DOI: 10.1515/cpp-2018-0003

Eveningness and its possibility of predicting burnout symptoms among physicians and nurses – preliminary results

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Abstract

Introduction. A sense of burnout may seriously impair one's functioning and well-being. It may also hamper the quality of care over a patient. The present study therefore assesses sleep quality and chronotype as predictors of a sense of burnout in physicians and nurses of a district hospital.

Material and methods. The study group comprised 16 physicians and 31 nurses of a district hospital in Central Poland. The participants completed the Link Burnout Questionnaire (LBQ), Chronotype Questionnaire, and Pittsburgh Sleep Quality Inventory. A linear regression model was constructed for each LBQ dimension by means of stepwise elimination. Each model was adjusted to empirical data ($p<0.05$).

Results. A rise in Psychophysical exhaustion was predicted by greater scores for Morningness-Eveningness (ME) and Distinctness (DI) of the rhythm. A higher ME score was associated with higher scores in Relationship deterioration and Sense of professional ineffectiveness, with the latter also associated with presence in the nurses group. The nurses group also demonstrated higher Disillusionment and Psychophysical exhaustion scores than the physicians group.

Conclusions. Eveningness predicted greater burnout in the studied sample. Thus, chronotype should be considered an important burnout risk factor and it can act as a starting point for devising behavioural interventions.

Keywords: sleep quality, chronotype, circadian preference, doctors

Streszczenie

Wstęp. Poczucie wypalenia może w istotny sposób pogarszać funkcjonowanie i dobrostan jednostki, ale także wpływać w negatywny sposób na poziom opieki nad pacjentem. W niniejszym badaniu dokonano oceny chronotypu oraz jakości snu i ich związku z wypaleniem zawodowym wśród lekarzy i pielęgniarek.

Materiały i metody. Badana grupa składała się z 16 lekarzy i 31 pielęgniarek szpitala powiatowego w Centralnej Polsce. Respondenci mieli za zadanie wypełnić Kwestionariusz Wypalenia Zawodowego (LBQ), Kwestionariusz Chronotypu i Inwentarz Jakości Snu Pittsburgh. Skonstruowano model regresji liniowej metodą eliminacji wstecznej dla predykcji wyniku dla każdego z wymiarów LBQ. Modele były dopasowane do danych empirycznych ($p<0.05$).

Wyniki. Wzrost wyniku na skali Wyczerpania psychofizycznego był związany ze wzrostem wyniku na skali Poranność-Wieczorność (ME) i na skali Wyrazistości rytmu (DI). Wzrost wyniku na skali ME był związany ze wzrostem wyniku na skali Braku zaangażowania w relacje i Poczucia braku skuteczności zawodowej. W grupie pielęgniarek stwierdzono wyższy średni wynik na skali Rozczarowana oraz Wyczerpania psychofizycznego niż w grupie lekarzy.

Wnioski. Wieczorność okazała się być predyktorem wysokiego poczucia wypalenia w badanej próbie. Należy zatem rozważyć chronotyp jako ważny czynnik ryzyka wypalenia zawodowego oraz cel ewentualnych interwencji profilaktycznych.

Słowa kluczowe: jakość snu, chronotyp, preferencja okołodobowa, lekarze

Introduction

Burnout syndrome can be defined as a set of psychological and somatic symptoms caused by chronic exposure to stress due to professional work. Maslach et al. defined it as comprising emotional exhaustion, depersonalization and reduced personal accomplishment [1, 2]. Santinello et al. later enumerated four factors of burnout syndrome: Psychophysical exhaustion, Relationship deterioration, Sense of professional ineffectiveness and Disillusionment [3].

Burnout syndrome is a relatively new psychological construct and its nosological position is uncertain and controversial. It is suggested that this phenomenon may represent an important clinical and epidemiological problem due to its overlap with mood disorders [4, 5]. Burnout concerns mainly, but not exclusively, those working in occupations requiring interaction with people, such as physicians or nurses, and these groups may be at greater risk of affective disorders than the general population. The need to work shifts, particularly night shifts, may represent an additional factor contributing to the occurrence of depressive symptoms[6, 7].

Chronotype is considered a personal disposition towards the optimal time of day for functioning. It is biologically determined and manifests itself as circadian fluctuations of mood, energy levels and cognitive abilities. The classical view on chronotype considers it solely as a morningness - eveningness preference [8], however, more recent concepts suggest that it may be a multidimensional construct: Kontrymowicz-Ogińska also proposes the existence of subjective amplitude, or distinctness, of the circadian rhythm, defined as an awareness of the differences in one's psychophysiological state throughout the day[9].

The presence of an evening, or late, chronotype has been recognized as a risk factor for depression since it predisposes the individual to misalignment with the more widely-held morning-focused social circadian rhythm [10]. Merikanto et al. also found eveningness to be associated with high indices of burnout among young adults [11]. Little is known of the correlations of the subjective amplitude of the rhythm, however, it has been found to be positively linked to neuroticism (emotional liability) [12], the severity of depressive symptoms among medical students [13], and the severity of addiction among men addicted to alcohol [14]. Despite this, no up-to-date data exist on the relationship between the distinctness of the rhythm and burnout.

A sense of burnout may seriously impair one's functioning and well-being. It may also hamper the quality of care over a patient, as previously shown for both doctors and nurses [15, 16]. Therefore, to facilitate early diagnosis, treatment and prophylaxis of occupational burnout, it is important to identify the risk factors of burnout syndrome.

Both insomnia and excessive sleepiness are widely considered as symptoms, or perhaps early signs, of affective disorders, however, little is known about the link between sleep disorders and burnout [5, 17]. In addition, it has not been confirmed whether chronotype, as a biologically-determined personal disposition, may be a risk factor of burnout among physicians and nurses.

The aim of the present study was to assess sleep quality and chronotype as predictors of a sense of burnout in physicians and nurses of a district hospital.

The following hypotheses were devised:

a) Poor sleep quality predicts a high degree of burnout among physicians and nurses.

b) An evening chronotype predicts high severity of the burnout symptoms in the studied group.

Materials and Methods

Studied sample

The study group comprised 16 physicians (N = 9.57% were women) and 31 nurses (100% were women) of a district hospital in Central Poland. With the consent of the hospital manager, the questionnaires were distributed among the personnel. The main inclusion criterion was giving informed consent. The exclusion criteria comprised a previous diagnosis of either mood or anxiety disorder and a traumatic life event in the six months preceding the study (e.g. serious accident, the funeral of a relative). The study group was recruited via snowball sampling.

Questionnaires

The operationalization of the variables of interest was based on psychometric methods. A questionnaire comprising questions on the profession and age of the participant and the number of night shifts performed in the preceding month was drawn up for the study. The selected self-reported psychological tests (described below) had satisfactory validity and reliability for the purposes of scientific research. All psychometric tools were also translated into Polish and underwent proper adaptation.

The symptoms of burnout syndrome were measured with the Link Burnout Questionnaire (LBQ), created by Santinello and adapted by Jaworowska [3]. The test comprises 24 items divided into four dimensions, namely Psychophysical exhaustion, Relationship deterioration, Sense of professional ineffectiveness and Disillusionment (six items each).

The Chronotype Questionnaire (CQ) by Ogińska [9, 18] was utilized to assess the circadian preference in the studied sample. CQ consists of two dimensions: Morningness - Eveningness (ME), referring to the optimal time of day for

functioning, comprising eight items, and Distinctness of the circadian rhythm (DI), also known as the subjective amplitude of the rhythm, comprising six items.

Sleep quality was assessed with the Pittsburgh Sleep Quality Inventory (PSQI), developed by Buysse et al. [19]. A Polish translation is available on the website of the Centre of Sleep Medicine at Institute of Psychiatry and Neurology in Warsaw [20].

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/312/17/KE). The ethical matters of the study concern mainly the selection and use of the psychometric tools and the interpretation of their results; these are discussed in a more detailed manner in the literature [21, 22].

Statistical analysis

The statistical analysis was performed in SPSS 24.0 (IBM, United States). The continuous variables were characterized by mean values with standard deviations. The assumption of normality of the distribution was verified with the Shapiro-Wilk test. The heterogeneity of variance in the subgroups was checked with Levene's test. The intergroup comparisons were conducted by means of analysis of variance: the F test with the post hoc Tukey's test or Welch's t-test with the post hoc T3 Dunnet test were used, depending on the homogeneity of variance. The η2 parameter was utilized to present the size of effect. Pearson's correlation quotient was calculated to assess the association between two continuous variables. Four separate linear regression models were constructed by means of stepwise elimination to predict the four LBQ dimension scores. The index of tolerance was used to check for possible colinearities. No interactions between the explanatory variables were diagnosed. The level of significance was assumed at $\alpha=0.05$.

Results

Differences between physicians and nurses

The mean age of the group of nurses was significantly higher than that of the physicians, as was mean PSQI score, but with a small effect size. As far as the LBQ dimensions were concerned, mean Psychophysical exhaustion, Sense of professional ineffectiveness scores and Disillusionment were significantly higher in the nurses group than the physicians group, with small to moderate effect sizes. No other statistically significant differences were found in terms of the remaining continuous variables of interest, including the dimensions of the Chronotype Questionnaire (Table 1.).

Table 1. Comparison of the mean values (M) with the standard deviations (SD) of the variables of interest between the studied groups of physicians and nurses.

	Physicians (N=16)		Nurses (N=31)		η2	F	p
	M	SD	M	SD			
Age	41.06	13.68	51.97	8.57	0.200	21.245	0.008
Night shifts	3.44	2.92	4.42	3.36	0.021	0.979	0.328
ME score	17.69	6.45	17.58	5.75	0.000	0.003	0.954
DI score	19.56	7.41	20.29	3.90	0.004	19.397	0.717
PSQI score	3.94	1.98	6.77	2.86	0.218	12.556	0.001
Psychophysical exhaustion	15.75	5.48	20.00	7.21	0.087	4.270	0.045
Relationship deterioration	14.81	4.20	17.52	7.25	0.040	44.266	0.113
Sense of professional ineffectiveness	11.06	3.87	14.00	4.70	0.093	4.610	0.037
Disillusionment	10.50	4.24	17.58	4.79	0.356	24.865	<0.001

ME – morningness-eveningness, DI – Distinctness of the circadian rhythm, PSQI – Pittsburgh Sleep Quality Index, η2 – size of effect, F – statistics in the F-test or Welch's t-test, p – probability in the statistical test

Correlations

The CQ Morningness - Eveningness score correlated positively and intermediately with PSQI score, the Relationship deterioration score and Sense of professional ineffectiveness score. In addition, the Distinctness of the rhythm score (DI) correlated positively and intermediately with PSQI score and Psychophysical exhaustion. What is more, a positive and intermediate correlation was seen between the PSQI score and Psychophysical exhaustion, Sense of professional ineffectiveness and Disillusionment. More detailed information on correlation quotients is given in Table 2.

Table 2. Pearson correlation quotients presenting the association between the variables of interest.

		Age	1	2	3	4	5	6	7
1	Night shifts	0.085							
2	ME score	-0.047	-0.065						
3	DI score	-0.004	-0.077	0.153					
4	PSQI score	0.251	0.076	0.389**	0.300*				
5	Psychophysical exhaustion	-0.081	-0.029	0.263	0.409**	.310*			
6	Relationship deterioration	0.074	-0.047	0.388**	0.252	0.202	0.440**		
7	Sense of professional ineffectiveness	0.047	0.020	0.349*	0.053	0.366*	0.299*	0.540**	
8	Disillusionment	0.153	0.153	0.349*	0.197	0.351*	0.646**	0.367*	0.475**

ME – morningness-eveningness, DI – Distinctness of the circadian rhythm, PSQI – Pittsburgh Sleep Quality Index; *p<0.05 (two-tailed); **p<0.01 (two-tailed)

Prediction of the severity of burnout symptoms

A linear regression model was constructed for each LBQ dimension by stepwise elimination. Each model was adjusted to the empirical data (p<0.05).

Rise in Psychophysical exhaustion was predicted by rise in ME score and by rise in DI score. What is more, being a nurse predicted a higher Psychophysical exhaustion score than being a physician. Rise in Relationship deterioration was associated with rise in ME score, with small to moderate size of effect. Rise in Sense of professional ineffectiveness was associated with being in the nurses group and rise in ME score. Rise in Disillusionment score was predicted by belonging to the nurses group, with a moderate effect size (Table 3.).

Discussion

Hypothesis 1: Sleep quality vs burnout

PSQI score, which reflected sleep quality, correlated positively and in a statistically significant manner with Psychophysical exhaustion, Sense of professional ineffectiveness and Disillusionment, but those associations were not confirmed in the linear regression models. Thus, the presented results are not sufficient to confirm that poor sleep quality predicted burnout in physicians and nurses in this study.

Arora et al. found that Disengagement correlated positively with PSQI global score in medical students, but the study did not consider the confounding effect of chronotype [23]. Demir Zencirci and Arslan reported that poor sleep quality was associated with a high emotional exhaustion score from the Maslach Burnout Inventory, a dimension similar to Psychosocial exhaustion in the LBQ, among nurses working different shifts [24]. The association was controlled for morningness - eveningness preference. Similarly, a meta-analysis by Pacheco et al. found emotional exhaustion to be linked to low sleep quality and excessive daytime sleepiness among Brazilian medical students [25]. Vela-Bueno et al. report that physicians with high burnout displayed a higher global PSQI score, and were five times more likely to demonstrate insomnia, than those with low burnout [26].

The evidence concerning link between sleep quality and burnout is scarce, yet the problem is an important one and the presence of sleep disturbances appears to be a vital prognostic factor of burnout recovery. Sonnenschein et al. found that impaired sleep recovery hampered the improvement of burnout symptoms, independently of

Table 3. Parameters of linear regression models for the prediction of the Link Burnout Questionnaire (LBQ) dimensions in the studied sample.

Psychophysical exhaustion						
R^2=0.233; F= 5.660, df=3, p=0.002						
	B	**B 95% CI**		**Beta**	**t**	**p**
Intercept	-1.989	-12.278	8.300		-0.390	0.699
Group (Nurses)	4.013	0.245	7.781	0.278	2.148	0.037
ME score	0.357	0.052	0.663	0.306	2.359	0.023
DI score	0.379	0.035	0.722	0.289	2.224	0.031
Relationship deterioration						
R^2=0.199; F= 11.152, df=1, p=0.002						
	B	**B 95% CI**		**Beta**	**t**	**p**
Intercept	8.047	2.613	13.481		2.982	0.005
ME score	0.485	0.193	0.778	0.446	3.340	0.002
Sense of professional ineffectiveness						
R^2=0.145; F= 4.889, df=2, p=0.012						
	B	**B 95% CI**		**Beta**	**t**	**p**
Intercept	3.995	-1.954	9.943		1.353	0.183
Group (Nurses)	2.962	0.314	5.611	0.307	2.254	0.029
ME score	0.232	0.018	0.446	0.298	2.186	0.034
Disillusion						
R^2=0.342; F= 24.865, df=1, p<0.001						
Intercept	3.419	-1.517	8.355		1.395	0.170
Group (Nurses)	7.081	4.221	9.941	0.597	4.986	0.000

ME – morningness-eveningness, DI – Distinctness of the circadian rhythm, PSQI – Pittsburgh Sleep Quality Index; R2-quotient of determination, F – F statistics, df – degrees of freedom, p – probability in a test of significance, B – unstandardized linear regression parameter, SE – standard error of B, β - standardized linear regression parameter (size of effect), t – Student's t statistics

depression [27]. Elsewhere, trouble falling asleep decreased the chance of returning to work in a six-month follow-up period by two-fold, while conversely, refreshing sleep increased it almost three-fold [28]. In view of this data, workers experiencing poor sleep quality may require certain counselling or short-term therapy concerning sleep hygiene as to avoid burnout [29].

What is more, little is known about the causal relationship between burnout and sleep quality, however, it appears that it may be reciprocal, as observed with the link between sleep and depression [30].

Hypothesis 2: Chronotype vs burnout

Our findings indicate that eveningness predicted a greater degree of Psychosocial exhaustion, Relationship deterioration and Sense of professional ineffectiveness, thus, confirming the second hypothesis of the study.

These findings are in line with those of previous research, although only a few works have been performed on the association between burnout and chronotype. Merikanto et al. reported that evening and intermediate chronotypes suffered from a greater degree of burnout compared to those oriented towards morningness in a sample of young adults [11]. On the other hand, Bellicoso et al. found burnout symptoms to be associated with poor sleep quality, but not chronotype, in a group of 128 oncological caregivers.

Additionally, a relationship was found between high subjective amplitude of the rhythm and a high Psychophysical exhaustion score. This result is entirely novel since no previous study on burnout has included an analysis based on the multidimensional concept of chronotype. As mentioned earlier, high distinctness of the rhythm, and thus susceptibility to circadian mood and energy levels, was associated with emotional liability and depressive symptoms [13,14]. It may be speculated that individuals with high subjective amplitude of the rhythm may be also more susceptible to the negative stress generated by working with

patients and by shift work. Thus, they may also experience greater degrees of psychological and physical exhaustion.

It appears that the relationship between sleep quality, chronotype and burnout is a complex one and may require more sophisticated methods of both study design and statistical analysis, for example, those employing both prospective design and path analysis. Since shift work is an essential element of the duties of both nurses and physicians, they are at permanent risk of disruption in their circadian rhythm. Therefore, chronotype should be considered an important risk factor of burnout, and one that constitutes a starting point for further studies based on devising behavioural interventions intended for its prevention.

Limitations

Despite obtaining statistically significant results with moderate effect sizes for certain associations, the study does have limitations. The research group was not chosen in a random manner and it comprised a relatively small number of observations, what is more, the method of collecting data was retrospective in character. Thus, the presented findings should be considered only as preliminary ones, and prospective as well as multicentre studies are required in the future, particularly those that include more confounding factors, for example, a more detailed interview on the characteristics of the shift work.

Conflict of interest

The authors have declared no conflict of interest.

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The study was funded by Medical University of Lodz institutional grant nr 503/1-151-07/503-16-001.

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Otrzymano: 21.11.2017
Zrecenzowano: 01.01.2018, 16.01.2018
Przyjęto do druku: 21.03.2018