

Morningness-eveningness and mental health: initial evidence of the moderating roles of mattering and anti-mattering

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Abstract

Mental health problems are more prevalent in evening-oriented individuals than in their morning-oriented counterparts. Recently, research has offered first insights into how the negative effects of eveningness on mental health and well-being can be magnified or alleviated depending on accompanying psychological characteristics. In the current study, we evaluated how eveningness relates to mattering and anti-mattering and whether mattering and anti-mattering can moderate the association between eveningness and mental health. The participants were 692 Polish adults (337 women, 355 men) aged between 21 and 57 years ($M \pm SD: 39.76 \pm 9.63$). All participants completed measures of morningness-eveningness and depressive and anxiety symptoms, the General Mattering Scale (GMS) and the Anti-Mattering Scale (AMS, see <https://osf.io/3ak4v/>). Conducted analyses showed that 1) the Polish versions of GMS and AMS have appropriate reliability and validity, 2) eveningness is negatively associated with mattering and positively associated with anti-mattering, depressive, and anxiety symptoms, and 3) the magnitude of the association between eveningness and mental health symptoms increased with higher anti-mattering and lower mattering. Overall, this study presents the first evidence of how feelings of being important and being valued may buffer against the negative effects of eveningness on mental health.

Keywords: morningness-eveningness, mattering, anti-mattering, mental health, anxiety symptoms, depressive symptoms

Introduction

Morningness-eveningness, also called chronotype, is a central individual difference within the scope of chronopsychology (Adan et al. 2012). It is mainly visible in preferences for the timing of functioning, especially sleep and wake times: some individuals prefer going to bed and

waking up early (morning types), while others prefer a later daily schedule (evening types). However, the vast majority of the human population is intermediate in this regard and does not display distinct circadian preferences (neither types). Besides these obvious manifestations, circadian rhythm is also visible in several physiological characteristics such as cortisol secretion (Oginska et al. 2010), melatonin secretion, and body temperature (Lack et al. 2009). Similarly, morningness-eveningness is associated with several psychological characteristics, with evening-oriented individuals reporting lower life satisfaction (Drezno et al. 2019), lower self-esteem (Gorgol et al. 2023), and higher prevalence of mental health symptoms (Gao et al. 2019).

Current literature offers several possible explanations for why higher eveningness is a risk factor for developing mental health problems. First, research shows a shared common genetic basis for chronotype, depression, and anxiety (Lieberman et al. 2017). Second, evening-oriented individuals are exposed to less natural daylight and more artificial light than morning-oriented people (Goulet et al. 2007) which can affect their mood and emotion regulation via neurobiological pathways (Blume et al. 2019). Third, the morning orientation of the social clock (i.e. school and work schedules) often forces evening-oriented individuals to operate at their non-optimal time of day, which, in turn, is associated with various negative consequences, referred to as *social jetlag* (Wittmann et al. 2006). Even though important, the mechanisms listed above seem to explain the links between eveningness and mental health problems only partially (Rodríguez Ferrante et al. 2023).

Recently research has offered the first insights into the role of psychological factors in the relationship between morningness-eveningness and mental health problems. In particular, several psychological characteristics are associated with higher morningness and lower eveningness. What is more, most of these characteristics can magnify or alleviate the negative

effects of eveningness on depressive symptoms. These include Big Five personality traits (conscientiousness and neuroticism; Gorgol et al. 2022a), temperamental factors (briskness and emotional reactivity; Gorgol et al. 2022b), and self-esteem (Gorgol et al. 2023). Analogically, psychological factors have also been shown to contribute to the relationship between morningness-eveningness and well-being, with the first evidence of perceived social support leading to lower well-being in evening-oriented individuals (Wills et al. 202; Gorgol et al. 2022c).

A central goal of the present research was to test the hypothesis that mattering is associated negatively and anti-mattering is associated positively with eveningness. Mattering is a concept similar yet distinguishable from constructs such as perceived social support and self-esteem (see Elliott 2009; Flett 2018). Mattering is described as feeling significant and valued by others and is positively related to life satisfaction (Flett 2022; Rosenberg & McCullough 1981), well-being, and optimism (Reece et al. 2021). Importantly, mattering acts as a core psychosocial and universal human need that is linked with psychosocial outcomes such as loneliness (Flett et al. 2022). As such, mattering can indicate high adaptability and is viewed as a protective factor concerning indicators of ill-being including depression (Flett 2022).

Anti-mattering is the feeling of not mattering to others (see Flett et al. 2022). People with a high level of anti-mattering feel unvalued or devalued and they seem like they are unseen and unheard by other people. This can take extreme forms such that someone feels entirely insignificant and irrelevant due to being unimportant to other people. This can result in unbearable feelings of psychological pain and loneliness for some people. Both mattering and anti-mattering are relatively stable across time for most individuals but can fluctuate to a certain

degree and describe experiences that are best captured by two separate (yet correlated) dimensions, rather than being two ends of the same dimension (Flett et al. 2022).

Why should eveningness be associated negatively with mattering and positively with anti-mattering? First, feelings of not mattering are associated with low self-esteem, deficits in personal well-being, and lower social support (see Flett 2022), so the association between low mattering and eveningness should parallel the results found with individual differences in self-esteem, social support, and well-being. Second, some research has linked eveningness with perceived discrimination (see Stolarski & Gorgol 2023), and this accords with the broad notion that anti-mattering can arise from being discriminated against and devalued by other people. Third, while somewhat speculative, it is possible that for many people, their eveningness is a defensive strategy to avoid painful social experiences rooted in anti-mattering experiences. More generally, anti-mattering may reflect a negative motivational orientation. If so, then higher levels of eveningness reflect a greater unmet need for relatedness and social connection as well as a great unmet need to matter to others. Some of this may reflect a history of less-than-optimal relationships with parents, including feelings of not mattering to parents. Previous research has indicated that eveningness is associated with reports of poorer relationships with parents and teachers (see Prieto et al. 2012) and high levels of loneliness (Norbury 2022). Feelings of not mattering are also associated with relationship difficulties and loneliness (see Flett 2022). The association between eveningness and (anti-)mattering can also be understood conversely. Given the morning orientation of the social clock, eveningness may create difficulties in forming meaningful social connections, leading to lower feelings of mattering and higher feelings of anti-mattering (see Kivelä et al. 2022).

In the present study, we sought to provide an in-depth examination of two factors associated with social experiences (mattering and anti-mattering) that have the potential to

amplify or alleviate the negative effects of eveningness on mental health (symptoms of depression and anxiety). In other words, our main objective was to investigate whether mattering and anti-mattering may act as moderators in the association between morningness-eveningness and the presence of depressive and anxiety symptoms. Our hypotheses were as follows: 1) eveningness is associated negatively with mattering and positively with anti-mattering, and 2) mattering and anti-mattering moderate the relationships between morningness-eveningness and mental health problems. Specifically, we proposed that higher mattering weakens the associations between morningness-eveningness and symptoms of depression and anxiety, whereas lower anti-mattering strengthens these associations. In doing so, our secondary aim was to adapt mattering and anti-mattering scales to Polish, test their psychometric properties, and establish their validity.

Methods

Participants

A total of 692 Polish adults (337 women and 355 men) aged between 21 and 57 years ($M \pm SD$: 39.76 ± 9.63) participated in the study (see Table 1 for detailed demographic characteristics of the group). By way of benchmarking, the sample size is large enough to detect ΔR^2 in hierarchical regression equal to 1.4% ($\alpha = .05$, power = .80) - an effect size comparable to other studies in this area (e.g. Gorgol et al. 2022a, Gorgol et al. 2022b). All participants were recruited by a professional company specializing in panel research and completed five questionnaires online through the Qualtrics platform. The study was conducted in line with ethical standards and has been accepted by the institutional ethics committee (KB 629/2021). All participants gave informed consent before taking part in the study.

Table 1.

Sociodemographic characteristics of the participants.

Variable	Category	N	%
Gender	Women	337	49%
	Men	355	51%
Education	Primary education	2	<1%
	Lower secondary education	4	<1%
	Vocational education	56	8%
	Secondary education	286	41%
	University degree	344	50%
Marital status	Single	160	23%
	Non-marriage relationship	135	19%
	Married	350	51%
	Divorced/Widowed	47	7%
Number of children	0	257	37%
	1	199	29%
	2	183	26%
	3	41	6%
	4	10	1%
	5	2	<1%

Measures

Morningness-eveningness was measured with the Composite Scale of Morningness (CSM) in the Polish adaptation provided by Jankowski (2015). It consists of 13 items referring to various aspects of circadian functioning. The total CSM score was computed as a sum of responses to all its items; scores range from 13 to 55. The internal consistency of the CSM in our study was equal to $\omega = .90$.

Mattering was measured using the General Mattering Scale (GMS; Marcus & Rosenberg 1987) in our adaptation (see <https://osf.io/3ak4v/>). It consists of 5 items referring to how individuals perceive they matter to others. The total GMS score was computed as a sum of responses to all its items; scores range from 5 to 20. The internal consistency of the GMS in our study was $\omega = .88$.

Anti-mattering was measured using the Anti-Mattering Scale (AMS; Flett et al. 2022) in our adaptation (see <https://osf.io/3ak4v/>). It consists of 5 items referring to how individuals feel like they do not matter to others. The total AMS score was computed as a sum of responses to all its items; scores range from 5 to 20. The internal consistency of the AMS in our study was $\omega = .92$.

Depressive symptomatology was measured with the Patient Health Questionnaire–9 (PHQ-9) in the Polish adaptation provided by Tomaszewski and colleagues (2011). It consists of 9 items referring to the frequency of depressive symptoms described in the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; American Psychiatric Association) over the past two-week period. The total PHQ-9 score was computed as a sum of responses to all its items; scores range from 9 to 36. The internal consistency of the PHQ-9 in our study was $\omega = .89$.

Anxiety symptomatology was measured with the Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al. 2006) in the Polish adaptation (Basińska & Kwissa-Gajewska, 2023). It consists of 7 items referring to the frequency of anxiety symptoms during the past two-week period. The total GAD-7 score was computed as a sum of responses to all its items; scores range from 7 to 28. The internal consistency of the GAD-7 in our study was $\omega = .93$.

Analytical strategy

In the first step of the study, GMS and AMS were translated from English into Polish by the two first authors of the present article and then back-translated into English by two bilingual

Polish-English speakers. The back-translation was then compared with the English version – both versions were in accord.

In the second step, we conducted a confirmatory factor analysis to test the factorial structure of GMS and AMS scales. We used multiple indexes to assess model fit: chi-square statistic (χ^2), comparative fit index (CFI), Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). We also used conventional criteria to assess model fit, with values above .90 for CFI and TLI and values below .08 for RMSEA and SRMR, providing evidence of adequate model fit (Marsh et al. 2004).

In the third step, we calculated descriptive statistics for all scales, including the mean, standard deviation, and internal consistency (McDonald's Omega; see Hayes and Coutts 2020). We also calculated age and gender differences for all variables using the t-test. To do so, we divided the participants into two subgroups: younger adults (21-39 years) and older adults (40-57 years). To mitigate the risk of a Type I error inflated by multiple comparisons, we applied the Bonferroni correction (Miller, 1966).

In the fourth step, we calculated bivariate correlations to provide a complete pattern of associations between morningness-eveningness, mattering, anti-mattering, depressive, and anxiety symptoms. Subsequently, to investigate the interplay between morningness-eveningness, mattering, and anti-mattering in predicting depressive and anxiety symptoms, we conducted moderation analyses (with age and gender included in the models as covariates).

Finally, we used the Johnson-Neyman technique to provide a deeper insight into the observed interaction effects. This analysis can produce one of the three outcomes: 1) no values of the moderator for the effects of the focal predictor on the dependent variable that are non-significant/significant across all values of the moderator, 2) a single value of the moderator which marks the start/end of the region of significance of the focal predictor's effect on the

dependent variable, or 3) two values of the moderator that mark the start and the end of the region of significance (or the end and the start of the region of significance) (Hayes 2017).

All statistical analyses were conducted using RStudio software, IBM SPSS 27, and Hayes (2017) PROCESS software, except for the power analysis which was conducted using GPower software (Faul et al. 2009). All the figures were created using Python software.

Results

Preliminary analyses

Before the main analyses, we excluded all entries from participants who did not finish the survey or failed the attention check (e.g., “In this question select ‘I strongly disagree’.”) which resulted in removing thirty-three participants. Next, we screened the data for missing values and univariate outliers, and none were found.

Confirmatory factor analysis

AMS

Confirmatory Factorial Analysis of AMS indicated medium model fit: $\chi^2(5) = 80.33$, RMSEA = .15 (90% Confidence Interval = [.12 - .18]), CFI = .97, TLI = .94. However, the modification index showed highly correlated error covariances between items 4 and 5. When we added these covariances to the model, the model fit strongly improved with $\chi^2(4) = 17.26$, RMSEA = .07 (90% Confidence Interval = [.04 - .10]), CFI = 1.00, TLI = .99 (see Figure 1).

GMS

Confirmatory Factorial Analysis of GMS indicated medium model fit: $\chi^2(5) = 37.77$, RMSEA = .10 (90% Confidence Interval = [.07 - .13]), CFI = .98, TLI = .96. The modification index showed highly correlated error covariances between items 1 and 3. When we added these covariances to the model, the model fit strongly improved with $\chi^2(4) = 15.32$, RMSEA = .06 (90% Confidence Interval = [.03 - .10]), CFI = .99, TLI = .98 (see Figure 1).

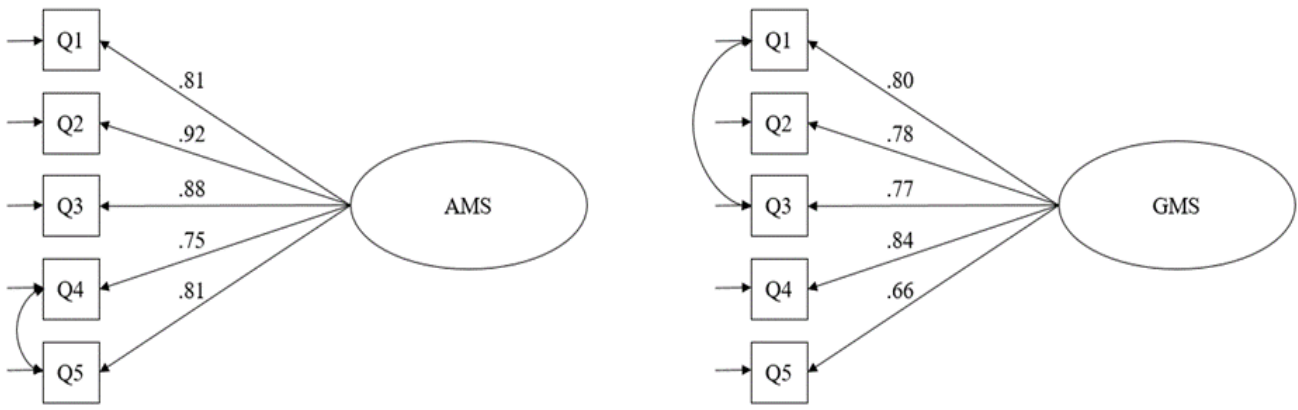


Figure 1. Confirmatory factorial analysis of anti-mattering scale (AMS) and general mattering scale (GMS).

Descriptive statistics

Means and standard deviations for all measures used in the study are shown in Table 2. Women scored significantly lower in morningness-eveningness ($t(690) = -3.03, p = .003, d = .23$), depressive symptoms ($t(690) = 3.29, p = .001, d = .25$), and anxiety symptoms ($t(690) = 3.42, p < .001, d = .26$) compared to men. There were no differences between genders in mattering and anti-mattering. Moreover, there were age differences in the studied variables. Younger adults (21-39 years) scored significantly lower in morningness-eveningness ($t(690) = -4.27, p < .001, d = .33$) and higher in depressive ($t(690) = 3.51, p < .001, d = .27$) and anxiety symptoms ($t(690) = 4.80, p < .001, d = .37$) than older adults (40-57 years).

Table 2.

Descriptive statistics (mean \pm standard error) for the variables in the study.

	21-39 years			40-57 years			Total			<i>p</i> -value (gender)	<i>p</i> -value (gender)	<i>p</i> -value (gender)	<i>p</i> -value (age)
	Women (<i>N</i> = 181)	Men (<i>N</i> = 176)	Total (<i>N</i> = 357)	Women (<i>N</i> = 156)	Men (<i>N</i> = 179)	Total (<i>N</i> = 335)	Women (<i>N</i> = 337)	Men (<i>N</i> = 355)	Total (<i>N</i> = 692)				
	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	M \pm SD	21-39 years	40-57 years	Total	Total
Morningness- eveningness	34.55 \pm 7.60	35.43 \pm 7.43	34.98 \pm 7.52	36.11 \pm 8.21	38.52 \pm 6.83	37.44 \pm 7.60	35.27 \pm 7.92	37.02 \pm 7.30	36.17 \pm 7.65	.270	.003	.003*	<.001*
Mattering	13.14 \pm 3.05	12.82 \pm 3.09	12.98 \pm 3.07	13.75 \pm 2.78	13.32 \pm 2.83	13.52 \pm 2.81	13.42 \pm 2.94	13.07 \pm 2.97	13.24 \pm 2.96	.325	.161	.118	.016
Anti-mattering	10.61 \pm 4.20	9.97 \pm 3.70	10.29 \pm 3.97	9.99 \pm 3.51	9.37 \pm 3.55	9.66 \pm 3.54	10.32 \pm 3.90	9.67 \pm 3.63	9.99 \pm 3.78	.127	.114	.023	.028
Depressive symptoms	17.57 \pm 5.82	16.18 \pm 5.17	16.88 \pm 5.55	16.08 \pm 4.98	14.88 \pm 5.46	15.44 \pm 5.27	16.88 \pm 5.49	15.52 \pm 5.35	16.18 \pm 5.46	.017	.037	.001*	<.001*
Anxiety Symptoms	14.14 \pm 5.11	12.78 \pm 4.95	13.47 \pm 5.07	12.24 \pm 4.94	11.15 \pm 4.69	11.66 \pm 4.83	13.26 \pm 5.11	11.96 \pm 4.88	12.59 \pm 5.03	.011*	.039	<.001*	<.001*

Note. * statistically significant differences after applying the Bonferroni correction.

The term “*p*-value (gender) 21-39 years” refers to the gender differences in the dependent variables within the age group of 21 to 39 years.

The term “*p*-value (gender) 40-57 years” refers to the gender differences in the dependent variables within the age group of 40 to 57 years.

The term “*p*-value (gender) Total” refers to the differences between genders in the dependent variables across the entire studied sample.

The term “*p*-values (age) Total” refers to the differences between the two age groups in the dependent variables across the entire studied sample.

Correlational Analyses

The matrix of bivariate correlations between the measured variables is provided in Table 3. Age was positively correlated with morningness and mattering while being negatively correlated with anti-mattering, depressive symptoms, and anxiety symptoms. Morningness was positively correlated with mattering and negatively correlated with anti-mattering, depressive, and anxiety symptoms. The link with anti-mattering was more robust than the link with mattering. Mattering was negatively associated with anti-mattering, depressive, and anxiety symptoms. Moreover, anti-mattering was positively correlated with depressive and anxiety symptoms; these associations were quite robust. Finally, depressive symptoms were positively associated with anxiety symptoms.

Table 3.

Macdonald's Omega and correlations between variables included in the present study ($N = 692$).

	ω	1.	2.	3.	4.	5.	6.
1. Age	-	-					
2. Morningness-Eveningness	.90	.22**	-				
3. Mattering	.88	.08*	.15**	-			
4. Anti-mattering	.92	-.10*	-.28**	-.53**	-		
5. Depressive symptoms	.89	-.19**	-.40**	-.40**	.64**	-	
6. Anxiety symptoms	.94	-.21**	-.33**	-.35**	.62**	.80**	-

Note. * $p < .05$, ** $p < .001$

Moderation analyses

To test whether the magnitude of the associations between morningness-eveningness and mental health (i.e. depressive and anxiety symptoms) changes depending on the level of mattering and anti-mattering, we conducted a series of four moderation analyses. In each of the models, morningness-eveningness was the focal predictor, mattering or anti-mattering was the moderator, and depressive symptoms or anxiety symptoms were the dependent variable.

Mattering and depressive symptoms

The interaction between morningness-eveningness and mattering was significant indicating that with higher mattering, the relationship between eveningness and depressive symptoms was weaker. This model explained around 30% of the variance in depressive symptoms.

The floodlight technique revealed a single Johnson-Neyman point (the threshold for significance of the effect of focal predictor, i.e., morningness-eveningness, on the outcome variable, i.e., depressive symptoms) located at the value of 19.60 (6.36 after centering) in mattering. It means that from low values of mattering up to this point, the association between eveningness and depressive symptoms was significant, whereas above this point eveningness was not a significant predictor of depressive symptoms. In the current sample, this association was significant in 97% of the participants. The interaction is presented in Figure 2, panel A, whereas the Johnson-Neyman regions illustrate the threshold of significance for the simple effects of morningness-eveningness on depressive symptoms for different levels of the mattering is provided in Figure 2, panel B.

Mattering and anxiety symptoms

The interaction between morningness-eveningness and mattering significantly indicated that the relationship between eveningness and anxiety symptoms was weaker with higher mattering. This model explained around 24% of the variance in anxiety symptoms.

The floodlight technique again revealed a single Johnson-Neyman point located at the value of 17.78 (4.54 after centering) in mattering. It means that from low values of mattering up to this point, the association between eveningness and anxiety symptoms was significant, whereas above this point eveningness was not a significant predictor of anxiety symptoms. In the current sample, this association was significant in 95% of the participants. The interaction is presented in Figure 2, panel C, whereas the Johnson-Neyman regions illustrating the threshold of significance for the simple effects of morningness-eveningness on depressive symptoms for different levels of the mattering is provided in Figure 2, panel D.

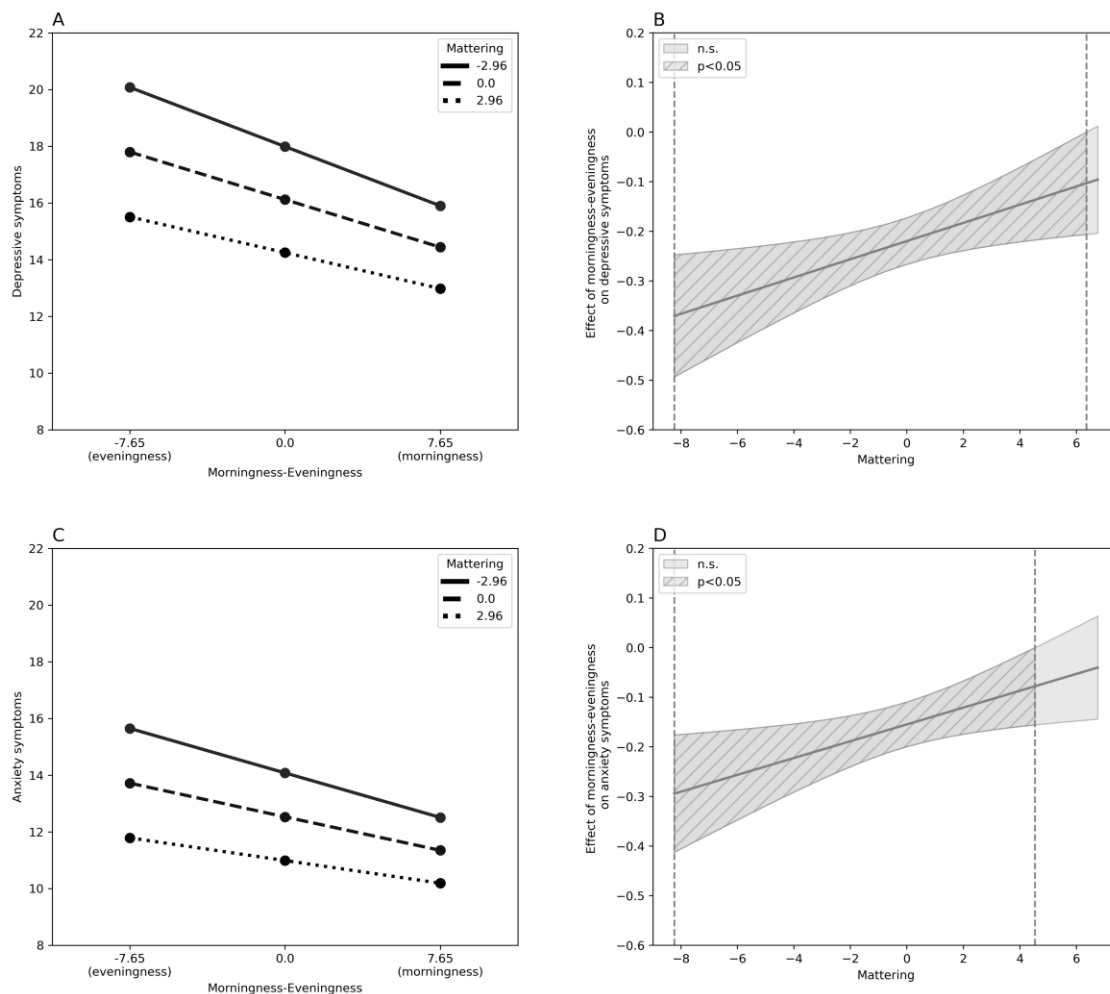


Figure 2. The interaction between morningness-eveningness and mattering in predicting the presence of depressive symptoms (panel A) and anxiety symptoms (panel C), and Johnson-Neyman regions representing the threshold for significance of the effect of the focal predictor

(morningness-eveningness) on the outcome variable (depressive symptoms in panel B and anxiety symptoms in panel D) for different levels of a moderator (mattering).

Anti-mattering and depressive symptoms

The interaction between morningness-eveningness and anti-mattering was significant indicating that with higher anti-mattering, the relationship between eveningness and depressive symptoms was greater. This model explained around 48% of the variance in depressive symptoms.

The floodlight technique showed no Johnson-Neyman values, meaning that at all levels of anti-mattering, the relationship between eveningness and anxiety symptoms was statistically significant. The interaction is presented in Figure 3, panel A, whereas the Johnson-Neyman regions for the simple effects of morningness-eveningness on depressive symptoms for different levels of the anti-mattering is provided in Figure 3, panel B.

Anti-mattering and anxiety symptoms

The interaction between morningness-eveningness and anti-mattering was significant indicating that with higher anti-mattering, the relationship between eveningness and anxiety symptoms was stronger. This model explained around 43% of the variance in anxiety symptoms.

The floodlight technique revealed a single Johnson-Neyman point located at the value of 6.08 (-3.91 after centering) in anti-mattering. It means that from low values of anti-mattering up to this point, the association between eveningness and anxiety symptoms was non-significant, whereas above this point eveningness was a significant predictor of anxiety symptoms. In the current sample, this association was significant in 78% of the participants. The interaction is presented in Figure 3, panel C, whereas the Johnson-Neyman regions illustrate the threshold of significance for the simple effects of morningness-eveningness on anxiety symptoms for different levels of the anti-mattering is provided in Figure 3, panel D.

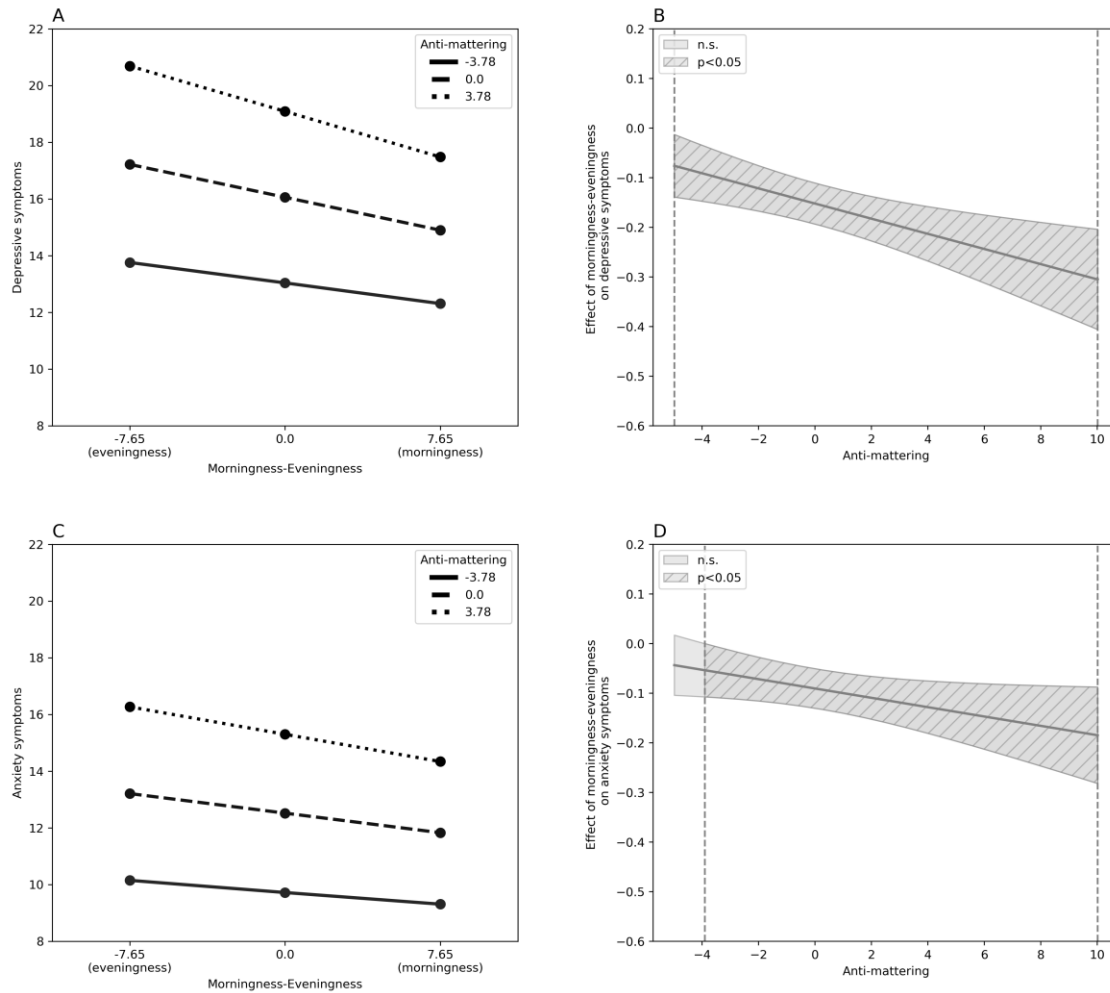


Figure 3. The interaction between morningness-eveningness and anti-mattering in predicting the presence of depressive symptoms (panel A) and anxiety symptoms (panel C), and Johnson-Neyman regions representing the threshold for significance of the effect of the focal predictor (morningness-eveningness) on the outcome variable (depressive symptoms in panel B and anxiety symptoms in panel D) for different levels of a moderator (anti-mattering).

Discussion

The present study had two primary goals. The first goal was to uniquely evaluate the hypothesis that individual differences in levels of morningness-eveningness are related to feelings of mattering versus not mattering. The related second goal was to test the hypothesis that levels of mattering and anti-mattering moderate the morningness-eveningness's effect on

depressive and anxiety symptoms. In addition, our psychometric goal was to adapt the measures of mattering and anti-mattering to Polish and test their factorial structure.

Confirmatory factor analysis without any modifications indicated medium model fit; however, when we allowed for covariance between two errors from the AMS scale (namely, items 4 "How much do you feel like you never matter to certain people?" and 5 "How often have you been made to feel by someone that they don't care what you think or what you have to say?"), and covariance between two errors from the GMS scale (namely, items 1 "How important are you to others?" and 3 "How much would you be missed if you went away?"), model fit improved. Based on the values of chi-square statistics, TLI, CFI, RMSEA, and conventional criteria for assessing model fit (see Marsh et al. 2004), the final model shows an adequate fit to the data. Furthermore, each scale showed good internal consistency, providing further evidence for the reliability of the measure. Both the indicators of model fit and reliability in the present study were of similar magnitude to those reported in other adaptations of AMS and GMS (e.g., Flett et al. 2022; Liu et al. 2023).

Regarding the first aim of the study, we have found that, at the level of correlations, eveningness was indeed related negatively to mattering, and positively to anti-mattering, and depressive and anxiety symptoms. The unique finding that anti-mattering is associated with eveningness is intriguing in several reasons, with the caveat that this finding needs to be replicated in future research. The association between eveningness and increased feelings of anti-mattering suggests that evening individuals may struggle more with feelings of insignificance or lack of value in terms of how they perceive they are regarded by other people. This has implications for understanding their mental health problems, particularly regarding anxiety and depression symptoms. Furthermore, our correlational results indicated the presence of exceptionally strong links between anti-mattering and levels of depression and anxiety

(respective r 's of .64 and .62). These associations were detected in a large sample of Polish adults, including a group of people who are midlife with ages ranging from 40 to 57 years. These results suggest that the need to matter to others and be connected is going unmet for many adults and considerable distress is linked with a history of adverse interpersonal exchanges that can leave people feeling irrelevant, invisible, and insignificant, which are closely linked to depression. Moreover, feeling insignificant or unvalued can lead to negative self-perception and low self-esteem, as well as increased anxiety about self-worth and one's place in the world. These feelings may contribute to insecurity and unease, which are key factors in the development of both depression and anxiety. We suppose that addressing anti-mattering may provide valuable insights into developing strategies of mental health interventions for reducing anxiety and depression as well as promoting well-being.

Regarding the second aim of the study, moderated regression analyses showed that the relationship between eveningness and the presence of depressive and anxiety symptoms decreased with higher mattering and increased with higher anti-mattering. It is worth noting that the model incorporating anti-mattering as a moderator explained a particularly high rate of variance in symptoms of depression (48%) and anxiety (43%). This adds to the line of research where the relationship between eveningness and mental health is shown to be dependent not only on biological factors (Jones et al. 2019) - social (Wittmann et al. 2006) and psychological factors (Gorgol et al. 2022a) can also play an important role in this relationship. In the current study, while mattering acts as a protective factor against depressive and anxiety symptoms, it seems that anti-mattering typically acts as a risk factor that increases these symptoms. This pattern was evident in the current findings. Anti-mattering is associated with the feeling of not mattering to other people (Flett et al. 2022). Its high level may be associated with low well-being, low self-esteem, and depression (Flett et al. 2022), and also the distress that people experience in the times we live in today (Giangrasso et al. 2022). Feeling valued by other

people is an element of fundamental psychological needs, thus a high level of mattering and a low level of anti-mattering seems to be crucial for protecting evening-oriented individuals from depressive and anxiety symptoms and enhance their mental health.

This result adds to our understanding of the emotional experiences of evening types and raises the question of whether feelings of insignificance may exacerbate mood disorders associated with eveningness. These findings suggest that, for many people, unmet interpersonal needs and feelings of insignificance could be consequences of eveningness, given that circadian preferences are, to some extent, biologically determined (see Adan et al., 2012), while social rhythms favor morning activity (Wittmann et al. 2006). The mismatch between social expectations and the biological clock might lead to feelings of marginalization and social disconnection, as well as negative social and self-perceptions (Stolarski & Gorgol, 2022; Gorgol et al., 2024) and feelings of anti-mattering. This dynamic may not only lead to intrusive thoughts and rumination at night (Carcioffo, 2020; Flett, Burdo, & Nepon, 2021) but also contribute to poor morning affect, commonly associated with eveningness (Zreik et al., 2022), as well as elevated levels of interpersonal stress (Díaz-Morales & Sánchez-Lopez, 2008), which further disrupt sleep. Thus, this finding highlights the interplay between social structures, individual behavior, and psychological well-being.

.It is important to note that obtained significant interaction effects do not allow determining which of its components acts as a moderator - in a cross-sectional study design, a distinction between a focal predictor and a moderator is made arbitrarily (see Hayes 2017). In the present study, the obtained effect could also be understood conversely - that mattering and anti-mattering are particularly significant for mental health symptoms among evening-oriented individuals. Yet, even in this case, the inverted interpretation of the moderation effects seems to lead to a similar conclusion: feeling more matter and lower anti-matter to other people is

particularly important for evening-oriented individuals. Thus, mattering, when high enough, may protect evening-oriented individuals from depressive and anxiety symptoms. Also, lower anti-mattering may be conducive to lower depressive and anxiety symptoms.

Several possible implications follow from these results. First, it is important to consider the tendency of evening types to experience anti-mattering when evaluating their mental health and well-being. Second, recognizing the role of anti-mattering in mental health could lead to the development of psychological interventions aimed at increasing the sense of significance among evening individuals. These programs may focus on building self-esteem and personal value as well as help alleviate depression and anxiety symptoms. Furthermore, increasing social support and raising societal awareness about the diverse chronotypes may help reduce feelings of isolation and marginalization, and help reduce the stigma associated with evening preferences.

While it was not our main focus, given that research on anti-mattering is still in its early stages, it is worth noting that there were sex and age differences in levels of anti-mattering. Levels of anti-mattering were significantly higher among women and younger participants. Further research is needed to test the generalizability of these findings. This work is potentially quite important given the need to gain better insights into the nature of individual differences in levels of not mattering as experienced by people of varying ages.

Limitations

Some limitations need to be mentioned. First, the assessment of all studied variables was based solely on self-report information and thus potentially subject to a range of biases. Second, the study was cross-sectional. It does not allow us to determine the direction of causality of the studied effects. Future longitudinal studies could provide a stronger test of our hypotheses and confirm the stability of the obtained effects. Third, we measured morningness-eveningness

using the CSM which, despite its strengths, has some drawbacks (see Randler et al. 2016). Future studies should replicate the present study using other scales, such as the more commonly used MEQ (Horne & Östberg 1976), or more sophisticated, multidimensional scales such as the Morningness-Eveningness-Stability Scale improved (MESSi; Randler et al. 2016). Finally, as the study was conducted in January 2023 in Poland, also factors such as time of the year (see Gorgol et al. 2022d) and the political situation (i.e. war in Ukraine) may have affected the results and could be explored in future research.

Conclusion

In summary, the current research established that feelings of not mattering are associated significantly with eveningness, and mattering and anti-mattering moderate the link between eveningness and depressive and anxiety symptoms. A high level of mattering seems to be a key part of perceived social worth that helps protect against depressive and anxiety symptoms, while a high level of anti-mattering may increase these symptoms, especially among evening-oriented individuals. Increasing the feeling of being valued by others may be very important for evening-oriented individuals with unmet socio-emotional needs who tend to report low mattering and high anti-mattering. We propose that developing a specific intervention or training focusing on increasing feelings of being important to others among evening-oriented individuals may protect them from the development of affective disorders. In this regard, feelings of mattering can be derived from engaging in prosocial activities throughout the day and night that add value to other people (see Prilleltensky 2020) and this can enhance feelings of mastery and efficacy that can buffer distress and loneliness.

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