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Consequences of Split Shift Work in Indian Traffic Police Personnel: Daytime Sleepiness, Stressors and Psychological Distress

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Abstract

The present study was aimed to measure the daily routine preference, daytime sleepiness, and psychological distress experiences, because of split shift system job in a sample in traffic police personnel of Raipur city, India. To measure such parameters we used the Morningness-Eveningness Questionnaire, Epworth Sleepiness Scale (ESS), Operational Police Stress Questionnaire (OPSQ), General Health Questionnaire and the Distress. To evaluate differences between age, body mass index, period of service length and drug / alcohol use for all the subjects (traffic police personnel) the t-test and chi-square test were used. Total Hundred male traffic police personnel participated and out of which most of them were found to belong in the evening active category. This study also indicates increased prevalence of excessive daytime sleepiness and (EDS) high level of psychological distress as measured by the GHQ-12 among few police workers. Moreover, a number of participants reported significant distress levels, when measured with distress thermometer. In nutshell, the study sample suggests adaptive coping strategies of traffic police personnel working in split shift system profession can be attributed to their evening (E)-type circadian preferences.

Introduction:

Police organisation relies on healthy, job satisfied and committed police personnel. Nevertheless, irrespective of various types of shift work Policemen tends to be regarded as naturally stressful due to individual risk of experience to violence and variety of other life-threatening events. The police job profile includes the detection, prevention and investigation of crime, aggressive pressure, and police act of violence & burnout have been shown to significantly affect coping strategies, behaviors and health outcomes of police workers and are causing concern to organization (Lambert *et al.*, 2016; Svedberg & Alexanderson, 2012). Police officers are often calling for work in extended long shifts hours under highly stressful circumstances. Studies on police personnel in different ethnic population strengthen findings that police work is constantly stressful job due to hazardous environmental work exposures and includes workplace violence (Violanti *et al.*, 2013; Masilamani *et al.*, 2013; Pourshaikhian *et al.*, 2016). As a result prevalence of considerable associated

mental ill-health like emotional disturbances, sickness absence (Magnavita and Garbarino, 2013), stress-related diseases (Izawa *et al.*, 2016), poor sleep quality (Charles *et al.*, 2016), depression (Lawson *et al.*, 2012), anxiety, psychological distress, dissatisfaction with life, health problems especially digestive, nervous, and musculoskeletal, and adverse work conditions such as excessive workload and feeling of victimization (Souza *et al.*, 2012) symptoms might be expected in such population. Working in irregular shifts is ultimately get associated with irregular diet, adverse habits, obesity, larger waist circumferences/higher body mass index and alteration of some lipid measures among male police personnel working the midnight shift (Charles *et al.*, 2016; Violanti *et al.*, 2013). This study intends to know the circadian (circa=about; dian= 24 hours cycle) preference, excessive daytime sleepiness, stressors, psychological distress and general health conditions in traffic police personnel of Raipur city, (Chhattisgarh, India) working under split shift system schedules.

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Materials and methods:

In this study 100 male traffic police personnel (median age = 35 years, mean age = 39.1 ± 11.26 years; married = 87%; mean weight = 71.64 ± 11.34 kg; mean height 172.64 ± 5.65 cm; median body mass index (BMI) = 24.22 kg/m^2 ; mean BMI = $24.06 \pm 3.81 \text{ kg/m}^2$) were participated, working at the Raipur city (C.G.) Traffic police, India. The length of the chosen traffic police service years was in the range from 2 to 42 years (Median years of service 9.5 years). After getting proper permission, the participants were served a self-administered questionnaire.

Proper permission for the study was obtained from the relevant authority of the police department before the study began. In the initial stage of our study, a self-administered questionnaire was filled up to get the information on demographics and lifestyle characteristics including age, education level, smoking status, physical activity, anthropometric data, caffeine use, tobacco or alcohol consumption, history of any diseases. Working hours: The individual traffic police worked in a rotational split-shift system (early or late shifts) characterized by person's work schedule (eight hour duty, either early or late shifts) split into two parts i.e. early shifts for four hours in the morning (08:00 am to 12:00 pm) then four hours in the evening (16:00 pm to 20:00 pm) or late shifts for four hours in the afternoon (12:00 pm to 16:00 pm) then four hours in the night (16:00 pm to 24:00 am). In spatial circumstances, they have to work for extended hours on road/ highway as per the requirements in a number of days known as On-call shift. Measurements: In this study, the major variables focused on most suited time period for various biological activities (circadian preferences), viz., sleepiness, stressors, including behavioral and /or psychological issues viz., unfair treatment, work satisfaction, administrative support, health problems etc. Morningness-Eveningness Questionnaire (MEQ) prepared by Horne & Östberg (1976), was applied initially to all 100 cases of traffic police personnel. It is a 7-item questionnaire for chronotype prevalence study. The scores range from 6 to 32 and participants can be classified into three categories: (1) 6 to 15 for the evening (E)-type; (2) 16–22 for intermediate (I)-type; (3) 23 to 32 for the morning (M)-type. Higher values on MEQ designate stronger morningness preference. During the Second step, daily sleepiness was assessed in all subjects by Epworth Sleepiness Scale (ESS), (Johns, 1991). It consists of 8 items each measured on a scale from 0 to 3. The scores for the eight questions are added together to obtain total score ranging from 0 (no chance of dozing) to 24 (high chance of dozing). ESS score =10 indicates increased daytime sleepiness. During the third step, traffic police personnel were given to complete a self-report measure which is a 20-item Operational Police Stress Questionnaire (PSQ-Op) to determine operational stressors associated with

performing a job of policing. The PSQ-Op deals with stressors for an occasion, fatigue and health problems as an outcome of the job type. PSQ-Op scales (Shane, 2010) are a 7 point Likert Scale (ranges from 1: no stress at all, 4: moderate stress, 7: a lot of stress and 2, 3, 5, 6 are filler). During the fourth step, the general health questionnaire (GHQ-12) was provided to the subjects to assess psychological distress. It consists of 12 items (six are positively framed and the remaining 6 are negatively framed) which assess the mental problem using a 4 point Likert-type scale (from 0 to 3). The obtained scores were added to produce a total score ranging from 0 to 36. The positive items were scaled from 0 (always) to 3 (never) and the negative items were scaled from 3 (always) to 0 (never). High scores show poorer health. Based on the threshold scores, the participants were then split into no distress (scores <15), moderate distress (scores 15–20), and high distress (scores >20) groups.

In the final of the fifth stage, the distress thermometer (DT) was used to evaluate subjective stress on a visual analogue scale in traffic police personnel. It is a single-item, 11-point scale in a thermometer layout on which traffic police personnel were asked to rate their level of distress they felt during the job in the previous week. It consists of a line with a 0-10 scale, in which 0 point shows "no distress" and 10 points shows "extreme distress". We used a cut-off score of 5 to indicate distress.

Statistical analysis:

Data were analysed using Microsoft Excel 2010 (Microsoft Corporation, Seattle, WA, USA). Descriptive measures (means $\pm$ SD) were calculated for all test variables and items. Results were calculated using frequency distribution. For statistical analysis t-test, Chi-square test, correlation and descriptive statistic are used.

Results:

Out of 100 traffic police personnel, only 17 were reported as occasional smokers, 33 were alcoholic and rest all were reported to be the social drinkers/any stimulant Consumers. In this study, only 8 participants forwarded their history of health problems.

Distribution of MEQ Score: The average MEQ score was 14.36 (SD=2.69) (Table-1). Out of 100 traffic police personnel, about 67% were evening (E)-type, whereas 32% were intermediate (I)-type and only 1% was morning (M)-type. On the basis of circadian preference frequency a statistically significant (Chi-square, $p < 0.05$) difference was observed in the distribution of evening (E)-type, intermediate (I)-type and morning (M)-type in the young age group as compared to old age group (Table-2). Results of t-test showed statistically significant ($p < 0.05$) decreases (towards greater eveningness), although small, in MEQ average scores of older age and higher years of traffic police service groups. In contrast, MEQ average

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scores increase statistically significant ($p < 0.05$) in the group used to drug/ alcohol (Table 3).

Distribution of EES Score: overall mean ESS score was 7.93 (SD 3.70) with a range of 1-20 (Table 1). The results suggest that 29% of personnel experienced an excessive daytime sleepiness (ESS=10) score and 71% personnel had normal sleepiness (ESS<10) score (Table-2). Table-3 depicts that the difference in ESS average score is statistically significant in young and old age groups (t-test-1.79; $p < 0.05$).

Table 1: Descriptive statistic of all variables (at group level) studied in traffic police officers (N=100)

Statistic	MEQ	ESS	PSQ-Op	GHQ-12	DT
Mean	14.36	7.93	66.21	19.03	4.11
Standard Error	0.27	0.37	0.92	0.25	0.16
Median	14	7	65.5	19	4
Mode	14	6	60	21	6
Std. Deviation	2.69	3.70	9.20	2.54	1.61
Sample Variance	7.22	13.72	84.67	6.43	2.58
Confidence Level (95.0%)	0.53	0.74	1.83	0.50	0.32

Morningness-Eveningness Questionnaire (MEQ); Epworth Sleepiness Scale (ESS); Operational Police Stress Questionnaire (PSQ-Op); General health questionnaire (GHQ-12); Distress thermometer (DT)

Distribution of PSQ-OP Score: the average PSQ-Op stressors scores for 20 items ranged from 1.26 to 4.76. Overall study results mean PSQ-Op scores for approximately half of the items corresponded to a moderate range of stressors (Table-4). The major stressor for traffic police personnel were shift work (4.37 ± 0.19), working alone at night (4.71 ± 0.09), overtime demands (4.76 ± 0.18), injury risk on job (4.69 ± 0.08), work on days off (4.31 ± 0.23) and fatigue (4.17 ± 0.16).

Table 2: Distribution of MEQ scores, ESS scores, GHQ-12 scores and DT scores as a function of age in traffic police officers.

		Fr. Young	Fr. Old	Total	χ^2 -square	'p' value
MEQ	E-type	28	39	67	10.663	<0.01
	I-type	24	8	32		
	M-type	0	1	1		
		Young	Old	Total		
ESS	Excessive Daytime Sleepiness	19	10	29	2.99	0.08
	Normal Sleepiness	33	38	71		
		Young	Old	Total		
GHQ	High distress	16	14	30	0.03	0.98
-12	Moderate distress	35	33	68		
	No distress	1	1	2		
		Young	Old	Total		
DT	Incidence of distress	22	22	44	0.12	0.72
	No distress	30	26	56		

Morningness-Eveningness Questionnaire (MEQ); Epworth Sleepiness Scale (ESS); General health

questionnaire (GHQ-12); Distress thermometer (DT)

Distribution of GHQ-12 Score: a mean GHQ-12 score of 19.03 (SD 2.54) was obtained for traffic police personnel (Table 1). We found that 2% of the traffic police personnel shows no distress (scores <15), 68% shows moderate distress (scores 15-20), and 30% shows high distress (scores >20) (Table 2). **DISTRIBUTION OF DT SCORES:** Overall on average traffic police personnel demonstrated positive coping strategies with the profession (mean 4.11 ± 1.61). We observed that in this population the incidence of distress (DT score =5) was 48% and no distress (DT score <5) was 52% (Table-2). Further, the results of correlation indicated non-significant relationship between the variables studied in the present study (Table-5). The degree of GHQ-12, PSQ-Op and DT scores are not significant across age, BMI, years of service length and drug use/ alcoholism (Table-3).

Table 3: t-test of the difference between various groups (agewise, obesity, traffic police years of service, Drug/ Alcoholic intake) for all variables studied in traffic police officers.

Score	Mean $\pm$ SE Young	Mean $\pm$ SE Old	t-Stat	p-value
MEQ	15.08 $\pm$ 0.37	13.58 $\pm$ 0.36	2.79	<0.001
ESS	8.58 $\pm$ 0.55	7.23 $\pm$ 0.47	1.79	<0.05
PSQ-Op	66.13 $\pm$ 1.32	66.29 $\pm$ 1.29	-0.11	0.46
GHQ-12	19.17 $\pm$ 0.35	18.88 $\pm$ 0.38	0.49	0.31
DT	4.19 $\pm$ 0.20	4.02 $\pm$ 0.26	0.37	0.35
	Normal weight	Obesity		
MEQ	14.80 $\pm$ 0.33	13.94 $\pm$ 0.41	1.52	0.07
ESS	7.84 $\pm$ 0.53	8.02 $\pm$ 0.52	-0.31	0.38
PSQ-Op	66.41 $\pm$ 1.38	66.02 $\pm$ 1.23	0.18	0.43
GHQ-12	19.16 $\pm$ 0.34	18.90 $\pm$ 0.38	0.42	0.34
DT	4.10 $\pm$ 0.23	4.12 $\pm$ 0.23	-0.20	0.42
	Low years	High years		
MEQ	14.94 $\pm$ 0.37	13.78 $\pm$ 0.38	2.10	<0.05
ESS	8.5 $\pm$ 0.59	7.36 $\pm$ 0.44	1.48	0.07
PSQ-Op	66.3 $\pm$ 1.37	66.12 $\pm$ 1.24	0.07	0.47
GHQ-12	19.12 $\pm$ 0.33	18.94 $\pm$ 0.39	0.26	0.40
DT	4.2 $\pm$ 0.21	4.02 $\pm$ 0.24	0.40	0.34
	No drug/alcohol	Drug/Alcohol intake		
MEQ	13.88 $\pm$ 0.28	15.33 $\pm$ 0.55	-2.44	<0.05
ESS	7.91 $\pm$ 0.46	7.97 $\pm$ 0.64	-0.14	0.44
PSQ-Op	66.79 $\pm$ 1.07	65.03 $\pm$ 1.74	0.84	0.20
GHQ-12	19.04 $\pm$ 0.29	19.00 $\pm$ 0.49	-0.01	0.50
DT	4.12 $\pm$ 0.19	4.09 $\pm$ 0.31	-0.06	0.48

Table 4: Descriptive statistics of 20-item operational Stress in traffic police officers

PSQ-Op	Mean $\pm$ SE	Median	Mode	SDCL (95.0%)
Shift work	4.37 $\pm$ 0.19	5	6	1.94 0.38
Working alone at night	4.71 $\pm$ 0.09	4	4	0.94 0.19
Overtime demand	4.76 $\pm$ 0.18	5	6	1.78 0.35
Injury risk on job	4.69 $\pm$ 0.08	4	4	0.83 0.16
Work on days off	4.31 $\pm$ 0.23	4	2	2.25 0.45
6- item	3.53 $\pm$ 0.18	3.5	4	1.75 0.35
7- item	3.87 $\pm$ 0.19	4	3	1.89 0.37

PSQ-Op	Mean $\pm$ SE	Median	Mode	SDCL (95.0%)	
8- item	1.78 $\pm$ 0.06	2	2	0.63	0.12
9- item	2.16 $\pm$ 0.09	2	2	0.92	0.18
10- item	2.64 $\pm$ 0.10	3	3	1.03	0.20
11- item	2.39 $\pm$ 0.10	2.5	3	1.01	0.20
Fatigue	4.17 $\pm$ 0.16	5	5	1.63	0.32
13- item	3.55 $\pm$ 0.18	3	2	1.83	0.36
14- item	3.09 $\pm$ 0.16	4	4	1.61	0.32
15- item	3.17 $\pm$ 0.17	3	2	1.68	0.33
16- item	3.38 $\pm$ 0.20	3	5	2.04	0.41
17- item	2.77 $\pm$ 0.13	2	4	1.26	0.25
18- item	1.26 $\pm$ 0.07	1	1	0.71	0.14
19- item	2.90 $\pm$ 0.22	2	2	2.24	0.44
20- item	2.71 $\pm$ 0.15	3	1	1.46	0.29

Operational Police Stress Questionnaire (PSQ-Op)

Table 5: Correlation among various variables (Morningness-Eveningness Questionnaire (MEQ); Epworth Sleepiness Scale (ESS); Operational Police Stress Questionnaire (PSQ-Op); General health questionnaire (GHQ-12); Distress thermometer (DT) studied in traffic police officers.

	AGE	BMI	MEQ	ESS	PSQ-Op	GHQ-12
BMI	0.26*					
MEQ	-0.28*	-0.12*				
ESS	-0.18*	0.08*	0.25*			
PSQ-Op	0.06*	0.02*	-0.16*	-0.06*		
GHQ-12	-0.06*	-0.02*	0.04*	0.00*	-0.03*	
DT	-0.17*	-0.01*	0.00*	0.10*	-0.14*	-0.05*

* (Non significant)

Discussion:

The distribution of chronotypes (morning/ evening/ intermediate active persons) provides evidence that the majority of traffic police personnel belonged to the evening type category. The intermediate type was found to be the second priority, and the morning type was found to be least frequent. The finding resembles with the previous studies in which work schedules were reported to be important predictors of chronotype, with night workers more likely to be the definitely evening type (Paine *et al.*, 2006). It has been reported that the eveningness may assist the adaptation of evening chronotypes (E-types) to night shift work. However, in a recent study, poor sleep quality in E-types for both the night and day shifts (Martin *et al.*, 2015) was also evidenced.

Earlier authors reported that chronotype is indeed the age and gender-dependent factor (Urbán *et al.*, 2011). However, in our finding there was no direct relationship of age and body mass index with chronotype was revealed. Reports are also available which concluded that the chronotype preference is fairly independent of ethnicity, gender, and socioeconomic position indicating that chronotype is an endogenous characteristic (Paine *et al.*, 2006). But, we found that obesity is marginally associated with chronotype.

In the present study conducted on the traffic police

personnel who were habitual of drugs or alcohol intake were more likely to be evening types. This finding corroborate earlier reports wherein it has been shown that evening active subjects used more stimulating and sedative substances like smoking and alcohol as compared to their morning active counterparts (Kervran *et al.*, 2015; Urbán *et al.*, 2011). Excessive daytime sleepiness is one of the most common problems that police officers have to cope with (Garbarino, 2014). As per the general accepted criterion ESS>10, in the present study, excessive daytime sleepiness (EDS) was revealed in only 29 % of the traffic police officers. However, Dominguez *et al.* (2006) reported, EDS to be more common (about 63%) among air traffic controllers and results into disturbances in the sleep-wake cycle. This could be attributed to the difference in physical activity during job and environmental light exposure while setting the circadian clock.

It has been already reported that obese people perform significantly more sleepiness than people with normal weight (Sander *et al.*, 2016). In our study, obesity was not found to be anyhow associated with daytime sleepiness. In addition, there has been no statistical significance in long years of Services and drug/ alcohol intake was evidenced. Further, among traffic police personnel we observed that the degree of ESS scores is statistically significant across age. Our results suggest that young age group working in rotational split shifts experienced excessive daytime sleepiness at work than older age group. This result supports the findings of earlier study wherein a continuous decline of daytime sleepiness was observed in the age range of 40-80 years (Sander *et al.*, 2016). On the other hand, some other studies indicated that sleeplessness or poor sleep quality decreased work efficiency. Therefore, further studies are needed to plan interventions for coping strategies that decrease daytime sleepiness of this age group. Study of stressors: Occupational stress was commonly apparent in all kind of police work, but the major characteristic of stress level in different groups varied (Singh & Kar, 2015). Overall our results indicated that traffic police officers exhibit good psychometric properties according to the PSQ-Op scores as most of the items corresponded to a normal range to the moderate range of stressors. These findings are in accordance with an earlier study (Udih & Idubor, 2016). Another study has used PSQ-Op in order to assess police-specific stressors and reported a higher level of stress in police personnel (Setti & Argentero, 2013). The reason for this apparent discrepancy in results may be due to the differences in nature of the police task. In the present study, higher prevalence rank order of stressors for traffic police personnel were overtime demands, working alone at night, injury risk on the job, shift work and work on days off. Similar results were also found in the earlier study (Udih & Idubor, 2016).

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Psychological stress: Mental health problems are more common among police personnel (Nelson & Smith, 2016). We confirmed the above previously reported study since out of 100 cases, 30 cases found to be having high psychiatric distress whereas 68 cases found to have moderate psychiatric distress according to the GHQ scores. Hence this study suggests that psychiatric symptoms should be evaluated further on a larger traffic police population. Further, we observed no change in the psychiatric stress level according to age, obesity, years of service length and drug/ alcohol intake. However, at this level, we do not have sufficient data on the psychiatric stress level association with above-mentioned factors so as to state something rigidly.

Distress thermometer: The findings of our study imply that traffic police personnel confirmed adaptive coping strategies with the profession as per their normal DT score. We observed that in this population the incidence of distress was only 48%. Similar results were also reported in an earlier study (Acquadro *et al.*, 2015).

Conclusively, these findings suggest the need and direction of further research on larger sample size.

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