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Can chronotype and social jet lag predict burnout among physical therapists?

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ABSTRACT

Burnout syndrome can be described as a set of psychological and somatic responses to chronic stress related to professional work. The aim of this study was to verify whether chronotype and social jetlag (SJL) are predictors of burnout symptoms among physical therapists. The studied sample consisted of 61 physical therapists. Variables of interest included raw scores of the following tools: the Link Burnout Questionnaire (LBQ), Chronotype Questionnaire (CQ), Pittsburgh Sleep Quality Index (PSQI) and an authored questionnaire regarding sociodemographics and information required to calculate SJL. Linear regression models were constructed to predict LBQ dimension scores. An increase in the Psychophysical Exhaustion score was associated with a decrease in CQ Morningness-Eveningness (ME) score, an increase in CQ Distinctness of the Rhythm (DI) score and a decrease in SJL. Also, the Psychophysical Exhaustion score was higher for subjects reporting fairly poor quality sleep (PSQI) than for rating it as very good. An interaction was identified between SJL and ME. An increase in Sense of Professional Ineffectiveness was predicted by a decreased SJL score, and increased Disillusionment was associated with higher DI score. Both chronotype and SJL may prove useful predictors of certain aspects of burnout among physical therapists, but they should be considered together.

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KEYWORDS

Eveningness; amplitude of the rhythm; psychophysical exhaustion; disillusionment

Introduction

Burnout syndrome can be described as a set of psychological and somatic responses to chronic stress, related to professional work (Bridgeman et al. 2018). It manifests most commonly in jobs requiring regular interaction with people seeking help, i.e. healthcare workers, including physicians, nurses or physical therapists (González-Sánchez et al. 2017; Pradas-Hernández et al. 2018; Rotenstein et al. 2018). Data from systematic reviews and meta-analyses suggest that burnout may concern up to 80% of healthcare professionals, depending on the type of

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job, workload, relationships with co-workers, sex (women appear to be more susceptible) and perceived stress (Adriaenssens et al. 2015; Kumar 2016; Rabatin et al. 2016).

Several psychometric models describing dimensional structure of burnout were devised. According to Maslach et al., the structure consists of emotional exhaustion, depersonalization and reduced personal accomplishment (Maslach et al. 1997). However, Santinello et al. identify four factors: psychophysical exhaustion, relationship deterioration, sense of professional ineffectiveness and disillusionment (Jaworowska 2014).

Since burnout is a relatively new psychological construct, its clinical and nosological significance remains to be determined. The symptoms of burnout resemble those occurring in depression, which suggests the existence of an association between burnout and mood disorders (Bianchi et al. 2015). It is already known that burnout may hamper well-being, and thus directly impact the quality of care over the patient and increase the risk of adverse events (Rabatin et al. 2016; Salyers et al. 2017). Burnout has been linked to factors associated with both the work environment and personal disposition. For example, high emotional intelligence, high agreeableness and low neuroticism were found to play a protective role (Rabatin et al. 2016; van der Wal et al. 2016; Lindeman et al. 2017), while risky alcohol consumption, insomnia, alexithymia or poor general mental health are believed to be associated with a high risk of burnout (Pedersen et al. 2016; Hyman et al. 2017; Metlaine et al. 2017). More precise identification of risk factors, or predictors, of burnout symptoms may facilitate more effective prophylaxis, early diagnosis and improved therapeutic intervention.

Chronotype, from the point of view of differential psychology, can be defined as a personal preference of optimal time of day for functioning (Taylor and Hasler 2018). It is considered a temperamental feature (i.e. biologically determined) and associated with diurnal levels of activity, mood and cognitive capacity (Jeong et al. 2015; Valdez 2018; Sławińska et al. 2019). Although classical perspectives regard chronotype as comprising only a single factor, i.e. Morningness-Eveningness (ME), more recent theories indicate that it may possess a multidimensional psychometric structure: for example, Oginska has proposed Distinctness of the Rhythm (DI), being the subjective amplitude of the rhythm, as a second component. DI was defined as an awareness of one's psychophysiological state throughout the day (Oginska et al. 2017).

Eveningness, or late chronotype, has been already recognized as a risk factor of depression, as it may predispose to social jetlag, i.e. misalignment between one's biological rhythm and a generally morning-oriented social rhythm (Au and Reece 2017; Bos and Macedo 2018). It has also been associated with significant burnout and poor well-being in young adults (Gulec et al. 2013; Merikanto et al. 2016). It has been found that late chronotype can predict high psychophysical exhaustion, high relationship deterioration and an increased sense of professional ineffectiveness among physicians and nurses (Mokros et al. 2018). Interestingly, this evening type may not only hamper mental status, but also increase the incidence of comorbid somatic diseases (Sahbaz et al. 2018).

Less is known about the practical meaning of the distinctness of the rhythm, although it has been found to be positively correlated with depressive symptoms, neuroticism and psychophysical exhaustion as a burnout symptom (Oginska and Oginska-Bruchal 2014; Nowakowska-Domagala et al. 2016; Mokros et al. 2017, 2018).

Social jetlag (SJL), a term closely related to the chronotype concept, is calculated as the mathematical difference between typical mid-sleep hour on work days, being a correlate

of the social rhythm, and on free days, being a correlate of the biological rhythm. Increased SJL values indicate greater dysregulation in circadian rhythm (Roenneberg et al. 2004). SJL has been repeatedly linked to greater alcohol and coffee consumption, tobacco smoking and excessive calorie intake (Wittmann et al. 2006; Koopman et al. 2017; Borisenkov et al. 2018); however, there is little evidence of any potential link between social jetlag and burnout syndrome. Cheng and Hang found high SJL to be associated with a higher degree of burnout among nurses working night shifts (Cheng and Hang 2018), and Yong et al. report that increased SJL may be associated with lower Work Ability Index values (Yong et al. 2016). However, Lehto et al. found no association between SJL and burnout among secondary school students (Lehto et al. 2019).

The aim of this study is to verify whether chronotype and social jetlag are predictors of burnout symptoms among physical therapists, and to identify the link to sleep quality and use of alcohol, tobacco, coffee and energetic drinks.

The following hypotheses considering the studied group were devised on the basis of previous literature. Due to limited source materials on the subject, the hypotheses refer to burnout in general, not specifically to any of its dimensions. The hypotheses refer to the studied group, i.e. physical therapists from Central Poland.

- (1) Evening chronotype is associated with high values for burnout syndrome.
- (2) High Distinctness of the Rhythm (DI) is linked to increased severity of burnout.
- (3) High social jetlag predicts increased severity of burnout.

Materials and methods

Study group and protocol

The studied sample consisted of 61 professionally active physical therapists (69% of whom were women, $N = 42$) from the area of Central Poland; the participants were recruited via snowball sampling by the authors of the study from November 2017 to February 2018. The main inclusion criterion was informed consent given in writing. The exclusion criteria comprised the following: use of an alarm clock (i.e. disruption of the biological rhythm) on free days, a previous diagnosis of either a mood or anxiety disorder and a traumatic life event in the 6 months preceding the study (e.g. a serious accident, a funeral of a relative). Thus, the final analysis included $N = 54$ subjects (16 men and 38 women). Descriptive statistics for continuous variables of interest are included in [Table 1](#).

Questionnaires

The variables of interest were operationalized based on psychometric methods. A questionnaire designed for the study included questions on the age of the subject, number of coffees, energetic drinks and units of alcohol consumed per week and data required to calculate packyears of smoking and social jetlag (i.e. typical timing of sleep during working days and free days). One unit of alcohol was assumed to represent 250 ml of beer, 125 ml of wine or 25 ml of vodka. The employed self-reported psychological tests (described below) met satisfactory criteria in terms of their validity and reliability for the purposes of scientific research.

Table 1. Comparison of the studied variables between men and women in the studied group of physical therapists.

	Men (N = 16)		Women (N = 38)		F	p
	M	SD	M	SD		
Age	34.81	11.41	39.39	12.10	1.669	0.202
Practice time (years)	11.81	12.01	16.62	12.71	1.662	0.203
Packyears of smoking	2.50	7.75	1.67	6.88	0.151	0.699
SJL (hours)	0.86	0.91	0.67	0.62	0.791	0.378
CQ ME	18.06	5.04	19.18	4.87	0.585	0.448
DI	19.75	4.28	19.39	4.20	0.080	0.779
PSQI total score	4.38	2.06	5.55	3.13	1.910	0.173
LBO Psychophysical Exhaustion	17.69	6.77	16.68	5.16	0.352	0.555
Relationship Deterioration	18.50	4.72	14.87	5.00	6.127	0.017
Sense of Professional Ineffectiveness	13.00	5.05	13.63	3.80	0.202	0.657
Disillusionment	14.94	7.33	13.18	5.51	0.932	0.339

SJL – social jetlag, CQ – Chronotype Questionnaire, ME – Morningness-Eveningness, DI – Distinctness of the Rhythm, PSQI – Pittsburgh Sleep Quality Index, LBO – Link Burnout Questionnaire, M – mean, SD – standard deviation, F – F statistics (analysis of variance), p – probability in the statistical test.

The symptoms of burnout syndrome were measured with the **Link Burnout Questionnaire** (LBO), created by Santinello and adapted to Polish requirements by Jaworowska (2014). The test consists of 24 items divided into four dimensions, i.e. Psychophysical Exhaustion, Relationship Deterioration, Sense of Professional Ineffectiveness and Disillusionment (six items each). The answers are evaluated on the 6-point Likert-like Scale and refer to the frequency of certain behaviours. An increase in scores corresponds to increased burnout symptoms. Jaworowska found that Cronbach's *alpha* quotients for the enumerated dimensions were, respectively, 0.77, 0.69, 0.63 and 0.84 in Polish adaptation of the tool. Those values were similar to ones for the original version (Jaworowska 2014).

A modified version of the **Chronotype Questionnaire** (CQ) by Ogińska was used to assess subject's circadian preference (Oginska et al. 2017). It comprises two scales: Morningness-Eveningness (ME), describing the optimal time of day for functioning (eight items) and Distinctness of the Rhythm (DI), or subjective amplitude of the rhythm (eight items). The subjects were assessed according to a 4-point Likert-like Scale. High scores on the ME scale indicate evening chronotype, while those on the DI scale, high amplitude (or distinctness) of the rhythm. Cronbach *alpha* for the ME scale was 0.92, while for DI – 0.77 (Oginska et al. 2017).

The **Pittsburgh Sleep Quality Inventory** (PSQI) was employed to measure sleep quality. The questionnaire was developed by Buysse et al. (1989). The Polish version is available on the website of the Centre of Sleep Medicine at the Institute of Psychiatry and Neurology in Warsaw (2008). The inventory comprises seven components, i.e. Subjective Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbances, Use of Sleeping Medication, Daytime Dysfunction, each scored from 0 to 3 points, calculated on the basis of the respondent's answers. An higher global score indicates decreased sleep quality; a score of five points is considered to be a cutoff for clinically significant poor sleep quality. The original version of the test yielded Cronbach's *alpha* of 0.82 (Buysse et al. 1989).

Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki. The study protocol was approved by the Bioethical Committee of the Medical University of Lodz (RNN/387/17/KE). Ethical matters of the study concern mainly the selection and use of psychometric tools and the interpretation of their results; these are discussed in a more detailed manner in the literature (Bartram 2019).

Statistical analysis

The statistical analysis was performed in STATISTICA 13 (Dell, USA). Continuous variables were characterized by mean values with standard deviations. Due to the sample size ($N > 50$), the central limit theorem was used and no attempt was made to confirm the normality of the continuous variables. The heterogeneity of variance between the subgroups was checked with the Levene's test. Intergroup comparisons were conducted by analysis of variance: the F test or Welch's t-test, depending on the homogeneity of variance. The Pearson's correlation quotient was calculated to assess the association between two continuous variables. Due to multiple testing, the Benjamini-Hochberg correction with an assumed false discovery rate of 0.25 was applied to p-values of correlation quotients. Four linear regression models were constructed by means of stepwise elimination to predict the four LBQ dimension scores. An analysis of residuals was performed for each model to assess the validity of assumptions of normality, homoscedasticity and independence between observations (with the Durbin-Watson test). The tolerance indices were analysed to track possible multicollinearities. One interaction was diagnosed, based on a comparison between correlation and partial-correlation quotients, calculated for the model. Effect sizes were assessed in two manners: for each model as a whole (coefficient of determination R^2) and for each parameter in the model (semi-partial correlation sR). Those quotients may be interpreted in terms of Cohen's thresholds for small (0.1), medium (0.3) and strong correlation (0.5)(Cohen 2013). The level of significance was adopted for $\alpha = 0.05$.

Results

Correlations

Positive, moderate and statistically significant correlations were observed between CQ DI score and two out of the four dimensions of the LBQ Questionnaire, i.e. Psychophysical Exhaustion and Disillusionment. No statistically significant correlation was found between CQ ME score and any of the LBQ factors ($p > 0.05$). Social jetlag correlated in a negative, moderate and statistically significant manner with the Sense of Professional Ineffectiveness. A detailed matrix of Pearson correlation quotients between the continuous variables of interest is presented in Table 2.

Linear regression models predicting severity of burnout

The linear regression models were constructed by means of stepwise elimination. Age, sex, alcohol consumption, energy drink consumption, coffee consumption, ME score, DI

Table 2. Pearson correlation quotients between the studied variables in the analysed group of physical therapists.

	1	2	3	4	5	6	7	8	9
1	Age								
2	Practice time (years)	0.988**							
3	Packyears of smoking	0.325*	0.336*						
4	SJL (hours)	-0.284	-0.292	-0.217					
5	CQ	-0.187	-0.188	-0.330*	0.270				
6	ME	-0.061	-0.067	0.001	-0.087	0.263			
7	DI	0.130	0.103	-0.186	0.058	0.137	0.099		
8	PSQI total score	0.163	0.152	0.121	-0.179	-0.021	0.372*	0.221	
9	LBQ	-0.130	-0.146	0.177	0.114	-0.082	0.311	0.097	0.545**
10	Relationship Deterioration	0.045	0.065	-0.031	-0.345*	-0.011	0.129	0.324	0.174
	Sense of Professional Ineffectiveness	0.072	0.039	0.117	-0.184	0.115	0.378*	0.593**	0.512**
	Disillusionment								0.319

SJL – social jetlag, CQ – Chronotype Questionnaire, ME – Morningness-Eveningness, DI – Distinctness of the Rhythm, PSQI – Pittsburgh Sleep Quality Index, LBQ – Link Burnout Questionnaire, * – $p < 0.05$, ** – $p < 0.01$ (concerns p-values after Benjamini-Hochberg correction)

score, SJL, PSQI component scores (Subjective Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbances, Use of Sleeping Medication, Daytime Dysfunction) were all found to be possible predictors. All constructed models were adjusted to empirical data ($p < 0.001$) and their parameters are shown in Table 3.

An increase in the LBQ Psychophysical Exhaustion score was predicted by a decrease in ME score, an increase in DI score and a decrease in SJL, independently of each other. Also, LBQ was higher for subjects who described their sleep quality in PSQI as fairly bad compared to those who claimed it was very good. An interaction was identified between SJL and ME (Figure 1). According to the model, a slightly increased value of Psychophysical Exhaustion was associated with decreased social jetlag for a person with intermediate type ME (i.e. scoring 20 on the ME scale). Simultaneously, for an extreme evening type (32 points on the ME scale), an increase in Psychophysical Exhaustion score was predicted by a rise in social jetlag. Extreme evening types tended to reach a higher score in Psychophysical Exhaustion than intermediate types, as modelled. The effect size of SJL and the diagnosed interaction was higher than that of the remaining variables included in the model.

Table 3. Parameters (B) identified for the prediction of Link Burnout Questionnaire (LBQ) dimensions in the studied sample of physical therapists; effect sizes are given as semi-partial correlations (sR) of linear regression models.

	B	B 95% CI		sR	t	p
<i>Psychophysical exhaustion</i>						
$R^2 = 0.312; F = 5.012, df = 6, p < 0.001$						
Intercept	22.030	12.420	31.641		4.612	<0.001
ME	-0.577	-0.965	-0.190	-0.342	-2.999	0.004
AM	0.348	0.013	0.684	0.238	2.087	0.042
SJL	-12.345	-19.885	-4.804	-0.375	-3.294	0.002
Subjective sleep quality 1 vs 0	0.847	-1.294	2.988	0.091	0.796	0.430
Subjective sleep quality 2 vs 0	3.116	-0.189	6.422	0.216	1.897	0.064
SJL*ME	0.576	0.202	0.951	0.353	3.098	0.003
<i>Sense of professional ineffectiveness</i>						
$R^2 = 0.102; F = 7.018, df = 1, p = 0.011$						
Intercept	14.911	13.363	16.460		19.320	<0.001
SJL	-2.007	-3.528	-0.487	-0.345	-2.649	0.011
<i>Relationship deterioration</i>						
$R^2 = 0.370; F = 7.250, df = 5, p < 0.001$						
Intercept	18.068	15.601	20.535		14.725	<0.001
Alcohol 1 vs 0 pt	-2.897	-5.641	-0.152	-0.231	-2.122	0.039
Alcohol 2 vs 0 pt	0.385	-2.370	3.140	0.031	0.281	0.780
Alcohol 3 vs 0 pt	6.257	2.253	10.261	0.342	3.142	0.003
Energy drinks 1 vs 0 pt	-5.317	-8.852	-1.782	-0.330	-3.025	0.004
Energy drinks 2 vs 0 pt	4.611	0.018	9.203	0.220	2.019	0.049
<i>Disillusionment</i>						
$R^2 = 0.232; F = 6.330, df = 3, p = 0.001$						
Intercept	5.432	-1.766	12.630		1.516	0.136
AM	0.513	0.155	0.871	0.347	2.880	0.006
Sleep disturbances 1 vs 0 pts	-2.705	-5.203	-0.207	-0.262	-2.175	0.034
Sleep disturbances 2 vs 0 pts	3.864	0.535	7.194	0.281	2.331	0.024

R^2 – coefficient of determination; F – F statistics (linear regression); df – degrees of freedom; p – probability in the statistical test, t – statistics in the test, ME – Morningness-Eveningness score, DI – Distinctness of the Rhythm score, SJL – social jetlag, Subjective sleep quality – scoring in the Pittsburgh Sleep Quality Index (PSQI) component 9:0 – very good, 1 – fairly good, 2 – fairly bad; Alcohol scoring: 0 – less than or equal to 1 unit per week, 1–2 to 5 units per week, 2–6 to 10 units per week, 3 – 11-20 units per week; Energy drinks: 0 – does not drink at all, 1 – less than 1 per day, 2 – one per day; Sleep disturbances = scoring in the PSQI component 5 tapping into causes of sleep interruptions.

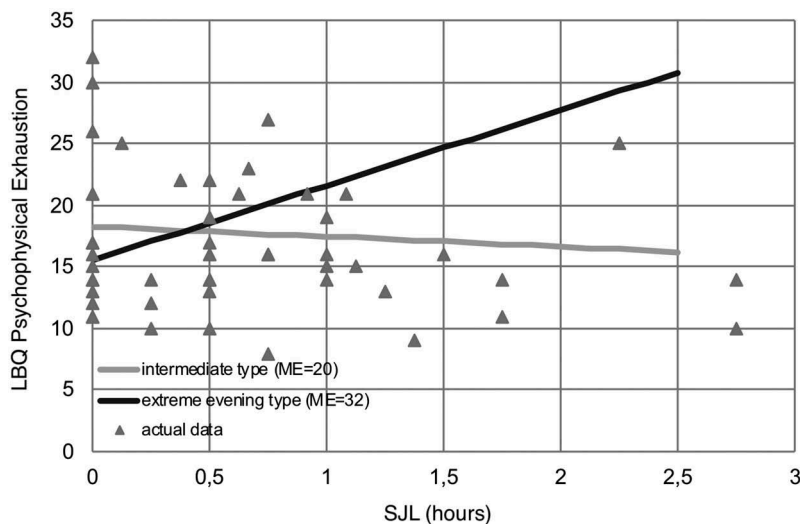


Figure 1. The association between psychophysical exhaustion and social jetlag (SJL): actual and modelled data based on individual chronotype questionnaire morningness-eveningness (ME) score in the studied group of physical therapists. LBQ – link burnout questionnaire.

An increase in Sense of Professional Ineffectiveness was predicted only by a decrease in social jetlag.

Participants consuming 11 to 20 units per week demonstrated a higher Relationship Deterioration score than subjects drinking up to one unit of alcohol per week; in addition, those who consumed one energy drink per day gave a higher score than those who avoided consuming energy drinks. Conversely, the consumption of two to five units per week was associated with a lower Relationship Deterioration score than in the case of less than, or equal to, one unit of alcohol per week; similarly, the consumption of less than one energy drink per day resulted in a lower score than not consuming energy drinks at all.

A higher CQ DI score indicated an increased LBQ Disillusionment score. In addition, a PSQI Sleep Disturbances score of two was associated with higher LBQ Disillusionment than a score of zero, while a PSQI Sleep Disturbances score of one predicted a lower Disillusionment score than a score of zero.

Discussion

Hypotheses 1 & 3

Eveningness was found to be associated with a decrement in Psychophysical exhaustion, independently of social jetlag. However, in the model predicting Psychosocial Exhaustion among physical therapists, a relationship was identified between ME and SJL. Eveningness predicted high Psychosocial Exhaustion as a dimension of burnout syndrome, but only in the presence of high SJL. Thus, hypothesis 1 was partially confirmed in the studied group.

Two surprising associations were observed: an increase in SJL predicted a decline in both Psychophysical Exhaustion and in Sense of Professional Ineffectiveness. The first relationship was observed in the context of the interaction identified between ME and

SJL; in the second case, SJL was the only predictor of the Sense of Professional Ineffectiveness score in the proposed model. Thus, hypothesis 3 was neither confirmed, nor can it be rejected due to interaction with ME.

Late chronotype preference is a well-established risk factor of depressive symptoms, and one that has been attributed to the predisposition towards desynchronization between biological and social circadian rhythms. A recent meta-analysis suggests that while this effect may be weak, it nevertheless constitutes a possible target of intervention for both the prophylaxis and the treatment of mood disorders (Au and Reece 2017). A similar association may be expected between evening chronotype and burnout due to the postulated overlap between affective disorders and burnout syndrome (Bianchi et al. 2015). In a study of almost 500 young adults, Merikanto et al. report that Evening and Intermediate types suffered from higher burnout than morning types, regardless of the occurrence of other mental symptoms. However, the proposed model did not include social jetlag nor shift work as possible confounding factors (Merikanto et al. 2016). Furthermore, late chronotype has previously been linked to high ability-based emotional intelligence, which is a protective factor against burnout (Stolarski and Jankowski 2015). This may explain why eveningness was associated with a decrement in psychophysical exhaustion, independently of other analysed factors.

The relationship between SJL and burnout symptoms comes as a surprise, but one that may be confirmed by previous findings. A high SJL score may result from staying up late due to socialising: such time spent with social support, i.e. friends and other acquaintances, is considered a protective factor against burnout (Wittmann et al. 2006; Śliwiński et al. 2014; Woodhead et al. 2014; Hyman et al. 2017). However, this relationship requires further investigations, which should also encompass the negative effect of SJL on cardiometabolic profile (Rutters et al. 2014). Risk-benefit weighing should be considered if high SJL is confirmed to have a protective effect on burnout.

Currently, published findings concerning these associations are scarce and the ones that exist suggest various other possible factors that may contribute to desynchronisation between biological and social rhythm, e.g. SJL, markers of social support or shift work, which should be considered in future studies.

Hypothesis 2

An increase in Distinctness of the Rhythm (DI) was associated with increased scores for two burnout dimensions: Psychophysical Exhaustion and Disillusionment. Thus, hypothesis 2 was confirmed.

Although the link between DI and Psychophysical Exhaustion scores identified in the present study reflects those identified in the previous research on physicians and nurses, the link between DI and Disillusionment does not (Mokros et al. 2018). This disjunction may have influenced the specificity of the results and the observed differences between the studied samples; clearly, further verification is required.

Little is known of the clinical significance of the relationship between the subjective amplitude of the rhythm and Morningness-Eveningness. The author of the Chronotype Questionnaire highlights that high DI is associated with low emotional stability, i.e. high neuroticism (Ogińska 2011); this link has been confirmed in consecutive studies across different populations (Nowakowska-Domagala et al. 2016; Mokros et al. 2017; Ogińska

et al. 2017). Similarly, DI was linked to an emotion-oriented coping style (Oginska and Oginska-Bruchal 2014). Both neuroticism and the emotion-oriented stress coping style are recognized as risk factors of burnout symptoms (Nowakowska-Domagala et al. 2015; van der Wal et al. 2016). This dyad may be further supplemented by high amplitude of the rhythm; this combination may give rise to a specific pattern of circadian functioning marked by high emotional lability or negative emotionality, which predisposes the individual to psychophysical exhaustion and disillusionment. However, this is merely speculation requiring further research, which should ideally include the confounding effect of personality traits and coping styles.

Other findings

Interestingly, in the proposed model, Relationship Deterioration was predicted by a specific pattern of self-reported alcohol and energy drink consumption: drinking two to five units of alcohol per week or less than one energy drink per day was linked to lower indices of Relationship Deterioration compared to declarations of total abstinence from both. Conversely, high alcohol intake and consumption of at least one energy drink per day were associated with relationship deterioration in the studied group. Those results suggest a non-linear association between alcohol consumption and certain aspects of burnout syndrome; however, no direct relationship was observed as linear regression models were employed. It should be noted that such U-shaped associations have frequently been observed between alcohol consumption and the function of the cardiovascular system or cognitive activity: small to moderate amounts of alcohol have a protective effect, while excessive amounts increase the risk of dementia and adverse cardiovascular events (Goel et al. 2018; Gutwinski et al. 2018). It is possible that a similar association may exist between alcohol consumption and burnout; however, this is only the first study to propose such a relationship. So far, alcohol use has only been described in terms of its abuse and is potential to increase the risk of burnout syndrome (van der Wal et al. 2016). In contrast, while consumption of energy drinks has been associated with impulsiveness, anxiety and sleep disorders, among others, no direct link to burnout has been reported, let alone any possible U-shaped relationship (Peacock and Bruno 2015; Ali et al. 2015). It has been postulated that mixing alcohol and energy drinks may have a negative influence on neurological and cardiovascular health by encouraging binge drinking (Marczinski 2015); however, no interaction between alcohol and energy drink use was diagnosed in the present study. Unfortunately, it is only possible to form a limited interpretation of our present results, and further studies examining the relationship between intensity of psychoactive substance use and burnout are required to draw more generalized conclusions.

Limitations

Despite making several significant findings with a moderate effect size, certain limitations to the design of the study and reasoning should be outlined. The studied group is relatively small and was not randomly recruited. Thus, the results may not fully reflect the pattern of associations among physical therapists from a certain area. A large sample would allow a greater number of confounding factors to be included and thus better delineate certain mediations or moderations. Also, social jetlag was measured on the basis

of self-reported typical hours of sleep, which may reduce the reliability of the data; actigraphy would provide more accurate assessment (Vitale et al. 2014).

The existence of intercorrelations between the constituent dimensions of the LBQ raises the question of whether those variables can be treated as independent: the theoretical background of the LBQ requires them to be considered as such. Even so, its author, Santinello, hypothesizes that burnout symptoms are linked, particularly psychophysical exhaustion and disillusionment. These theoretical considerations have been confirmed by the application of both the original form and the Polish adaptation of the questionnaire (Santinello 2010; Jaworowska 2014). Despite evidence for lack of independence of the LBQ dimensions, it was assumed anyway. However, it should be emphasized that such approach requires presentation of the results as tentative with proper qualification. The alternative would be to employ the total score of LBQ as a general marker of burnout, yet this approach would probably provide less new data.

Conclusions

- Eveningness predicted high Psychosocial Exhaustion as a dimension of burnout syndrome, but only in the presence of high SJL.
- High values of Distinctness of the Rhythm was associated with high burnout indices in two dimensions: Psychophysical Exhaustion and Disillusionment.
- Both chronotype and SJL may prove useful risk factors for certain aspects of burnout among physical therapists, but those parameters should be considered together.
- Low intake of energy drinks and alcohol may be linked to a low value of Relationship Deterioration; however, these associations require further investigations.

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References

- Adriaenssens J, De Gucht V, Maes S. 2015. Determinants and prevalence of burnout in emergency nurses: a systematic review of 25 years of research. *Int J Nurs Stud.* 52:649–661.
- Ali F, Rehman H, Babayan Z, Stapleton D, Joshi -D-D. 2015. Energy drinks and their adverse health effects: a systematic review of the current evidence. *Postgrad Med.* 127:308–322.

- Au J, Reece J. 2017. The relationship between chronotype and depressive symptoms: a meta-analysis. *J Affect Disord.* 218:93–104.
- Bartram B. 2019. Using questionnaires. In: Mike Lambert, editor. *Practical Research Methods in Education: An Early Researcher's Critical Guide.* Abingdon (Oxford): Routledge; p. 1–11.
- Bianchi R, Schonfeld IS, Laurent E. 2015. Burnout-depression overlap: a review. *Clin Psychol Rev.* 36:28–41.
- Borisenkov MF, Polugrudov AS, Paderin NM, Bakutova LA. 2018. Young inhabitants of the North with late chronotype and social jetlag consume more high-calorie foods and alcohol. *Biol Rhythm Res.* 1–11.
- Bos SC, Macedo AF. 2018. Literature review on Insomnia (2010–2016). *Biol Rhythm Res.* 50(1):1–70.
- Bridgeman PJ, Bridgeman MB, Barone J. 2018. Burnout syndrome among healthcare professionals. *Am J Heal Pharm.* 75:147–152.
- Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. 1989. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. *Psychiatry Res.* 28:193–213.
- Cheng W-J, Hang L-W. 2018. Late chronotype and high social jetlag are associated with burnout in evening-shift workers: assessment using the Chinese-version MCTQshift. *Chronobiol Int.* 35:910–919.
- Cohen J. 2013. *Statistical power analysis for the behavioral sciences.* Abingdon, Oxford: Routledge.
- Goel S, Sharma A, Garg A. 2018. Effect of alcohol consumption on cardiovascular health. *Curr Cardiol Rep.* 20:19.
- González-Sánchez B, López-Arza M, Montanero-Fernández J, Varela-Donoso E, Rodríguez-Mansilla J, Mingote-Adán J. 2017. Burnout syndrome prevalence in physiotherapists. *Rev Assoc Med Bras.* 63:361–365.
- Gulec M, Selvi Y, Boysan M, Aydin A, Oral E, Aydin EF. 2013. Chronotype effects on general well-being and psychopathology levels in healthy young adults. *Biol Rhythm Res.* 44:457–468.
- Gutwinski S, Schreiter S, Priller J, Henssler J, Wiers CE, Heinz A. 2018. Drink and think: impact of alcohol on cognitive functions and dementia – evidence of dose-related effects. *Pharmacopsychiatry.* 51:136–143.
- Hyman SA, Shotwell MS, Michaels DR, Han X, Card EB, Morse JL, Weinger MB. 2017. A survey evaluating burnout, health status, depression, reported alcohol and substance use, and social support of anesthesiologists. *Anesth Analg.* 125:2009–2018.
- Jaworowska A. 2014. *LBQ - Kwestionariusz Wypalenia Zawodowego - polska normalizacja.* Podręcznik. Warszawa: Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego.
- Jeong HJ, Moon E, Park JM, Lee BD, Lee YM, Choi Y, Chung YI. 2015. The relationship between chronotype and mood fluctuation in the general population. *Psychiatry Res.* 229:867–871.
- Koopman ADM, Rauh SP, Van Riet E, Groeneveld L, Van Der Heijden AA, Elders PJ, Dekker JM, Nijpels G, Beulens JW, Rutters F. 2017. The association between social jetlag, the metabolic syndrome, and type 2 diabetes mellitus in the general population: the new hoorn study. *Journal of Biological Rhythms.* 32. 359–368.
- Kumar S. 2016. *Burnout and Doctors: Prevalence, Prevention and Intervention.* Healthc (Basel, Switzerland). 4:1–9.
- Lehto JE, Kortesoja L, Partonen T. 2019. School burnout and sleep in finnish secondary school students. *Sleep Sci.* 12:10–14.
- Lindeman B, Petrusa E, McKinley S, Hashimoto DA, Gee D, Smink DS, Mullen JT, Phitayakorn R. 2017. Association of burnout with emotional intelligence and personality in surgical residents: can we predict who is most at risk? *J Surg Educ.* 74:e22–e30.
- Marczinski CA. 2015. Can energy drinks increase the desire for more alcohol? *Adv Nutr.* 6:96–101.
- Maslach C, Jackson SE, Leiter M. 1997. *The Maslach Burnout Inventory: Manual.* In: Zalaquett CP, Wood RJ, editors. *Eval Stress A B Resour.* Lanham, MD, US: The Scarecrow Press; p. 191–218.
- Merikanto I, Suvisaari J, Lahti T, Partonen T. 2016. Eveningness relates to burnout and seasonal sleep and mood problems among young adults. *Nord J Psychiatry.* 70:72–80.
- Metlaine A, Sauvet F, Gomez-Merino D, Elbaz M, Delafosse JY, Leger D, Chennaoui M. 2017. Association between insomnia symptoms, job strain and burnout syndrome: a cross-sectional survey of 1300 financial workers. *BMJ Open.* 7:e012816.

- Mokros Ł, Koprowicz J, Nowakowska-Domagala K, Rodak J, Pietras T. 2018. Eveningness and its possibility of predicting burnout symptoms among physicians and nurses – preliminary results. *Curr Probl Psychiatry*. 19:23–29.
- Mokros Ł, Witusik A, Michalska J, Łęzak W, Panek M, Nowakowska-Domagala K, Antczak A, Pietras T. 2017. Sleep quality, chronotype, temperament and bipolar features as predictors of depressive symptoms among medical students. *Chronobiol Int*. 34(6):708–720.
- Nowakowska-Domagala K, Jabłkowska-Górecka K, Kostrzanowska-Jarmakowska L, Morteń M, Stecz P. 2015. The interrelationships of coping styles and professional burnout among physiotherapists: a cross-sectional study. *Medicine (Baltimore)*. 94:e906.
- Nowakowska-Domagala K, Mokros Ł, Jabłkowska-Górecka K, Grzelińska J, Pietras T. 2016. The relationship between chronotype and personality among patients with alcohol dependence syndrome: pilot study. *Chronobiol Int*. 0528:1–8.
- Ogińska H. 2011. Can you feel the rhythm? A short questionnaire to describe two dimensions of chronotype. *Pers Individ Dif*. 50:1039–1043.
- Oginska H, Mojsa-Kaja J, Mairesse O. 2017. Chronotype description: in search of a solid subjective amplitude scale. *Chronobiol Int*. 34:1388–1400.
- Oginska H, Oginska-Bruchal K. 2014. Chronotype and personality factors of predisposition to seasonal affective disorder. *Chronobiol Int*. 31:523–531.
- Ośrodek Medycyny Snu Instytutu Psychiatrii i Neurologii w Warszawie. 2008. Skala Jakości Snu Pittsburgh.
- Peacock A, Bruno R. 2015. Young adults who mix alcohol with energy drinks: typology of risk-taking behaviour. *Addict Behav*. 45:252–258.
- Pedersen AF, Sørensen JK, Bruun NH, Christensen B, Vedsted P. 2016. Risky alcohol use in Danish physicians: associated with alexithymia and burnout? *Drug Alcohol Depend*. 160:119–126.
- Pradas-Hernández L, Ariza T, Gómez-Urquiza JL, Albendín-García L, De la Fuente El, Cañadas-De la Fuente GA. 2018. Prevalence of burnout in paediatric nurses: a systematic review and meta-analysis. *PLoS One*. 13:e0195039.
- Rabatin J, Williams E, Baier Manwell L, Schwartz MD, Brown RL, Linzer M. 2016. Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health*. 7:41–43.
- Roenneberg T, Kuehnl T, Pramstaller PP, Ricken J, Havel M, Guth A, Mero M. 2004. A marker for the end of adolescence. *Curr Biol*. 14:1038–1039.
- Rotenstein LS, Torre M, Ramos MA, Rosales RC, Guille C, Sen S, Mata DA. 2018. Prevalence of burnout among physicians: a systematic review. *JAMA*. 320:1131–1150.
- Rutters F, Lemmens SG, Adam TC, Bremmer MA, Elders PJ, Nijpels G, Dekker JM. 2014. Is social jetlag associated with an adverse endocrine, behavioral, and cardiovascular risk profile? *J Biol Rhythms*. 29:377–383.
- Sahbaz C, Devetzioglou T, Ozcelik AM, Kirpınar I. 2018. Circadian preferences are associated with vegetative symptoms and comorbid medical diseases in patients with major depression. *Biol Rhythm Res*. 50(5):703–717.
- Śliwiński Z, Starczyńska M, Kotela I, Kowalski T, Kryś-Noszczyk K, Lietz-Kijak D, Kijak E, Makara-Studzińska M. 2014. Life satisfaction and risk of burnout among men and women working as physiotherapists. *Int J Occup Med Environ Health*. 27:400–412.
- Salyers MP, Bonfils KA, Luther L, Firmin RL, White DA, Adams EL, Rollins AL. 2017. The relationship between professional burnout and quality and safety in healthcare: a meta-analysis. *J Gen Intern Med*. 32:475–482.
- Santinello M. 2010. LBO: link burnout questionnaire: giunti, O.S. Organizzazioni Speciali. Firenze.
- Ślawińska M, Stolarski M, Jankowski KS. 2019. Effects of chronotype and time of day on mood responses to crossFit training. *Chronobiol Int*. 36(2):237–249.
- Stolarski M, Jankowski KS. 2015. Morningness–eveningness and performance-based emotional intelligence. *Biol Rhythm Res*. 46:417–423.
- Taylor BJ, Hasler BP. 2018. Chronotype and mental health: recent advances. *Current Psychiatry Reports*. 59:1–10.
- Valdez P. 2018. Homeostatic and circadian regulation of cognitive performance. *Biol Rhythm Res*. 50(1): 85–93.

- van der Wal RAB, Bucx MJL, Hendriks JCM, Scheffer G-J, Prins JB. 2016. Psychological distress, burnout and personality traits in dutch anaesthesiologists: a survey. *Eur J Anaesthesiol.* 33:179-186.
- Vitale JA, Roveda E, Montaruli A, Galasso L, Weydahl A, Caumo A, Carandente F. 2014. Chronotype influences activity circadian rhythm and sleep: differences in sleep quality between weekdays and weekend. *Chronobiol Int.* 0528:1–11.
- Wittmann M, Dinich J, Merrow M, Roenneberg T. 2006. Social jetlag: misalignment of biological and social time. *Chronobiol Int.* 23:497–509.
- Woodhead EL, Northrop L, Edelstein B. 2014. Stress, social support, and burnout among long-term care nursing staff. *J Appl Gerontol.* 35:84–105.
- Yong M, Fischer D, Germann C, Lang S, Vetter C, Oberlinner C. 2016. Are chronotype, social jetlag and sleep duration associated with health measured by work ability index? *Chronobiol Int.* 33:721–729.