



Daylight exposure and the other predictors of burnout among nurses in a University Hospital

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Abstract

The purpose of the study was to investigate if daylight exposure in work setting could be placed among the predictors of job burnout.

The sample was composed of 141 nurses who work in Akdeniz University Hospital in Antalya, Turkey. All participants were asked to complete a personal data collection form, the Maslach Burnout Inventory, the Work Related Strain Inventory and the Work Satisfaction Questionnaire to collect data about their burnout, work-related stress (WRS) and job satisfaction (JS) levels in addition to personal characteristics. Descriptive statistics, parametric and non-parametric tests and correlation analysis were used in statistical analyses.

Daylight exposure showed no direct effect on burnout but it was indirectly effective via WRS and JS. Exposure to daylight at least 3 h a day was found to cause less stress and higher satisfaction at work. Suffering from sleep disorders, younger age, job-related health problems and educational level were found to have total or partial direct effects on burnout. Night shifts may lead to burnout via work related strain and working in inpatient services and dissatisfaction with annual income may be effective via job dissatisfaction.

This study confirmed some established predictors of burnout and provided data on an unexplored area. Daylight exposure may be effective on job burnout.

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1. Introduction

Burnout is a term that was first used in the medical arena by Herbert Freudenberger (1974). It is known to be a prolonged psychological response to chronic emotional and interpersonal stressors on the job, and is defined by the three dimensions of emotional

exhaustion (EE), depersonalisation (D), and low personal accomplishment (PA). The EE component represents the basic individual stress dimension of burnout. It refers to feelings of being overextended and depleted of one's emotional and physical resources. There has been much discussion whether EE is the essential feature of burnout. The D component represents the interpersonal context dimension of burnout. It refers to a negative, callous or excessively detached response to various aspects of the job. The component of reduced efficacy or PA represents the self-evaluation dimension of burnout. It refers to feelings of incompetence and a

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lack of achievement and productivity at work (Freudenberger, 1974; Maslach et al., 2001). Burnout is a common problem especially in caregiving and service occupations, in which the core of the job is the relationship between provider and recipient (Maslach et al., 2001). Health care providers, especially nurses, are generally being considered as an above risk group regarding work stress and burnout (Tummers et al., 2001). Previous studies have reported low-to-moderate or moderate-to-high burnout levels among nurses working in different areas of nursing (Chen and McMurray, 2001; Stordeur et al., 1999; Barrett and Yates, 2002). Job-related psychological problems, like burnout, affect both quality of care delivered to patients and professional and personal lives of the caregiver. Burnout has also been shown as a major contributor to shortage of experienced nurses (Stundin-Huard and Fahy, 1999).

Socio-demographic factors such as age, job experience, marital status, having children, educational level or income, and job-related factors such as excessive work load, absence of job resources, lack of autonomy have been found related to burnout (Maslach et al., 2001; Stundin-Huard and Fahy, 1999; Aries and Ritter, 1999; Tyler and Ellison, 1994). Health problems that may be attributed to work conditions and sleeping disorders are also contributing factors to higher burnout levels (Chen and McMurray, 2001; Melamed et al., 1999; Goldberg et al., 1996; Perski et al., 2002).

Daylight exposure has curative effects on mood disorders like depression (Beauchemin and Hays, 1996; Benedetti et al., 2001; Lam et al., 1992; Painter, 1999; Wirz-Justice et al., 1996). Human retina receives only visible light (400–700 nm wavelength). This photic energy is then transduced and delivered to the visual cortex and, by an alternative pathway, to the supra-chiasmatic nucleus, the hypothalamic region that directs circadian rhythm. Visible light exposure also modulates the pituitary and pineal glands, leading to neuroendocrine changes. Melatonin, norepinephrine and acetylcholine decrease with light activation, whereas cortisol, serotonin, GABA and dopamine levels increase. These induced neuroendocrine changes can lead to alterations in mood (Roberts, 2000). Oren et al. (2001) have shown that antidepressant source of visible light is capable of inducing the production of reactive oxygen species in skin. They have suggested that such species may participate in signal transduction pathways leading to mood changes. Burnout is described as a kind of depression, which can only be seen in the work setting (Maslach et al., 2001; Penson et al., 2000). Considering the similarity between burnout and mood disorders, we hypothesized that daylight exposure might have a direct or indirect effect on burnout. Indirect effect may be seen via work related strain (WRS) and/or job satisfaction (JS) for both parameters have been found significantly correlated with burnout in previous studies, which were

carried out among nurses (Stordeur et al., 1999; Barrett and Yates, 2002; Aries and Ritter, 1999; Hansson et al., 1996; Kalliath and Morris, 2002; Shader et al., 2001; Oehler and Davidson, 1992; Robinson et al., 1991; Dolan, 1987; Stewart and Arklie, 1994).

The purpose of this study was to investigate if daylight exposure could be placed among known predictors of burnout.

2. Methods

One hundred and forty nine nurses working at Akdeniz University Hospital in Antalya, Turkey were included in our study. All nurses were given information about the study and written consent was obtained from each. All attendants were asked to complete the Maslach Burnout Inventory (MBI), the Work related Strain Inventory (WRSI) and the Work Satisfaction Questionnaire (WSQ) in addition to a personal data collection form. One hundred and forty one of 149 nurses completed all four forms appropriately between 18 and 25th of March 2003. The remaining eight nurses were excluded for they completed the forms inappropriately. The response rate was 94.6%.

Personal data collection form with forced choice and open-ended questions was designed by the authors to obtain information about demographic, socio-economic, personal and work-related issues, which were thought to have possible effects on the scores of WRSI, WSQ and MBI (Table 1). The question “how many hours (including lunch time, rest intervals, etc.) are you exposed to direct daylight during a typical work day?” had three choices: less than 1 h, 1–3 h and 3 h or more. Only six participants reported that they were exposed to daylight less than 1 h. Therefore, we gathered the sample in two groups for statistical evaluation: those under daylight exposure less than 3 h a day (group A) and those under exposure at least 3 h a day (group B) (Table 1).

The MBI has 22 statements regarding different burnout dimensions, and each item has five choices ranging from “never” (=0 point) to “always” (=4 points). The inventory consists of three subscales measuring EE (range 0–48), D (range 0–30) and PA (range 0–42) separately (Maslach and Jackson, 1996). The MBI was translated into Turkish language by Canan Ergin (1992). Reliability of the MBI among Turkish physicians and nurses were confirmed by Ergin (1992) with Cronbach alpha values 0.83, 0.65 and 0.72 for EE, D and PA respectively. Alpha values of EE, D and PA in our study were 0.89, 0.71 and 0.72, respectively.

The WRSI, which includes 18 statements regarding perceptions of strain in occupational setting, was used to measure WRS levels (Revicki et al., 1991). The

Table 1
Distribution of study group (group A + B) according to personal characteristics and mean values

Characteristics	Group A (<i>n</i> = 66) (<3 h/day)	Group B (<i>n</i> = 75) (≥3 h/day)	<i>p</i>
Mean age ±SD (year)	29.7±6.0	29.7±5.9	0.959 ^a
Mean duration of nursing ±SD (year)	9.1±6.6	8.9±6.0	0.884 ^a
<i>Educational level</i>			
Vocational high school	7	10	0.796 ^b
University	59	65	
<i>Marital status</i>			
Married	41	49	0.728 ^b
Single or divorced	25	26	
<i>Number of children <18 years (n=105)</i>			
None	17	13	0.364 ^b
One	20	24	
Two or more	12	19	
<i>Mean annual personal income (US \$)</i>			
Income (<i>n</i> = 137)	4450±1233	4456±1246	0.974 ^a
Enough for living	21	30	0.483 ^b
Not enough for living	41	45	
<i>Working place in hospital</i>			
ICUs, emergency or operating rooms	35	3	0.000 ^b
Inpatient services	13	51	
Outpatient clinics, laboratories or administrative units	18	21	
<i>Shifts worked</i>			
Only days	25	23	0.367 ^b
Days and/or nights	41	52	
Mean number of night shifts per person in a month	13.1±6.1	10.1±1.7	0.020 ^a
<i>Total daily sleep time (hours)</i>			
6.9±1.5	6.9±1.5	6.8±1.2	0.542 ^a
<i>Sleep disorders</i>			
None	15	16	0.842 ^b
At least one	51	59	
<i>Health problems associated with the job</i>			
None	16	9	0.580 ^b
At least one	50	66	
<i>If I were given another chance, I would choose the same job once again</i>			
Yes	15	11	0.278 ^b
No	51	64	

^aStudent *t*-test.

^bChi-square test.

statements are about work-related expectations and stress, interpersonal relations in work settings, productivity, working habits, interactions between work and family, etc. Each item has four choices ranging from “I surely agree” to “I surely disagree”. Five of 18 items including positive statements were scored 1–4 according to selected choice, whereas the other negative statements were scored 4–1. Reliability of this inventory for Turkish nurses was confirmed by Aslan et al. (1996) (Cronbach alpha = 0.78). Alpha value of WRSI in our study was 0.74.

The WSQ was used to measure JS levels among participants (Hackman and Oldham, 1980). The questionnaire includes 14 items and each item has a half-finished statement that can be completed by selecting one of five following choices ranging from “never satisfies me” = (1 point) to “highly satisfies me” = (5 points). Guler (1990) confirmed reliability of this questionnaire for Turkish population (Cronbach alpha = 0.96). Alpha value of WSQ in our study was 0.82.

EE and D positively correlated (*r*: 0.62 and 0.46) while PA and JS showed negative correlation (*r*: -0.44 and

–0.46) with WRSI scores in a study conducted to confirm validity of MBI, WRSI and WSQ among Turkish Health professionals (Aslan et al., 1998).

Levels of three burnout components (EE, D and PA) were dependant variables in this study. We also took WRS and JS levels as dependant variables in order to investigate if daylight exposure and the other independent study variables (descriptive variables such as age, job experience, educational level, marital status, number of children, annual income and other independent variables such as work places, work shifts, sleep time, and sleep disorders and work-related health problems) had an effect on burnout via work stress and JS.

Distribution and mean values of the study group according to daylight exposure were analysed using “chi-square” and “student *t*-tests”. Correlations of WRSI, WSQ, and MBI scores with each other were determined using “Pearson correlation analysis”. Effects of independent variables on WRS, JS, and burnout parameters were determined using multiple regression analysis. Statistical significance was set at less than 5%.

3. Results

All 141 participants were female and their mean age was 29.7 ± 6.0 years. Mean duration of nursing experi-

Table 2
Correlation of work-related strain, job satisfaction and three burnout components with each other

	WRS (<i>r</i>)	JS (<i>r</i>)	EE (<i>r</i>)	D (<i>r</i>)	PA (<i>r</i>)
JS	–0.42 ^a	1.0			
EE	0.67 ^a	–0.47 ^a	1.0		
D	0.46 ^a	–0.40 ^a	0.58 ^a	1.0	
PA	–0.46 ^a	0.27 ^a	–0.47 ^a	–0.43 ^a	1.0

WRS: work-related strain; JS: job satisfaction; EE: emotional exhaustion; D: depersonalisation; PA: personal accomplishment.

^aSignificant correlation at the level of 0.05 ($p < 0.05$) in Pearson correlation analysis.

Table 3
Mean measurement scores of study group

	Mean scores			Difference between group A and B	
	Total	Group A	Group B	<i>t</i>	<i>p</i> ^a
WRS	38.5 ± 7.0	39.9 ± 6.7	37.3 ± 7.1	2.234	0.027
JS	37.1 ± 8.3	35.6 ± 8.1	38.5 ± 8.2	–2.079	0.039
EE	19.2 ± 6.9	19.5 ± 6.7	19.0 ± 7.1	0.405	0.686
D	5.2 ± 3.6	5.4 ± 3.9	5.0 ± 3.4	0.691	0.491
PA	20.8 ± 4.0	20.8 ± 3.9	20.9 ± 4.3	–0.197	0.844

^aStudent *t*-test, difference between group A and B.

ence was 9.0 ± 6.2 years. Sixty-six of the nurses (46.8%) reported that they were exposed to daylight less than 3 h during a typical workday (group A). The remaining 75 (53.2%) were under daylight exposure 3 h or more (group B). Nurses in group A and B had similar demographic, socio-economic, personal and job-related data except for their working places in the hospital and amount of night shifts in a month. The number of the nurses under daylight exposure less than 3 h a day was significantly high among those working in intensive care units, emergency and operating rooms. The nurses who were exposed to daylight less than 3 h a day also had more night duties than the others (Table 1).

Five dependant variables were found significantly correlated with each other in the correlation analysis. WRS showed negative correlation with JS and PA, but positive correlation with EE and D. JS was negatively correlated with EE and D, but there was a positive correlation between JS and PA. EE was negatively correlated with PA and positively correlated with D. The correlation between PA and D was negative (Table 2).

Mean scores of the total study group obtained from WRSI and WSQ were 38.5 ± 7.0 and 37.1 ± 8.3 , respectively. Mean MBI scores were 19.2 ± 6.9 for emotional exhaustion, 5.2 ± 3.6 for D and 20.8 ± 4.0 for PA (Table 3). Mean WRS score was significantly higher and mean JS score was significantly lower in group A than those in group B, but no significant difference was found between two groups regarding burnout components (Table 3). The same effects of daylight exposure on WRS and JS were confirmed by multiple regression analysis.

Following variables were determined as predictors of work stress, JS and burnout dimensions in multiple regression analysis.

WRS: Suffering from sleep disorders ($t: 4.690$, $p = 0.000$), having night duties ($t: 3.123$, $p = 0.002$) and duration of natural daylight exposure ($t: -2.809$, $p = 0.006$).

JS: Suffering from sleep disorders ($t: 4.240$, $p = 0.000$), duration of natural daylight exposure ($t: 5.648$, $p = 0.000$), working in inpatient services ($t: -4.706$,

$p = 0.000$) and satisfaction with wages ($t: -3.128$, $p = 0.002$).

EE: Suffering from sleep disorders ($t: 3.034$, $p = 0.003$), age ($t: -2.806$, $p = 0.006$), having job-related health problems ($t: 2.255$, $p = 0.027$) and educational level ($t: 3.390$, $p = 0.001$).

D: Suffering from sleep disorders ($t: -2.221$, $p = 0.029$) and age ($t: -2.913$, $p = 0.005$).

PA: Suffering from sleep disorders ($t: 2.111$, $p = 0.05$) and age ($t: 4.491$, $p = 0.000$).

4. Discussion

Level of burnout among study group was moderate in *EE*, low in *D* and high in *PA* according to national norms of burnout among nurses in Turkey (Ergin, 1996). Considering the significant correlation among *WRSI*, *WSQ* and *MBI* scores, we can demonstrate a link between work stress, *JS* and burnout. However, the specific nature of that link is a matter of speculation. For example, we do not know whether burnout causes dissatisfaction or a drop in satisfaction causes burnout. Alternatively both burnout and job dissatisfaction may be caused by another factor such as poor working conditions (Maslach et al., 2001).

The purpose of the study was to investigate the possible direct or indirect effects of daylight exposure on burnout. In the literature, we could not find any research regarding these effects, but in one study, lack of windows in the work place was reported to be a contributing factor to work stress (Heerwagen et al., 1995). In our study, exposure to daylight at least 3 h a day seems to reduce work stress and dissatisfaction. We also expected to find a result showing that daylight exposure had a curative effect on burnout parameters, because there are a lot of studies reporting this effect of daylight on mood disorders (Beauchemin and Hays, 1996; Benedetti et al., 2001; Lam et al., 1992; Painter, 1999; Wirz-Justice et al., 1996). If burnout is a kind of depression which can only be seen in work settings (Maslach et al., 2001; Penon et al., 2000), then there must be a relationship between burnout levels and hours of daylight exposure, but we could not find any direct correlation. However, an indirect correlation via work stress and *JS* can be seen between daylight and burnout.

Although they did not focus on psychological status of the nurses in their interesting study, Roseman and Booker (1995) found that medical errors among nurses were more likely in midwinter than in the fall. They reported a strong relationship between increased darkness and rate of medical errors. Perhaps it would be possible to explain the relationship between darkness and medical errors via psychological status of the nurses in a study considering also burnout, work stress and satisfaction.

Suffering from sleep disorders and younger age were found to be effective on all three dimensions of burnout whereas job-related health problems and educational level were effective only on *EE*. Having night duties may lead to burnout via *WRS* and working in inpatient services and dissatisfaction with annual income may be effective via job dissatisfaction. In the literature it is possible to find results similar to ours regarding sleep disorders (Melamed et al., 1999; Goldberg et al., 1996; Perski et al., 2002), age (Chen and McMurray, 2001; Bermejo and Muthny, 1993; Bartz and Maloney, 1986), job-related health problems (Chen and McMurray, 2001), educational background (Maslach et al., 2001), night shifts (Shader et al., 2001; Aslan et al., 1997; Wheeler and Riding, 1994), working areas (Pelosi et al., 1999) and income level (Aries and Ritter, 1999).

One of the limitations in our study is lack of data about personality characteristics or interpersonal relations of the participants. People who display low levels of hardiness (involvement in daily activities, a sense of control over events and openness to change), poor self-esteem and an external locus of control (attributing events and achievements to powerful others or chance) are more prone to higher burnout scores. Role conflict or role ambiguity in work organisation, lack of social support and feedback especially from supervisors and lack of autonomy for work-related decisions are also linked to burnout (Maslach et al., 2001). Another limitation is about the sample and the location of study. A university hospital, in which some departments like radiology or operating rooms get no direct sunlight, seems to be an ideal work setting to find staff under less daylight exposure for comparison with the others. Nurses, a high-risk group regarding burnout, also seem to be ideal for a study investigating predictors of burnout. But, we need larger sample from different work places and occupations if our results are to be generalised. Some authors have hypothesised that burnout shows a sequential progression over time (Maslach et al., 2001). If burnout is a process, then a follow-up study instead of a cross-sectional one would give more reliable results although most of the relevant data have come from cross-sectional studies.

5. Conclusion

We found moderate burnout levels among nurses working in our University Hospital. Suffering from sleep disorders and younger age were found as the predictors for all three parameters of burnout whereas job-related health problems and educational level were effective only on *EE*. Having night duties, working in inpatient services and dissatisfaction with annual income may be effective via *WRS* and *JS*. Our hypothesis claiming that there might be a relationship between burnout and

daylight exposure was not supported completely. Daylight exposure was indirectly effective on burnout via work stress and JS, but we could not find any significant direct effect. Further research using larger populations and different occupation groups is needed on this area to reach an appropriate conclusion. On the basis of our results, we recommend nursing administrators to consider the issue of daylight exposure while dealing with low JS and high work stress among nurses. Some rotations in working hours may be useful to provide the staff with more daylight exposure. Interventions to improve bad or hard working conditions such as providing enough number of personals, tolerable work hours or enjoyable work environment will be helpful to prevent nursing staff from suffering burnout.

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