

Chronotype and Life Satisfaction: The Role of Sex and Age

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Хронотип и удовлетворенность жизнью: возрастные и половые различия

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Abstract. Chronotype represents the preference for evening or morning hours for mental and physical performance and viewed as a stable human behavioral trait and personality feature. Chronotype relates to many biological, social, and psychological aspects. Depression, anxiety, and health problems are associated with eveningness in the clinical and non-clinical populations. At the same time, morningness demonstrates a positive relationship with well-being. Many studies show that age and sex is a significant predictor of time-of-day preference. This

study is attempted to investigate the association between life-satisfaction and morningness-eveningness and explore age and sex differences. Two hundred thirty-eight persons participated in this study; age distribution was: 17–28 years. The reduced Morningness–Eveningness Questionnaire was used to measure chronotype preferences, and Social frustration and life satisfaction scale were used to assess the subjective level of life satisfaction. Age differences were found for chronotype demonstrating the tendency to eveningness for young adults (23–28 age) than for students (18–22 age), but no sex differences in morningness-eveningness were found. Eveningness negatively correlates with all life-satisfaction dimensions, but this association differs depending on sex and age. In general, the morningness-eveningness preferences seem to be dependent on age more than sex, but the life satisfaction influenced by both factors. We may report the existence of association between eveningness and life satisfaction, which is much more reliable for men and younger persons.

Keywords: *chronotype; morningness; eveningness; life-satisfaction; age; sex*

Аннотация. Хронотип рассматривается как стабильная поведенческая и личностная черта, которая характеризуется предпочтением вечерних или утренних часов для умственной и физической работы. Хронотипические предпочтения рассматриваются в связи с различными биологическими, социальными и психологическими характеристиками. Исследования на клинических и неклинических выборках показали, что тревожность, депрессивность и проблемы со здоровьем больше связаны с вечерним хронотипом. В то же время утренний хронотип обнаруживает положительную связь с благополучием. Было установлено, что возраст и пол являются важными предикторами предпочтения времени суток для активности. Данное исследование направлено на изучение связи между удовлетворенностью жизнью и утренним или вечерним хронотипом в зависимости от возрастных и половых различий. В исследовании приняли участие 238 человек в возрасте от 17 до 28 лет. Для измерения хронотипических предпочтений использовался краткий опросник для определения утреннего — вечернего хронотипа, а для оценки субъективного уровня удовлетворенности жизнью применялась шкала социальной фрустрации и удовлетворенности жизнью. Большая склонность к вечернему хронотипу была обнаружена у респондентов в возрасте 23–28 лет, чем у студентов в возрасте (18–22 лет), что может быть связано с внешним распорядком жизни студентов (академический год, расписание и др.). Не было обнаружено половых различий в отношении предпочтений утреннего или вечернего хронотипа. Вечерний хронотип отрицательно коррелирует со всеми аспектами удовлетворенности жизнью, но эта связь различается в зависимости от пола и возраста. В целом хронотипические предпочтения больше связаны с возрастными факторами, чем с полом, но на удовлетворенность жизнью влияют оба фактора. Можно утверждать, что для мужчин и молодых людей в большей степени характерны связи между вечерним хронотипом и удовлетворенностью жизнью.

Ключевые слова: *хронотип; утренний хронотип; вечерний хронотип; удовлетворенность жизнью; возраст; пол*

Introduction

Chronotype

Through the last decades, the research about Chronotype or morningness-eveningness preferences has been significantly risen. Chronotype describes the timing of sleeping and the preference for evening or morning hours for mental and physical performance. Morning or evening preference has proven to be a stable human behavioral trait with a measurable and predictable impact in different physiological systems (Adan et al., 2012). It is viewed as an interesting aspect of personality, and the psychometric measurements have been well-established and validated (Randler, Baumann, & Horzum, 2014; Tonetti, Adan, Di Milia, Randler, & Natale, 2015).

Morning oriented persons or “Larks” prefer to get up early and go to bed early; they reach their maximum in cognitive performance and well-being during the morning. Whereas opposed to them evening oriented persons, “Owls” get up late, prefer later bedtimes and rise times, and perform better in the afternoon or evening hours. There is the third type of chronotype — neither-type placed in intermediate position and represents the majority of the population (Adan et al., 2012; Díaz-Morales, 2007). Self-reported measures usually assess morningness-eveningness (e.g., Di Milia, Adan, Natale, & Randler, 2013; Tonetti et al., 2015). One of the most popular scales is the scale for self-assessment of morningness-eveningness (Horne & Östberg, 1977).

Many biological markers, such as the sleep-wake cycle, body temperature, and the hormones melatonin and cortisol, are associated with circadian rhythmicity. As an example, greater morningness is associated with an increased cortisol level upon awakening and a higher overall cortisol output; however, it was not associated with the cortisol awakening response (Petrowski, Schmalbach, & Stalder, 2020). It should be mentioned that the connections between chronotype and biological markers are more complex conjointly with age (Adan et al., 2012; Meliska et al., 2011; Randler & Schaal, 2010). The influence of longitude and latitude of residence is also a relevant factor in chronotype as well as the levels of light exposure during the day- or nighttime (Randler, 2008b).

Chronotype relates to many psychological aspects, e.g., personality traits, as well as psychopathology. Negative associations have been found between morningness and neuroticism and psychoticism with the Eysenck personality model (Adan et al., 2012). The morningness-eveningness features are related to personality characteristics, especially to novelty seeking, and persistence in Cloninger’s biological model. Studies with the Zuckerman sensation seeking scale in adults have revealed the association between eveningness and sensation seeking, and the tendency to participate in disinhibited activities (Antúnez, Navarro, & Adan, 2014). Concerning the Big-five model, there are some studies showing that morning-oriented people are more conscientious and less extravert (Tavernier, Hill, & Adrien, 2019).

Chronotype and Life Satisfaction

People's health and well-being may be determined by the interaction of endogenous and external factors, and chronotype may be considered in this line as an important feature. An extensive amount of research on sleep in relation to negative psychological functioning showed that poor sleep quality and short sleep duration turns to lower general life satisfaction (Tavernier et al., 2019). On the other hand, the facts suggests that positive affect (a part of well-being) is an important factor of affecting individuals' overall sleep. Positive affect regulation-dysregulation relates to good sleep patterns or sleep disturbances (Gariépy, Doré, Whitehead, & Elgar, 2019). Nurturing basic psychological needs help to improve sleep quality characteristics among students (Tavernier et al., 2019).

Different health problems were more common among adolescents with a later chronotype, irrespective of their sleep duration and lifestyle factors as well as depressive tendencies, bulimic behaviors, and higher morbidity (Urban, 2010). It is well-known that evening types consume more stimulants, are more often habitual smokers, and their mealtimes are more irregular (Kim S. J. et al., 2010). Turning to prior studies, one may find that depression was associated with eveningness in the clinical and non-clinical population, which has also been reported (Ong, Kim, Young, & Steptoe, 2017; Putilov, 2018; Yeo et al., 2019). Besides, the relation between eveningness and anxiety has found higher anxiety scores in evening types compared to morning types, but it is more significant for women (Díaz-Morales & Sánchez-López, 2008). The studies mentioned above, one would expect a positive relationship between satisfaction with life and morningness. The relationship between morningness-eveningness and life satisfaction seems to be independent of geographical location and cultural differences (Jankowski, 2012).

Chronotype and Age, and Sex Differences

The association between morningness-eveningness and age has been well established (Adan et al., 2012). During adolescence, the morningness preference shifts to an evening preference, but from the beginning of adulthood, morningness preference gradually returns. It explains the result of physical changes and changes in the social demands in adolescence (Adan et al., 2012; Randler, 2008b). Many studies show that age is a significant predictor of time-of-day preference (Cavallera & Giudici, 2008); however, conscientiousness is a significant mediator between them (Walker, Kribs, Christopher, Shewach, & Wieth, 2014).

The role of age as a moderator of the connection between chronotype and depression was uncovered in a few studies. So, the relationship of depressive symptoms with eveningness revealed for younger and older people than for the middle age group (Ong et al., 2017). The same underlying mechanism as the circadian instability may be the reason for eveningness-associated depression of younger or older age. However, the social demands are stricter for middle-age people forcing them to regulate sleep-wake time accurately.

Concerning sex differences, many studies report that larger proportion of evening chronotype is found among males, while morning chronotype is more commonly observed among females (Adan & Natale, 2002; Randler, 2011). The difference in favor

of morning chronotype in adult women is in accordance with the fact that the circamensual rhythmicity is associated with the menstrual cycle in women (Adan & Natale, 2002). Otherwise, there are some studies which showed that boys and men sleep shorter than girls and women, and further, sleep timing is shorter in women, and thus, men have earlier chronotypes. It is quite evidently to suggest that chronotype is influenced by individual factors, such as age and sex (Adan et al., 2012).

Taking into account available studies about chronotype and lifestyle, personality traits, sleep patterns, and school schedule, we aimed to investigate the association between life-satisfaction and morningness-eveningness in subjects with a broader age range and to explore the sex differences.

We primarily hypothesized that life satisfaction would correlate with morningness-eveningness and that the association between life satisfaction and morningness-eveningness would be more prominent in specific age groups, especially in younger age groups in whom that association has already been reported. Our study hypotheses were based not on any specific theoretical model, but on the results of previous studies on depression and morningness-eveningness.

Methods and Equipment

Participants

Two hundred thirty-eight persons participated in this study (30 % of men). Age distribution was: 17–28 years; the mean age was 19.68 years. Subjects were not paid for participating in the study, and they all gave their informed consent prior to their inclusion in the study. All participants were tested in groups. Subjects completed questionnaires on circadian typology (rMEQ), Social frustration level questionnaire, and completed a self-report questionnaire with information on sociodemographic variables.

Methods

Morningness–eveningness. The circadian typology was assessed using the reduced Morningness–Eveningness Questionnaire (rMEQ) (Horne & Östberg, 1977). We used a shortened 5-item version of the scale to assess the individual differences. The highest score corresponds with Eveningness Chronotype as the lowest score with Morningness chronotype. The rMEQ internal reliability for the present sample was adequate ($\alpha = .78$). The higher scores in the questionnaire show the tendency to Eveningness and lower to Morningness.

Life satisfaction. Different life satisfaction domains were evaluated by the questionnaire Social Frustration and Life Satisfaction Scale which contains 20 items, 4 for each of the five dimensions considered (Vasserman, Iovlev, & Berebin, 2004). These dimensions are the satisfaction with relations with family and relatives, social relationships, social status,

socioeconomic level, and satisfaction with health and work capacity. Students rated each item on a 5-point Likert scale (1 — never; 5 — always).

The internal reliability (Cronbach's) of dimensions were adequate for the present sample, from .76 to .81.

Procedure and data analysis. The total sample was divided into two groups: undergraduate students ($N = 201$; from 18 till 22 ages; $M = 19.86$, $SD = 1.23$) and young adults ($N = 50$; from 23 till 28 ages; $M = 26$, $SD = 1.95$). Because of the inequivalence of respondents in groups, the tests for normality and equivalence of variance were made. *U*-Mann–Whitney test was used to compare age and sex groups. Correlation analysis was made for preliminary results about the association between Chronotype and Life-Satisfaction scales. Correlation analysis and *U*-Mann–Whitney test was used for data analysis.

Results

Age and Sex Differences

Age differences revealed for Chronotype measure showing the tendency to Eveningness for young adults more than for students (*Table 1*). Life-satisfaction measures significantly differ between age groups. Young adults have lower satisfaction except for satisfaction with socio-economic level.

Table 1

Means, standard deviations and *U*-test statistics for the chronotype and life-satisfaction variables in two age groups

Variables	Undergraduated students		Young adults		<i>U</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Chronotype	2.43	.51	2.8	.55	3005.5***
Satisfaction with relations with family and relatives	2.49	1.06	1.98	.99	3513.5***
Satisfaction with social relations	2.5	1.09	2.04	1.01	3595.5***
Satisfaction with social status	2.68	1.00	2.28	1.05	3686***
Satisfaction with socio-economic level	2.7	.92	2.49	.99	4304
Satisfaction with health and work capacity	2.73	1.04	2.17	1.05	3379.5***
Cumulative satisfaction score	2.62	.86	2.19	.88	3343.5***

Note. *** $p < .001$; ** $p < .01$; * $p < .001$.

There is no significant difference between men and women in time of day preferences (Table 2). Otherwise, for the life-satisfaction features, the significant differences were proved except satisfaction of relations with family and relatives.

Table 2

Means, standard deviations and *U*-test statistics for the chronotype and life-satisfaction variables for men and women

Variables	Men		Women		<i>U</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Chronotype	2.59	.61	2.47	.5	5776.5
Satisfaction with relations with family and relatives	2.19	.92	2.48	1.11	5728.5
Satisfaction with social relations	2.15	1.01	2.51	1.11	5310.5**
Satisfaction with social status	2.28	1.03	2.73	.99	4814.5***
Satisfaction with socio-economic level	2.47	.9	2.74	.95	5444.5*
Satisfaction with health and work capacity	2.41	1.13	2.7	1.02	5406.5*
Cumulative satisfaction score	2.3	.87	2.63	.86	4972**

Note. *** $p < .001$; ** $p < .01$; * $p < .001$.

Next, we perform the ANOVA to find interaction between age and sex factors.

Significant effect of age ($F = (1.25) 19.43, p < .001$) and interaction of sex and age factors ($F = (1.25) 3.85, p < .05$) on Chronotype was found.

Association between Chronotype and Life-Satisfaction

On the level of zero-order correlations were found significant associations of Chronotype with all life-satisfaction dimensions in the whole sample (Table 3). All correlations reflect the negative relationship between Chronotype and satisfaction in any life domains.

Table 3

Spearman correlations for the chronotype and life-satisfaction variables (r_s)

Variables	All sample	Undergraduated students	Young adults	Men	Women
	chronotype				
Satisfaction with relations with family and relatives	-.220**	-.162*	-.202	-.323**	-.173*
Satisfaction with social relations	-.169**	-.124	-.132	-.328**	-.091

End of Table 3

Variables	All sample	Undergraduated students	Young adults	Men	Women
	chronotype				
Satisfaction with social status	-.177**	-.130	-.176	-.326**	-.088
Satisfaction with socio-economic level	-.189**	-.141*	-.288*	-.316**	-.105
Satisfaction with health and work capacity	-.336**	-.265**	-.366**	-.432**	-.281**
Cumulative satisfaction score	-.271**	-.200**	-.256	-.430**	-.186*

Note. *** $p < .001$; ** $p < .01$; * $p < .001$.

Though for the two age groups, correlations are the same except the association between Chronotype and Satisfaction of relations with family and relatives in undergraduate students' sample.

For the men sample Chronotype significantly is associated with all life-satisfaction aspects. However, for the women sample Chronotype correlates with the satisfaction with relations with family and relatives, satisfaction with health and work capacity, and cumulative satisfaction score.

Discussion

Our study hypotheses were based not on any specific theoretical model, but on the results of previous studies on morningness-eveningness and life-satisfaction.

Younger adults showed the tendency to evening type in comparison with undergraduate students. This fact contradicts to the previous findings that growing up leads to morningness (Adan et al., 2012; Randler, 2008b). Our findings can be explained from the point of view that for undergraduate students' everyday life is more external regulated — academic year, and timetables, and this coincides with the previous works (Ong et al., 2017; Zimmermann, 2011). In contrast, young adults may have more flexible schedules, and without extremal control or regulation, they became more evening type. We may propose that this age group is more stressed because of the transition to self-sufficient life, and this stress provoke the change in time preferences.

Chronotype has no differences regardless of sex in our study, which contradicts to other works, but the question about sex differences in chronotype remains debatable (Adan & Natale, 2002). Among the student age, women are more evening-oriented, but in the next age period, men are more evening-persons. These facts are partially related to studies of sleeping time (Borisenkov, Kosova, & Kasyanova, 2012; Tonetti, Fabbri, & Natale, 2008).

Life satisfaction seems to be determined by different factors, like sex and age. Men are less satisfied with any aspects of life from social relations to economic conditions, but concerning family life, they are satisfied like women. It corresponds with previous studies that postulate that under 45 years of age women tend to be happier than men (Inglehart, 2002).

Next, the question emerges, are the characteristics of eveningness reduce to satisfaction with life? Randler's results (2008a) indicate that individuals skewed towards morningness report higher overall satisfaction with life. At the same time, evening types experience affective disturbances because their endogenous sleep-wake cycle does not fit into current social and working schedules (Wittmann, Dinich, Merrow, & Roenneberg, 2006). As a result, they were less satisfied with lives, and we may confirm that also affective disorders and depression correlated with eveningness, and our data support these statements. This study revealed that, regardless of age and sex, chronotype was linearly related to greater life satisfaction. Setting out in detail, eveningness for women is less related to different aspects of life-satisfaction while men are related with all life-satisfaction features. Besides, for young adults, eveningness is not relate with the satisfaction with family relations. In general, for social relations as well as for the health and economic capacity, morning persons are more satisfied. So, these facts are marked in the previous studies that health problems are mostly related to evening chronotype (Kim S.J. et al., 2010; Urban, 2010).

Conclusion

In summary, the morningness-eveningness and seems to be dependent on age more than sex, but the life satisfaction is influenced by the both factors. We may report an association between eveningness and life satisfaction, which was much more reliable for men and younger persons.

Limitations of the present study may include a relatively small sample size for dividing group by age. Future studies will be needed to verify the psychological mechanism by which age and sex moderate the relationship between life-satisfaction and eveningness.

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