ORIGINAL ARTICLE

Eastern Journal of Medicine

East J Med 28(3): 504-512, 2023
DOI: 10.5505/ejm.2023.55707

Assessment of Impulsivity, Circadian Preferences, and Job Satisfaction in Nurses working with Shift system

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ABSTRACT

Shift work, particularly night shifts may deteriorate many factors like impulsiveness and job satisfaction along with the impairment in physical and mental performance as well as familial and social relationships. In this study, our objective was to evaluate impulsiveness, circadian preferences, and job satisfaction in nurses and to compare their effects on the day and night shift work.

For this purpose, a total of 100 nurses of a university medical center hospital (50 working day shift and 50 working night shift) were included in the study between March 2020 and May 2020. They were evaluated with socio-demographic information form, Barratt Impulsiveness Scale, Morningness-Eveningness Questionnaire, and Minnesota Satisfaction Questionnaire. Correlation coefficient was calculated to determine the relationships between scales.

In our study, for the shift working nurses, the mean scores of the Minnesota Satisfaction Questionnaire, Barratt Impulsiveness Scale and Morningness-Eveningness Questionnaire were 58.13±13.44, 68.62±10.64, and 53.00±7.19 respectively. The Barratt Impulsiveness total score and the sub-dimensions of scale attentional impulsiveness and motor impulsiveness were significantly higher in night shift workers (p values≤0.05). Job satisfaction was not statistically associated with sex and shift work type.

It was found that impulsivity scale sores of night-shift workers were higher than daytime workers. Effective management of impulsivity and assessment of workers' suitability for the shift system according to their chronotypes are important for preventing deficiencies in the health system.

Keywords: Shift work, impulsiveness, circadian preferences, job satisfaction

Introduction

Shift work is defined as the rotational working pattern of workers to provide continuity through the working hours in an organization (1). In this working system, the organization tries to maintain uninterrupted work to be carried out at all times of the week or day. The shift system is the arrangement of the daily working time as the day, evening and night shifts, even though the starting and ending hours of the shift may vary depending on physical conditions of the workplace and type of production (2, 3). The shift work system is difficult to manage and has many negative impacts on health. The effects of shift work on physical and mental wellbeing became a popular research topic in recent years. Individuals, who have to work at night and sleep in times of social activities, suffer from social isolation and face a lack of communication with family members and close acquaintances. Nurses are one of the occupational groups, which experience problems caused by the shift working system, is the subject of this study (4). Nurses should be carefully and their job performance is very important. Severe mental, behavioral, physical and cognitive impairments which can affect professional practice have irreversible negative consequences (4-6).

Nurses, who work in a stressful and busy workplace, experience more anxiety and anger due to the unfavorable working conditions compared to individuals working in other occupational conditions or due to the contact with individuals, who are under stress because of their ailments (7). Even though it can be suggested that they exhibit relatively fewer reactions, there are no sufficient studies to support this claim. The determination and elimination of the problems related to the work-life and working conditions are important for the improvement of the quality of healthcare service and prevention of the deficiencies in the healthcare system (8).

Impulsiveness has an important role in the pathological and non-pathological personality structures and several psychiatric disorders (9).

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Received: 25.03.2022, **Accepted:** 16.02.2023

Eysenck associated impulsivity with risk-taking, lack of planning, and delayed focusing. Impulsivity can also be defined as a common action, which is untimely expressed and often leads to undesirable consequences and inappropriate situations (10). Impulsivity includes rapid and unplanned behaviors without thinking about the adverse consequences for himself/herself and other people (11). According to Barratt, impulsivity is a multi-dimensional concept comprising reaction suppression errors, rapid information processing, novelty-seeking, and insufficiency in delaying gratification. The most remarkable characteristics of individuals with high impulsiveness are the decreased sensitivity to negative consequences of their behaviors, sudden and rapid reactions to the external-internal stimuli before information processing and completing the judgment process, and lack of regard for long-term consequences (12,13).

Chronotype is the main determining factor for the daily light/dark layout and physiological adaptation to the shift work system. For example, the "morning types", who are mostly functional in the early morning hours, have a lower tolerance to night shift (14). Individuals working the night shift, try to sleep during the daytime and have to work during the daytime activities while the organism prepares itself for renewal. This conflicting situation leads to the disruption of physiological functions (15). If nurses had to work in hours not suitable for their chronotype, it was found that they become more strained, their sleep quality was impaired, and they faced problems like fatigue, distraction, and impaired problem-solving efficiency (16, 17).

Job satisfaction can be defined as an emotional reaction to the perception of the job and its surroundings by the worker. There are external factors originating from the workplace along with internal factors like promotion and rewarding, which can enhance job satisfaction. Job satisfaction is low among nurses depending on factors such as long shift work hours, low income, a wide range of responsibilities and insufficient occupational reputation in society. Low job satisfaction decreases motivation and occupational efficiency and consequently leads to thoughts about early retirement (6, 18, 19).

Although there are some studies focused on shift work, sleep problems in nurses according to their chronotype and impulsive behavior their numbers are rather limited (20). To the best of our knowledge, there is no study investigating the relationships between job satisfaction and these variables. For this purpose, we aimed to investigate impulsivity, circadian preferences, and job satisfaction among nurses performing who are working on day and night shifts in a university hospital, and the effects of the socio-demographic and descriptive characteristics on these factors. It is hypothesized that there are significant differences between impulsivity, circadian preferences and job satisfaction on working in night and day shifts. İmpulsivity and job satisfaction scores according to the circadian preferences of shift worker are different from each other and we also hypothesized that night shift workers would be more impulsive, and those with more impulsivity would have less job satisfaction.

Materials and Methods

This study was conducted with the nurses in a university medical center hospital between March 2020 and May 2020. The study population consisted of 500 nurses and the study sample size was calculated with the "Formula for calculation of sample size with known universe (Population Volume) ($n=Nz^2Q^2 / d^2 (N-1) + z^2Q^2$). A literature search revealed that the effect size value of the Barratt impulsivity total score was "0.1" and the standard deviation was "0.05". Hereunder, the primary type error was 5% ($z=1.96$) and the power value of the test was 80%, while the accepted standard deviation value was 0.05 units. The calculated minimum sample size was 81 ($n=81$). After considering the working conditions, we decided to conduct our study with a total of 100 nurses. Inclusion criteria for the study were as follows: voluntary participation, age between 18 and 55, not being pregnant, not having a history of substance abuse or dependence, absence of present physical or psychological disease. The exclusion criteria were as follows; being under 18 or above 55 years of age, use of medicine for any psychiatric disorders, having been working in the facility for less than one year. The day shift workers were selected from the nurses who worked only day shift (08:00-16:00) and the night shift workers were selected from the nurses, who were working rotationally in 08:00-16:00 and 16:00-08:00 shifts. The study data was collected by the researcher according to the sociodemographic information form and then Barratt Impulsivity Scale, Morningness-Eveningness Scale, and Minnesota Satisfaction Scales.

Sociodemographic Information Form: The characteristics of the participants like age, gender, marital status, education status, working year, income level, seniority in the occupation, number of shifts per week, and familial history of psychiatric disorders were recorded in this form, which was prepared particularly to obtain this demographic information of the participants.

Barratt Impulsiveness Scale-11 (BIS-11): It is a self-report scale for the individual's impulsivity level and was prepared by Patton, Stanford, and Barratt (1995) (21). Güleç et al., (2008) had conducted the validity and reliability studies and adapted this scale to the Turkish language. BIS-11 consists of 30 items and uses a 4-point Likert scale (1=rarely/never; 2=occasionally; 3=often; 4=almost always/always). BIS-11 provides four different scores; attentional impulsiveness, motor impulsiveness, non-planning impulsiveness scores and total score. A high total score indicates high level of impulsivity (22). Regarding the sub-scales; a high score of the attentional impulsiveness scale indicates that the individual exhibits careless behavior; a high score of the motor impulsiveness subscale indicates that the motor activities are increased and the individual acts without regard. A high score of the non-planning subscale indicates inconsistent planning of life (22).

Morningness-Eveningness Questionnaire (MEQ): This questionnaire was developed by Horne and Ostberg in 1976 (23). It enables the classification of individuals as "morning type", "evening type" or "intermediate type" according to the lifestyle, sleep-wake rhythm, and time of the demonstrated performance. MEQ is a self-reporting scale consisting of 19 questions. The answers, marked on the ruler or obtained from the Likert-type questions are recorded. A total score between 59–86 indicates that the individual is a "morning type" and scores 16 - 41 and 42 - 55 indicate "evening type", and "intermediate type" respectively. The validity and reliability study of this questionnaire has been performed (24).

Minnesota Satisfaction Questionnaire (MSQ): This questionnaire was developed by Weiss et al., in 1967 and adapted by Baycan to the Turkish language in 1985. The MSQ consists of 20 items and uses a 5-point likert scoring system (scores between 1 and 5). This questionnaire detects the internal and external satisfaction factors. Thus it provides scores for general satisfaction, internal satisfaction, and external satisfaction (25, 26).

Ethical Considerations: This study was approved by the Ethics Committee for Non-Interventional Clinical Research of Yuzuncu Yil University (Decision Date / No: 06.03.2020 / E.19489). It was conducted according to the criteria of the last version of the World Medical Association (WMA) Declaration of Helsinki and the Good Clinical Practice Guideline recently published by the Turkish Ministry of Health. Before the implementation of the personal information form and questionnaires, the participants were briefed about the objective of the study, personal information form, and content of the scales. The written informed consent was obtained from all nurses who accepted to participate in the study.

Statistical Analyses: Descriptive statistics for the continuous variables were expressed in mean values and standard deviation; the categorical variables were expressed in numbers and percentages. Kolmogorov–Smirnov test of normality was used. The comparative analysis of the independent variables was performed with the student's t-test or Mann-Whitney-U test for two groups according to the normality assumption. Kruskal-Wallis test or variance analysis was used for more than two groups. If the Kruskal-Wallis test showed differences, the paired comparisons were done with Dunn's multiple comparisons test. The Pearson correlation coefficient was calculated to detect the correlation between the scales. The correlation between the categorical variables was analyzed with the chi-square (x^2) test. For all analyses, $p<0.05$ was considered statistically significant. All analyses were performed with the SPSS.22 statistical software package.

Results

Fifty of the 100 nurses, were working on the night shift. 67% of the participants were married and 33% were single. The average age of the 100 participants was 31.55±7.30 years. The sociodemographic characteristics of the participants were listed in Table 1.

BIS-11 scores were compared between day and night shift groups by using analysis of variance, the attentional impulsiveness, motor impulsiveness, and total impulsiveness scores of the night shift workers were significantly higher than daytime workers ($p=0.025$, $p=0.001$, $p=0.017$). Considering the chronotypes, 73% of the day and night shift workers were "intermediate" type. Evening type was less in both groups (Table 2).

As seen in Table 3; the evaluation of the BIS-11 mean scores for descriptive variables showed a statistically significant difference between males and females ($p=0.002$). The scores of males were higher than females on this scale. The analysis of the BIS-11 scores did not reveal a statistically significant difference for marital status, smoking, history of psychiatric disorder. There was no statistically significant difference for the education status and income level variables either.

The analysis of the total score of the MSQ for descriptive characteristics showed a statistically significant difference between job satisfaction and income levels ($p=0.016$). According to the results of the Dunn's Multiple Comparisons Test, which was

Table 1: Distribution of Descriptive Characteristics of Healthcare Workers (N=100)

Gender	N (%)	Shift	N (%)	Marital Status	N (%)
Female	58 (58%)	Night	50 (50%)	Married	67 (67%)
Male	42 (42%)	Day	50 (50%)	Single	33 (33%)
Smoking	N (%)	History of Psychiatric Disorder	N (%)		
Yes	24 (24%)	Yes	6 (6%)		
No	76 (76%)	No	94 (94%)		
History of physical Disease	N (%)	Psychological Disorder in Familial History	N (%)	Income Status	N (%)
Yes	15 (15%)	Yes	11 (11%)	2000-3499	16 (22%)
No	85 (85%)	No	89 (89%)	3500-4999	47 (47%)
				5000+	37 (37%)
Age (years)	N (%)	Education Status	N (%)		
18-25	27 (27%)	High School	12 (12%)		
26-33	37 (37%)	Assoc. Graduate	39 (39%)		
34-41	23 (23%)	Graduate	45 (45%)		
42+	13 (13%)	Postgraduate	4 (4%)		

Table 2: Comparison of Two Groups (Day and Night Shift) for Barratt Impulsivity Scale and Morningness-Eveningness Questionnaire

	Day Shift (N=50)	Night Shift (N=50)	Total (N=100)	*p
Barratt Impulsivity Scale	mean±SD	mean±SD	mean±SD	
Attention	18.00±5.28	18.90±3.24	18.45±4.38	0.025
Motor	21.20±4.58	24.54±4.01	22.87±4.60	0.001
Planning	27.40±5.26	27.20±4.31	27.3±4.79	0.917
Total	66.60±11.67	70.64±9.17	68.62±10.64	0.017
	N (%)	N (%)	N (%)	**p
MEQ (Morningness-Eveningness)				
Morning Type	11 (11%)	9 (9%)	20 (20%)	0.792
Intermediate Type	35 (35%)	38 (38%)	73 (73%)	
Evening Type	4 (4%)	3 (3%)	7 (7%)	

p≤0.05 *Independent T-test statistics **Chi-square test statistics
MEQ: Morningness-Eveningness Questionnaire

performed to determine the source of the difference, a significant difference was found between the income levels 2000-3499 Turkish lira (TL) and 5000+ (p=0.005) as well as between 3500-4999 and 5000+ (p=0.016). Participants, who had a salary higher than 5000, had higher job satisfaction. There was no statistically significant difference between age and education status for job satisfaction (Table 4).

The total scores of the questionnaires and the correlation coefficients showing the relationships between the three sub-scales of the BIS-11 were given in Table 5. A positive correlation (22.1 %) was determined between the total MEQ score and planning as seen in the table. According to this finding, it can be suggested that the total MEQ score increases about 22.1% with the increase of the planning scores of the individual. There were no statistically significant correlations between the total MSQ scores and other characteristics.

Discussion

It is well known that shift work including night shift may lead to several biological, psychological, and social problems. The objective of the study was to

Table 3: Comparison of Barratt Impulsivity Scale (BIS-11) Mean Scores For Descriptive Variables

		N	Median (min-max.)	Mann-Whitney-U	p
Gender	Female	58	66 (48-95)	766.00	0.002
	Male	42	73.5 (45-101)		
Marital Status	Married	67	68(45-101)	989.00	0.393
	Single	33	70(54-95)		
Smoking	Yes	24	70(51-101)	823.50	0.475
	No	76	67.5(45-96)		
History of Psychiatric Disorder	Yes	6	66(53-95)	274.00	0.907
	No	94	68.5(45-101)		

$p<0.05$

Table 4: Comparison of Minnesota Job Satisfaction Questionnaire Mean Scores for Descriptive Variables

		N	Median (min-max.)	Mann-Whitney U	p
Shift	Day	50	57(24-78)	1094.00	0.282
	Night	50	58.5(22-85)		
Gender	Female	58	58(29-80)	1100.00	0.410
	Male	42	57(22-85)		
Marital Status	Married	67	57(22-85)	1021.50	0.538
	Single	33	59.5(29-80)		
Smoking	Yes	24	59(24-78)	902.00	0.936
	No	76	57.5(22-85)		
History of Psychiatric Disorder	Yes	6	65(52-78)	179.00	0.135
	No	94	57(22-85)		

		N	Median (min-max.)	Chi-Square	p
Age	18-25	27	58(33-75)	6.184	0.103
	26-33	37	56(22-83)		
	34-41	23	57(39-85)		
	42+	13	67(44-77)		
Education	High School	12	63.5(39-78)	5.554	0.135
	Assoc. Graduate	39	57(29-80)		
	Graduate	45	57(22-85)		
	Postgraduate	4	73.5(57-80)		
Income	2000-3499	16	50.5(40-63)	10.391	0.016
	3500-4999	47	57(22-83)		
	5000+	37	61(45-85)		

*p<0.05, **: p<0.01

investigate the factors like impulsivity, circadian preferences, and job satisfaction in a total of 100 nurses. Fifty of them were night shift workers and the others were daytime workers. The most important finding of the study was that night shift workers had higher scores of distraction, motor impulsiveness, and total impulsiveness compared to daytime workers.

There are several studies focused on attention and impulsivity in shift workers (6, 27). In one of these studies, a significant increase was found in the hyperactivity and impulsivity scores of workers, who worked rotationally in night and day shifts, compared to the daytime workers. However, in drivers, there was no significant difference for the distraction,

Table 5: Correlation between Barratt Impulsivity (BIS-11) Scale, Minnesota Job Satisfaction Questionnaire (MSQ), and Morningness-Eveningness Questionnaire (MEQ)

BIS-11		Attention	Motor	Planning	MSQ Total	MEQ Total	BIS Total
Attention	r	1					
Motor	r	0.467**	1				
Planning	r	0.403**	0.321**	1			
MSQ Total	r	0.142	0.169	0.148	1		
MEQ Total	r	0.112	-0.062	0.221*	0.147	1	
BIS-11 Total	r	0.807**	0.753**	0.764**	0.153	0.117	1

*: p<0.05; **: p<0.01 r: Pearson correlation coefficiens
MSQ: Minnesota Job Satisfaction Questionnaire
MEQ: Morningness-Eveningness Questionnaire
BIS-11: Barratt Impulsivity Scale

gender, marital status, education status, and working time (27). In agreement with the results of this study, a study conducted by Çakar et al., (2015) the mean scores of "attentional impulsiveness", "motor impulsiveness", "non-planning impulsiveness", and "general (total) impulsivity" were 16.33±2.54; 20.85±3.67; 28.22±3.72; and 65.40±6.96 respectively (8). Individuals with high attentional impulsiveness scores face problems associated with attention and adaptation. When the individuals try to focus on a topic, they can easily be distracted from the main topic and can feel forced to think about other topics due to the emergence of different thoughts in their minds. Therefore, these individuals can be easily distracted and they are unable to show tolerance to cognitive confusion. Individuals with high motor impulsiveness scores react promptly to the encountered problems. They are usually tense and impatient in their daily life and want that their expectations are immediately fulfilled. Individuals with high non-planning impulsiveness scores cannot make plans for the future and exhibit uncontrolled behaviors (28, 29).

Rosenbloom and Wutz (2011) explored the behavior of the drivers with and without high distraction and hyperactivity scores in respect of gender. They found that the driving habits of the female drivers with high distraction and hyperactivity scores were safer compared to the males (30). We found significantly higher scores in males compared to females according to impulsivity. In the study conducted by Selvi et al. (2015), it was found that night shift workers had higher distraction and impulsivity scores compared to the daytime workers. Regarding the correlation between the impulsivity scores and participants' demographic characteristics like age, gender, marital status, work schedule, working time, smoking habit, morningness-eveningness, distraction, and hyperactivity sub-scale scores, unmarried and night shift workers had significantly higher impulsivity scores (6).

Job satisfaction in shift workers is also another important research topic. In a current study conducted by Bağır (2019), 146 participants were assessed with the MSQ and the analysis showed no significant difference for gender and marital status in respect of job satisfaction (31). Adams and Bond (2000), found no correlation between demographic characteristics like age, education, and job satisfaction (32). Arslan (2008) found that job satisfaction scale scores (internal - external - overall) were significantly higher in workers, who stated that the working pattern had a positive effect on their lives. Considering the working pattern, it was suggested that the high job satisfaction in daytime workers might depend on their regular life. Özaltın et al., (2002) reported that job satisfaction was higher in workers without shift work or with short duration shift work compared to the workers with long and continuous shift work (33). According to these results, it can be considered that the working styles did not affect the job satisfaction. The results of this study are consistent with our study. Regarding nursery, where 24-hour service is required, it can be suggested that shift work had negative effects on the life of nurses, who have additional responsibilities for their partners and mothers, and impaired job satisfaction. We detected that income level was correlated with job satisfaction. This indicated that improvements in the salaries of the nurses will contribute to the improvement of job satisfaction and no gender difference in job satisfaction associated with shift work.

The determination of the chronotype is critical for the evaluation of the suitability of the individual to shift working. It was reported that evening types are more suitable for the night shift and morning types are more appropriate for the day shift (34). Guzel

Ozdemir (2013), et al. investigated the chronotypes of nurses on the night shift. The participants (45 participants on the night shift and 45 participants on the day shift) were divided into groups regarding their chronotype (morningness, eveningness, intermediate). However, the investigators did not find any significant difference between the night shift and daytime workers. They determined that night shift workers were mostly evening-type (35). We investigated the individual differences according to sleep-wake cycle for chronotype and we observed that most of the day and night shift workers were "intermediate" type of chronotype. In the study of Karahan et al. in Turkey, in accordance with our study, it was reported that the majority of nurses consisted of intermediate type, and evening type constituted the least number of the group (16). A recent study on more than 500 female nurses working fixed day and rotating night shifts reported that rotating night shift nurses were more likely to have evening or intermediate chronotypes (36). In another study, it was revealed that 270 nurses, nurse assistants and technicians working in surgical clinics were the most (41.5%) "intermediate type" and the least "evening type" (21.6%) (37). However, the results in the nurses were different according to the working style. Unlike our study, Zhang et al. (2018) conducted a study on nurses (n=397) and found that 49.5% of nurses were "morning-type", 29.1% "evening-type", and 21.4% "intermediate type" (38). In a Spanish study of 390 nurses in 6 hospitals, the authors determined that "morning-type" was the most common (35.1%) and the "intermediate" was the least common (30.8%) type among nurses (39). In a study carried out in the Netherlands, 64% of the 96 intensive care nurses were "morning-type" (40).

Notwithstanding the differences, characteristics related to chronotype should be taken into consideration to find out whether an individual is appropriate for shift working. If it is known to which chronotype the individual belongs (morning, evening, or intermediate) and the working schedule is arranged accordingly, better results may be obtained (16). Consistent with previous studies, there were no significant deviations on the MEQ scores between the two groups.

Our study is a preliminary one drawing attention to the correlation of job satisfaction with impulsiveness, and circadian rhythm in a shift working system. This is the first study that has investigated the relationship between the work schedule and impulsivity, job satisfaction and chronotype and we did not find any relationship between job satisfaction and other parameters except of salary. Nevertheless, it has some limitations, which should be taken into consideration during the interpretation of the results. The most important of these limitations was small sample size and conducted only in one hospital. We did not search these relationships according to the clinics the participants worked. All data were based on self-reports, which may sensitize results to common method bias.

It was found that impulsivity scale sores of night-shift workers were higher than daytime workers. Chronotype should be evaluated to determine whether an individual is suitable for shift work. As we determined a significant difference between the income level and job satisfaction, we recommend the consideration of an improvement in the salaries of nurses. The training focused on the effective management of impulsivity and how to work effectively and efficiently can be organized to protect and maintain the psychological wellbeing of nurses (male and female nurses). Assuming that job satisfaction is a variable directly affecting individuals and organizations, it can be suggested that further studies focused on the correlation between impulsivity, job satisfaction and different other parameters. In conclusion, we recommend that studies with greater sample sizes and in different hospitals should be conducted to generalize these results.

Competing Interests: Authors state no conflict of interest.

Informed Consent: Informed consent was obtained from all individuals included in this study.

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