may in part explain the inability to replicate the posited factor structure in older working samples that are predominately male. For example, one study developed a model structure based on a student sample that contained 66% females and a mean age of 19 years was unable to be replicated in a working sample with a mean age of 40 years and contained 90% males (Di Milia, Folkard, Hill, & Walker, 2011). Monk and Kupfer (2007) identified a three factor solution using the Morningness–Eveningness Questionnaire (MEQ, Horne & Östberg, 1976) in a gender balanced sample with a mean age of 35 years. However, in an older sample four items failed to load leading Monk and Kupfer to suggest the 'morning alertness' factor is more age related while the 'evening sleepiness' factor is less age dependent.

The present study has two goals. The first is to test whether a factor structure developed on a young sample is applicable across older age groups. We first develop a factor solution using a sample aged <30 years and then use confirmatory factor analysis (CFA) to assess the fit in three older age groups. We also calculate Tucker's congruence coefficient as an additional indicator of how well the factors fit across the age groups. The second goal is to test the applicability of the 'morning affect' (MA) scale across the age groups. The MA scale is made up of a subset of items (3, 4, 5, 12) from the CSM (Smith, Reilly, & Midkiff, 1989) and may be

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http://dx.doi.org/10.1016/j.paid.2012.08.031

considered a 'pure' measure of morning preference. These items only refer to morning activity and the factor has been found in French (Caci et al., 2009) and Australian students (Di Milia & Bohle, 2009), as well as a working sample (Di Milia & Muller, 2012).

2. Methods

2.1. Sample

We pooled data from several German samples reported elsewhere (Randler, 2008) to obtain a sample with a wide age range (20–79 years). The data did not contain missing values. These data were collected following approval from the Ethics committee at the University of Education and informed consent from the participants. Participants were not paid for their participation.

The participants provided demographic data and completed a number of measures including the German version of the CSM (Randler, 2008). The CSM was translated into German using a parallel translation method and is reported to be a reliable and valid measure (Randler, 2008).

2.2. Procedure

The sample was divided into four age groups; <30 years ($n = 272$), 30–<40 ($n = 197$), 40–<50 ($n = 200$) and ⩾50 ($n = 158$). The male to female ratio across these age groups was 1:2.7; 1:2, 1:6 and 1:3.5, respectively. To retain the best items for the CSM model we conducted a principal components analysis (PCA) using oblique rotation on the <30 years age group. We used the scree test to identify the components and set the minimum factor loading at 0.40 (Hinkin, 1998). Items that cross loaded ⩾0.35 on another factor were discarded.

To assess the applicability of the model across the older age groups we calculated Tucker's congruence coefficient and employed a multi-group confirmatory factor analysis (CFA) using maximum likelihood estimation (AMOS, Ver. 7). A congruence coefficient >0.95 indicates the factors are similar (Caci, Nadalet, Bayle, Robert, & Boyer, 2003). Model fit was assessed via the χ^2 statistic (Barrett, 2007), several incremental fit indices, the root mean square error of approximation (RMSEA) and relative χ^2 (χ^2/degrees of freedom). Hu and Bentler (1999) suggest good model fit may be shown with fit indices ⩾.95 and RMSEA values <.06, while the value for relative χ^2 should be <2 (Ullman, 2001). In addition, the parsimony normed-fit index (PNFI) and the Akaike information criterion (AIC) were employed to determine model parsimony between the invariant (no difference) and variant (difference) models.

Finally, we tested the fit of the 4-item MA scale in eight groups (four age groups by gender). We included gender given some studies report gender differences (Adan & Natale, 2002; Randler, 2007).

3. Results

The sample comprised of 198 males and 629 females (75%). The overall mean age was 36.65 years ($SD = 12.43$) and gender differences were not found. The students' ($n = 356$) mean age ($M = 26.62$, $SD = 6.24$) was significantly lower ($p < .001$) than the worker ($n = 471$) group ($M = 44.43$, $SD = 10.25$). Statistical tests for normality are not appropriate in large samples but skewness (−.28) and kurtosis (−.21) were not excessive (Hair, Black, Babin, & Anderson, 2010). Controlling for age we found that females had a higher CSM score ($F(1,817) = 3.98$, $p < .05$).

One-way ANOVA revealed a significant increase in morningness across the age groups (see Fig. 1). Age and morningness were correlated (.39, $p < .001$) and the shift to morningness was observed at 35 years ($r = .11$, $p < .03$).

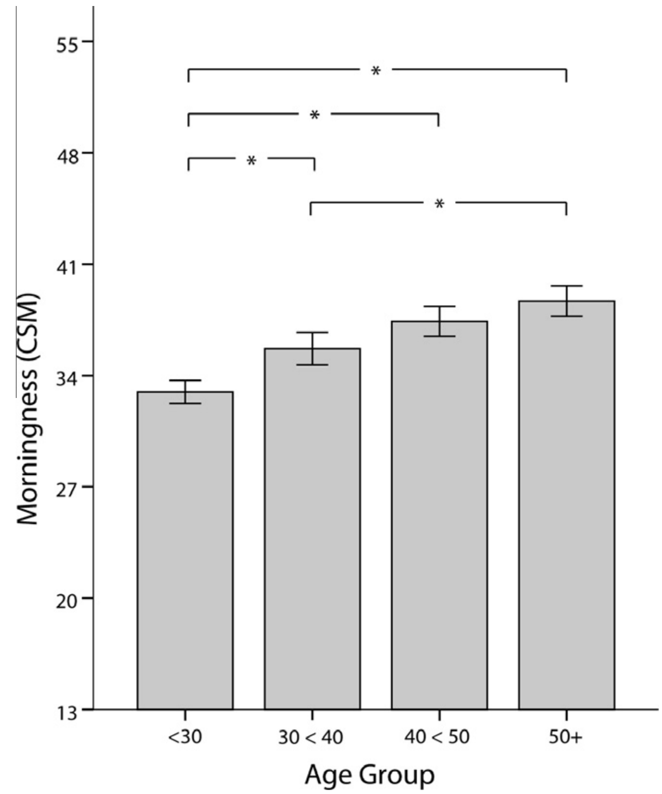

Fig. 1. Mean morningness score by age group (*$p < .001$).

The PCA resulted in a two component 10-item solution. Item 8 failed to load and two items cross loaded (9, 13). The first component explained 37.24% of the variance and consisted of six items (3, 4, 5, 6, 11, 12) concerned with morning activity. The factor loadings ranged from .51 to .89. The second component explained 16.15% of the variance and included four items (1, 2, 7, 9) that comprised a mix of morning and evening activity items. The factor loadings ranged from .58 to .83. Cronbach alpha for the CSM was .86.

Tucker's coefficient of congruence suggested the solution for Factor 1 (F1–F1) and Factor 2 (F2–F2) were highly congruous across the age groups (see Table 1). However, the coefficients between the factors (F1–F2, F2–F1) were weak indicating the structure identified in the <30 age groups is not a good fit in the older age groups.

The results from the CFA concerning the CSM were mixed (see Table 2). The χ^2 statistic and the RMSEA suggested the invariant model is a better fit. However, the AIC indicated the variant model is more parsimonious. The incremental fit indices for the invariant and variant models were poor (Barrett, 2007) and overall, the 10-item model was not a good fit across the age groups.

The results from the CFA on the MA factor suggested no significant differences between the invariant and variant models.

Table 1
Tucker's congruence coefficients for the two factor 10-item CSM model by age groups (F1 = factor 1, F2 = factor 2).

Age group	F1–F1	F1–F2	F2–F1	F2–F2
<30	0.99	0.48	0.63	0.96
30–<40	0.99	0.55	0.63	0.99
40–<50	0.99	0.53	0.69	0.96
⩾50	0.99	0.44	0.68	0.92