

## Night work effects on stress, sleep quality and cognitive performance of police officers

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### **Abstract**

Police work is in need at night. This may have adverse effects on police officers involved. This study aims to assess police officers stress, sleep quality, and cognitive performance using Spielberger Police Stress Survey, Pittsburgh Sleep Quality Index and Cognitive Functioning Self-Assessment Scale respectively. Data were obtained from 307 police officers at one of the Gulf countries. Levene's test of equal variances, t-test, analysis of variance, Cronbach's alpha and Spearman's rank correlation were used to analyse the data. Results showed that shift work has negative consequences on sleep quality, cognitive performance and, to a lesser extent, on stress. Results also showed that shift officers reported struggling more to stay awake than non-shift officers. Moreover, alarmingly short sleep duration and long time to fall asleep of many police officers, regardless of their roster, were reported. Cronbach's alpha outcome indicated that the results are reliable. This paper presents a novel work on shift work effects on police officers in developing countries. Based on the results, recommendations to help police officers cope with the negative effects of night work and improve their performance and sleep quality are given at the end.

**Keywords:** Shift work, police officers, sleep quality, cognitive functions, stress.

### **Introduction**

Shift work is a work pattern where employees on the following shift take over the same role on a rolling basis over, usually, a 24-hr period (Richbell and Chan 2011).

Shift work has become widespread across many sectors to provide essential 24-hr services such as police, hospitals, refineries, power generation, etc. Although shift work is essential in all societies, there is evidence demonstrating that shift work could lead to excessive stress, fatigue, sleep disorders, health problems, disruption in social life, psychological and physiological disturbances, etc. (Bendak 2003; Drake and Wright 2011).

In general, circadian rhythm of humans is impacted by sunlight exposure, where daylight boosts rhythms and night darkness delays them (Boivin et al. 1996). Employees on shift work are expected to adjust their sleeping schedule while their sleeping and awakening pattern is continuously changing. This can result in disruptions to their circadian rhythm (Violanti et al. 2008). This circadian rhythm disruption among shift operators can lead to disturbed sleep, mood changes, irregular hormone rhythms, diminishing cognitive ability, cardiovascular diseases, diabetes, obesity, metabolic syndrome and cancer. It can also lead to worse working memory and visual attention and disrupted perception which could result in greater accident risk and poorer performance (Guo et al. 2013; Wright et al. 2013).

Police work requires working at night when cognition, alertness, and vigilance are at their lowest levels (Horrocks and Pounder 2006). Both Drake et al. (2004) and Yazdi et al. (2014) reported that shift employees, like police officers, are more vulnerable to poor sleep quality, insomnia and daytime sleepiness. More specifically, average sleep duration of night shift employees was reported to be two hours less than those working day shifts (Torsvall et al. 1989). This shorter sleep duration, according to Mohr et al.

(2003), can increase traumatic stress which can adversely affect health of those involved, especially among those with high occupational stress levels police officers.

Police officers in their work are usually exposed to several occupational stressors including high physical and psychological workload levels, social life/work imbalance and insufficient support. Their work might also involve exposure infectious diseases and hazardous substances (Collins and Gibbs 2003, Nevels et al. 2021). Moreover, shift work is usually considered as a stressor in police work. It was reported in the scientific literature that police officer's work exposes them to greater stress levels than other occupations (Gerber et al. 2010, James et al. 2022, Opielka and Staller 2024).

Cognitive performance basically refers to actions a human does that involve the brain. Cognitive performance is essential for police officers in order to do investigative and administrative tasks (De Souza-Talarico et al. 2020). Cognitive Functioning Self-Assessment Scale (CFSS), which is a self-reporting questionnaire of 18 items, is widely used to assess cognitive functioning (Annunziata et al. 2012). Its reliability in assessing cognitive functions of individuals has also been verified (Chung et al. 2023).

Sleep enhances blood circulation and facilitates metabolism, thus helping the brain to work more efficiently. Sleep quality refers to sleeping duration and pattern. Nevertheless, the continuous (24/7) nature of police officers' work cause sleep deprivation, health issues and low sleep quality (Ma et al. 2020). Pittsburgh Sleep Quality Index (PSQI) is a validated tool to assess sleep quality by utilising various which are sleep quality, duration, latency, disturbance, habitual sleep efficiency,

implementing medication for sleeping and daytime dysfunction (Suwandi and Kim 2020). Gerber et al. (2010) assessed sleep quality of police officers by using a German version of PSQI consisting of 12 items on an 8-point Likert-type scale. These items were related to participants' emotional state right after waking up, perceived quality of sleep, restoration, mood, emotional state at work, sleepiness, concentration and emotional state before going to bed. Results showed statistically significant effects of shift work on sleep quality where shift operators stated significantly greater sleep related complaint rates than others. Shift operators also stated significantly lower satisfaction rate with their sleep after waking up than others.

Additionally, Ma et al. (2019) used PSQI to assess sleep quality of police officers. The authors used a questionnaire that consisted of 19 items, anchored on a 4-point Likert scale, aiming to assess the different factors that affect sleep quality during the previous one-month period. The questionnaire involved asking respondents to rate their perceived sleep quality, sleep duration, sleep latency, sleep disturbances, habitual sleep efficiency, use of sleep medication and daytime dysfunction. The scoring system was based on that developed by Buysse et al (1989), where an overall score was obtained by adding up scores of the seven components resulting in a score ranging between 0 and 21, with scores greater than 5 indicating poor sleep quality (Buysse et al. 1989). Results showed that male police officers had an average sleeping quality score of 6.3 while that of female officers was 7 keeping in mind that 78.6% of female officers worked day shifts only while that ratio for male officers was 29%.

Stress can be either physical or mental or a combination of both. It can arise from occupational load, family relations, financial issues and/or the society. Stress can make a human being depressed, frustrated, nervous and/or angry. Epel et al. (2018) depicted stress as a body reaction to external challenges and added that police officers are always under pressure as their main job is to protect the society from all types of danger.

Various methods are used to assess stress. They are usually categorised as destructive, semi-destructive, non-destructive, strain relaxation based or others. All stress measurement methods are indirect, with the Spielberger Police Stress Survey (SPSS) being one of them. SPSS comprises of 60 items for evaluating specific sources of stress among police officers. Ma et al. (2019) studied the relationship between police work induced stress and sleep quality. The authors investigated if stress level, frequency of stressors and police work characteristics (prior military work, workload, police rank, shift work) can lead to poorer sleep quality among officers. Using SPSS data, a mean stress score and mean stressors frequency were calculated for each participant. Besides SPSS, PSQI was utilised to assess sleep quality. Stress score and frequency of stressors had both a positive linear relationship with poor sleep quality. The authors recommended the use of stress coping or sleep promotion procedures for officers experiencing regular high workload levels.

It was observed in the published scientific literature that there is a shortage of studies, especially in developing countries, related to the effects of night shifts on police work

and police officers' performance and well-being as also postulated by Jensen et al. (2016) and Nevels et al. (2021). The purpose of the current study is to examine how shift work affects cognitive performance, stress level and quality of sleep of police officers. Based on the results, practical recommendations that would help in minimising stress and improve cognitive performance and sleep quality among police officers are given at the end.

## **Materials and Methods**

In recent years, the use of online surveys has been spreading rapidly in research. Practical advantages of online surveys include convenience of setup procedures, rapid updating of questionnaires, speed of recruitment, interactive data capture and instant monitoring of responses (Miller 2006). In the current study, an online survey was developed to capture the effects of shift work on cognitive performance, stress and sleep quality among police officers. Police administration in a jurisdiction in one of the Gulf countries was approached and their approval was granted subject to two conditions. These included adhering to personal data protection laws in that jurisdiction and not revealing the name of the police department by any means. Ethics approval was also received from the relevant Research Ethics Committee of the same police department. It should be noted that the current study adhered to ethical guidelines outlined in the Declaration of Helsinki (World Medical Association, 2014).

All officers in that department were sent a personalised email. Purpose of the study was explained first; then, officers were invited to participate online to this study while

stressing that participation was voluntary. Informed consent of those willing to participate was sought. Those who agreed to participate were then asked to answer survey questions.

A sample size of 304 officers was obtained using the methodology developed by Krejcie and Morgan (1970) while adopting 95% confidence level and 5.5% margin of error. Data collection continued until 307 questionnaires were received. The online questionnaire was divided into four sections. The first asked participants about their demographic data (shift roster, age group, gender and rank). The second section aimed to evaluate participants cognitive performance. Cognitive performance can be assessed subjectively using questionnaires or objectively using cognitive tests (Wardle-Pinkston et al. 2019; Alhola and Polo-Kantola 2007). In the current study, cognitive performance was assessed using the Cognitive Functioning Self-Assessment Scale (CFSS) developed by Annunziata et al. (2012). In this questionnaire, respondents were required to rate the frequency of 18 different events on a 5-point Likert scale (0 = never, 1 = rarely, 2 = sometimes, 3 = mostly, 4 = always) in the last twelve months. In the current study, respondents were required to assess the most relevant ten (listed in the following section) out of the 18 original events during the previous three months only. The final cognitive function score was the average of 22 scores, where higher scores indicate poorer cognitive performance.

The third section of the questionnaire assessed work-related stress of participants. SPSS (Spielberger 1981) was utilised for this purpose. The original survey, consisting of 60-items, was developed to assess acute and chronic stressors in police work over

the past month and year. In the current study, 22 of the 60 items (listed in the following results section) that are directly relevant to police work in concern were used and the remaining (less relevant) 38 items were dropped. Participants were asked to rate stress on a 4-point Likert scale (not stressful = 0, less stressful = 1, stressful = 2, very stressful = 3). The final stress score was the average of 22 responses, where higher scores indicate higher stress levels.

The fourth and last section of the questionnaire aimed to assess sleep quality of participants. Sleep quality was assessed using PSQI (Buysse et al. 1989) In the current study, twelve of the original 19 items were used in the questionnaire (listed in the following section) where subjects were asked to assess those items on a 4-point Likert scale during the past three months. The remaining seven items were discarded as they were thought to be irrelevant or less beneficial. The final score was the average of all twelve scores, with higher scores indicating poorer sleep quality. Buyssee scoring method was utilised to score each item as shown in Table 1.

Insert Table 1 around here.

Using SPSS v.27, descriptive statistics were used to describe demographic characteristics of participants and normality of data was checked. Then, analysis of variance and unpaired t-test were performed to test the difference between responses of shift and non-shift officers, with stress, cognitive functions and sleep quality being dependent variables. Reliability of the data was tested using the Chronbach's Alpha method and a significance level of 0.05 was adopted in the study.

## Results

### *Descriptive Statistics*

A total of 307 police officers responded to the online questionnaire, 279 of whom were males (90.9%) and 28 were females (9.1%). Participants took between five and eight minutes to complete the online questionnaire. Out of those participants, 104 (33.9%) were of Lieutenant – General rank (coded as 4), 153 (49.8%) were 1st Policeman – 1st Warrant Officer (coded as 3), 45 (14.7%) worked as policemen (coded as 2) and only five (1.63%) worked as civil servants (coded as 1). Moreover, 35 (11.4%) of the participants were between 18-24, 117 (38.1%) between 25-34, 110 (35.8%) between 35-44 and 43 (14%) between 45-54 years of age whereas the remaining two officers (0.6%) were older than 54 years of age.

Data collected showed that shift types worked by participants were diverse, and sample sizes of the different rosters were significantly different. Therefore, all participants working in all shift rosters were combined into a single group called “shift officers”, and those who did not work at night were combined into “non-shift officers.” It was found that 155 (50.49%) of the participants were non-shift officers whereas the remaining 152 (49.51%) were shift officers. The analysis was undertaken to study the overall effect of working in shifts regardless of the roster.

Usually if the sample size is greater than one hundred, violations of the normality assumption can be tolerated (Altman and Bland 1995; Ghasemi and Zahediasl 2012).

Nevertheless, and as shown in Table 3, all three data sets were normally distributed. It should be noted that the z-value shown in Table 2 is obtained by dividing skewness value by its standard error, or kurtosis value by its standard error, where  $-3.29 \leq z\text{-value} \leq 3.29$  for medium sized sample sizes (like the one in the current study) indicating normality (Gupta et al. 2019).

Insert Table 2 around here.

### ***Stress Survey Results***

To evaluate stress, all 307 participants were required to rate SPSS questions given in Table 3. Responses varied from non-stressful (0) to very stressful (3). The table presents mean and standard deviation of responses to each question for shift and non-shift officers. It was found that the mean stress value of shift officers was 1.82 and that of non-shift officers was 1.74.

Insert Table 3 around here.

Hypothesis testing was utilised to study the effects of shift work on stress as follows (where  $\mu$  is the mean stress value):

$$H_0: \mu_{shift} = \mu_{non-shift}$$

$$H_1: \mu_{shift} \neq \mu_{non-shift}$$

Levene's test of equal variances yielded a p-value of 0.02 indicating that the variances are not equal. After adjusting for outliers, a t-test for equality of means of stress scores where equal variances are not assumed was conducted and a p-value of 0.083 was obtained. Thus, the null hypothesis of equal means between shift and non-shift officers is accepted, and, therefore, it can be concluded that shift work is not associated with stress. Nevertheless, it should be noted that this p-value is significant at 0.1 significance level indicating potentially higher stress values at night and that more research is needed in this regard.

A Cronbach's Alpha reliability test was conducted to measure inter-rater reliability, where values  $\geq 0.7$  indicating that the data set was reliable. Test result was 0.924 suggesting that obtained police stress responses were reliable. Further validation was conducted to confirm that none of the questions would have a significant effect on the value of Cronbach's Alpha if it was to be deleted. All values were greater than 0.7 which was a further indicator of the reliability of stress results.

### ***Sleep Quality Survey Results***

As stated earlier, participants were required to respond to 14 items from PSQI to assess their sleep. Descriptive statistics of responses, ranging between 0 to 3, are presented in Table 4.

Insert Table 4 around here.

Again, hypothesis testing is utilised to study the effects of shift work on sleep quality as follows (where  $\mu$  is the mean sleep quality value):

$$H_0: \mu_{shift} = \mu_{non-shift}$$

$$H_1: \mu_{shift} \neq \mu_{non-shift}$$

Levene's test of equal variances yielded  $p = 0.002$  indicating that variances were not equal. After adjusting for outliers, a t-test for equality of means of sleep quality scores where equal variances are not assumed, with an average sleep quality score of shift officers of  $\mu=1.444$  and that of non-shift officers of  $\mu=1.241$ , was conducted. The test resulted in a p-value of 0.005 and the null hypothesis of equal means between shift and non-shift officers was rejected. Therefore, it could be concluded that shift work was associated with poorer sleep quality.

Two interesting outcomes were observed in the regard. In the number of minutes required to fall asleep, a high percentage of both shift and non-shift officers reported spending greater than 60 minutes to sleep (41% of non-shift officers and 42% of shift officers). Besides this, a greater percentage of non-shift officers (32%) spend less than 15 minutes to fall asleep as compared to shift officers (20%).

The second interesting point in sleep quality data was in the percentage of officers getting more than seven hours of sleep. It was observed that this percentage is alarmingly low regardless of the shift work status (14.8% among non-shift and 17.7% among shift officers). 33.5% of non-shift officers get 6 to 7 hours of sleep per night

while 22.3% of shift officers get the same amount of sleep. Similarly, 32.9% of shift and 24.5% of non-shift officers get less than 5 hours of sleep per night. Overall, this reflects that police officers, in general, get less than the recommended sleep duration, which is considered an alarming result given the significance of police work.

Cronbach's Alpha reliability test gave an alpha value of 0.825 suggesting that obtained police sleep quality responses were reliable. Further validation was conducted to confirm that none of the questions would have a significant effect on the value of Cronbach's Alpha if it was to be deleted. All values were found to be greater than 0.7 which was a further indicator of the reliability of sleep quality results.

Finally for sleep quality, Spearman's rank correlation was utilised to test the correlation between shift status and sleep quality survey responses. Test results showed, at 95% confidence level, that shift work was negatively correlated with "not being able to sleep within 30 minutes", which indicated that more shift officers were not able to sleep within 30 minutes than non-shift officers. Shift work was also negatively correlated with "cannot breathe comfortably" and "cough or snore loudly" (both at 95% confidence level), also indicating that shift officers got lower sleep quality. Furthermore, responses to "rate of overall sleep" and "having trouble staying awake while driving, eating, or engaging in social activities" were significantly different where shift officers reported worse responses at 99% confidence level than non-shift officers. This suggests that shift officers had worse overall sleep rate and harder time staying awake while doing different activities than non-shift officers.

### ***Cognitive Performance Results***

Statistics of responses (on a 5-point Likert scale from never (0) to always (4)) to the ten CFSS items are shown in Table 5.

Insert Table 5 around here.

Like in sleep quality and stress scores, hypothesis testing was utilised to study the effects of shift work on cognitive performance score as follows (where  $\mu$  is the mean cognitive performance score value):

$$H_0: \mu_{shift} = \mu_{non-shift}$$

$$H_1: \mu_{shift} \neq \mu_{non-shift}$$

Levene's test of equal variances yielded  $p = 0.02$  and the null hypothesis of equal variances was rejected. After adjusting for outliers, a t-test for equality of means of cognitive performance scores where equal variances are not assumed, with the average cognitive performance score of shift officers being  $\mu=1.62$  and that of non-shift officers being  $\mu=1.54$ , was conducted. Test result showed that  $p = 0.014$  indicating that the null hypothesis of equal means between shift and non-shift officers is rejected and that shift work is associated with poorer cognitive performance.

Similar to stress and sleep quality, a Cronbach's Alpha reliability test was conducted to measure inter-rater reliability of cognitive performance questionnaire responses. A value of 0.944 was obtained suggesting that cognitive performance responses were reliable. Further validation was conducted to confirm that none of the questions would

have a significant effect on the value of Cronbach's Alpha if it was to be deleted. All values were greater than 0.7 which served as a further indicator of the reliability of cognitive performance results.

### ***Effects of Age and Rank on Response Variables***

In order to validate that responses were not affected by other factors, the impact of different age groups and rank was tested using ANOVA. Results showed that stress, sleep quality and cognitive performance were not affected by age or rank where all p values were greater than 0.05. It should be noted that since the vast majority of respondents (279 out of 307) were male, no analysis due to gender differences was done.

## **Discussion**

This study assessed the effects of shift work among police officers on reported stress, sleep quality and cognitive performance. Over the past three months, a total of 307 police officers were asked to report their stress using the Spielberger Police Stress Survey (SPSS), sleep quality using the Pittsburgh Sleep Quality Index (PSQI) and cognitive performance using the Cognitive Functioning Self-Assessment Scale (CFSS). It can be concluded that, for the given sample of police officers, shift work is associated with lower sleep quality. This outcome can be attributed to the misalignment of the circadian rhythm with work-rest schedules (Strohmaier et al. 2018). Shift work is also significantly associated with worse cognitive performance.

Moreover, there is also an indicator that shift work is associated with higher levels of stress, but this was only significant at 0.1 significance level.

Given the sensitive and highly significant work of police officers for any society, minimising the effects of shift work on police officers is essential for them to conduct their work successfully. One way to achieve that is enhancing positive organisational culture which is reported in the literature that this can help reduce work stresses and support better cognitive performance (Alhola and Polo-Kantola 2007; Bendak and Rashid 2020). In this context, organisational culture can be defined as the beliefs and values that have existed in an organization over a long period of time, and staff beliefs of the foreseen value of their work. These factors can influence employees attitudes and behaviour and improving them is believed to help police officers in carrying on their job at night successfully (Tsai 2011).

Flexible working schedules can be also considered to suit officers' preferences and needs which motivates employees and helps shift managers to create coping mechanisms. Although shift schedules should be tailored to job demands, the societal and cultural background of the involved officers should also be considered, as they are the ones who are directly experiencing the issues of shift work (Amendola et al. 2011, Bendak 2003, Costa 2010, Opielka and Staller, 2024).

In the studied sample, there is an indication that police officers on shifts have more trouble staying awake while driving, eating, or engaging in social activities and a lower overall rate of sleep quality. To overcome these, limiting night shifts to a

maximum of one in three days, providing employees with bonus rest days and implementing a forward rotational shift schedule (i.e. morning-afternoon-night-day(s) off) and tailored training are recommended. The aim here is make sure that police officers can get better rest to overcome shift-related problems and enhance police officers' performance and health as also put forward by Bendak (2003), Burgess (2007), Opielka and Staller (2024) and Ma et al. (2019).

It should be highlighted the current study relied solely on self-reported data of police officers. This involves a bias risk. Nevertheless, there are no clear indicators of any bias in the data. Similarly, data obtained in the current study were from police department in a Gulf country. Police departments in other countries might have different circumstances. Therefore, more studies in other countries, involving both objective and subjective methods, are needed to better understand the effects of shift work on police officers so that its negative effects on them could be minimised.

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Table 1: Buyssee sleep quality scoring method.

| Response                                | Score |
|-----------------------------------------|-------|
| Less than 15 minutes to fall asleep     | 0     |
| 16 to 30 minutes to fall asleep         | 1     |
| 31 to 60 minutes to fall asleep         | 2     |
| Greater than 60 minutes to fall asleep  | 3     |
| Greater than 7 hours of sleep per night | 0     |
| 6 to 7 hours of sleep per night         | 1     |
| 5 to 6 hours of sleep per night         | 2     |
| Less than 5 hours of sleep per night    | 3     |
| Not during the past three months        | 0     |
| Less than once a week                   | 1     |
| Once or twice a week                    | 2     |
| Three or more times a week              | 3     |

Table 2: Data normality test results.

| Variable                                | Skewness/<br>Kurtosis value | Statistics | Standard<br>Error | Z-value    | Normality            |
|-----------------------------------------|-----------------------------|------------|-------------------|------------|----------------------|
| Stress (Shift)                          | Skewness                    | -.378      | .197              | -1.9187817 | Normally Distributed |
|                                         | Kurtosis                    | .645       | .391              | 1.64961637 | Normally Distributed |
| Stress (Non-shift)                      | Skewness                    | -.347      | .195              | -1.7794872 | Normally Distributed |
|                                         | Kurtosis                    | -.492      | .387              | -1.2713178 | Normally Distributed |
| Sleep<br>Quality<br>(Shift)             | Skewness                    | .022       | .197              | 0.11167513 | Normally Distributed |
|                                         | Kurtosis                    | -.579      | .391              | -1.4808184 | Normally Distributed |
| Sleep<br>Quality<br>(Non-shift)         | Skewness                    | .513       | .195              | 2.63076923 | Normally Distributed |
|                                         | Kurtosis                    | -.045      | .387              | -0.1162791 | Normally Distributed |
| Cognitive<br>Performance<br>(Shift)     | Skewness                    | .378       | .197              | 1.91878173 | Normally Distributed |
|                                         | Kurtosis                    | -.589      | .391              | -1.5063939 | Normally Distributed |
| Cognitive<br>Performance<br>(Non-shift) | Skewness                    | .397       | .195              | 2.03589744 | Normally Distributed |
|                                         | Kurtosis                    | -.188      | .387              | -0.4857881 | Normally Distributed |

Table 3: Stress survey results.

| Events                                               | Shift officers |       | Non-shift officers |       |
|------------------------------------------------------|----------------|-------|--------------------|-------|
|                                                      | Mean           | Stdev | Mean               | Stdev |
| Changing from day to night shift                     | 1.86           | 1.088 | 1.94               | 1.112 |
| Fellow officers not doing their job                  | 1.78           | .998  | 1.88               | 1.052 |
| Political pressure from within the department        | 1.95           | 1.009 | 1.95               | 1.118 |
| Incapacitating physical injury on the job            | 1.59           | .980  | 1.66               | 1.103 |
| Strained relations with nonpolice friends and family | 2.05           | 1.063 | 1.74               | 1.108 |
| Exposure to death of civilians or major accidents    | 1.57           | 1.227 | 1.52               | 1.172 |
| Inadequate support by supervisor                     | 1.80           | .990  | 1.67               | 1.189 |
| Dealing with family disputes and crisis situations   | 1.74           | 1.101 | 1.42               | 1.116 |
| Responding to a felony in progress                   | 1.50           | 1.023 | 1.23               | 1.123 |
| Public criticism of police                           | 1.77           | 1.113 | 1.60               | 1.034 |
| Disagreeable departmental regulations                | 1.67           | 1.066 | 1.45               | 1.105 |
| Insufficient manpower to adequately handle a job     | 2.11           | 1.004 | 1.96               | .955  |
| Lack of recognition for good work                    | 2.24           | .919  | 2.15               | 1.048 |
| Inadequate or poor-quality equipment                 | 1.97           | .979  | 1.82               | 1.020 |
| Assignment of increased responsibility               | 1.80           | 1.074 | 1.96               | 1.039 |
| Lack of participation on policy making decisions     | 1.56           | .975  | 1.55               | 1.042 |
| Inadequate salary                                    | 2.17           | .968  | 2.14               | .993  |
| Making arrests while alone                           | 2.02           | 1.006 | 1.80               | 1.111 |
| Competition for advancement                          | 1.58           | 1.033 | 1.37               | 1.111 |

|                                                      |      |       |      |       |
|------------------------------------------------------|------|-------|------|-------|
| Frequent changes from boring to demanding activities | 1.89 | .994  | 1.64 | 1.049 |
| Mistreatment of police officers in court             | 1.63 | .966  | 1.97 | 1.104 |
| Excessive paperwork                                  | 1.75 | 1.063 | 1.94 | .994  |

Table 4: Sleep quality results.

| Event                                                                                | Shift officers |       | Non-shift officers |       |
|--------------------------------------------------------------------------------------|----------------|-------|--------------------|-------|
|                                                                                      | Mean           | Stdev | Mean               | Stdev |
| Number of minutes to fall asleep each nigh                                           | 1.76           | 1.196 | 1.56               | 1.310 |
| Hours of sleep per nigh                                                              | 1.75           | 1.099 | 1.61               | 1.015 |
| Cannot go to sleep within 30 minutes                                                 | 2.10           | 1.096 | 1.81               | 1.194 |
| Wake up in the middle of the night or early morning                                  | 1.87           | 1.189 | 1.87               | 1.097 |
| Have to get up to use the bathroom                                                   | 1.76           | 1.144 | 1.56               | 1.026 |
| Cannot breathe comfortably                                                           | .86            | 1.185 | .72                | 1.080 |
| Cough or snore loudly                                                                | 1.43           | 1.305 | 1.09               | 1.147 |
| Feel too cold                                                                        | 1.49           | 1.223 | 1.14               | 1.099 |
| Feel too hot                                                                         | .81            | 1.078 | .66                | .963  |
| Had bad dreams                                                                       | 1.10           | 1.149 | 1.00               | 1.044 |
| Have pain                                                                            | 1.08           | 1.232 | 1.03               | 1.142 |
| Rate of overall sleep quality                                                        | 2.41           | 1.299 | 1.88               | 1.243 |
| Use of medicine                                                                      | .55            | .968  | .61                | .996  |
| Having trouble staying awake while driving, eating, or engaging in social activities | 1.25           | 1.214 | .84                | 1.041 |

Table 5: Reported cognitive performance.

| Event                                             | Shift officers |       | Non-shift officers |       |
|---------------------------------------------------|----------------|-------|--------------------|-------|
|                                                   | Mean           | Stdev | Mean               | Stdev |
| Lack of concentration                             | 1.74           | 1.154 | 1.71               | 1.111 |
| Absent mindedness                                 | 1.79           | 1.290 | 1.72               | 1.171 |
| Difficulty in performing two tasks simultaneously | 1.96           | 1.332 | 1.77               | 1.161 |
| Difficulty in performing mental calculation       | 1.69           | 1.308 | 1.61               | 1.165 |
| Tip of the tongue phenomenon                      | 1.44           | 1.346 | 1.33               | 1.146 |
| Difficulty in recalling recent information        | 1.43           | 1.305 | 1.34               | 1.107 |
| Difficulty in recalling old information           | 1.62           | 1.260 | 1.58               | 1.018 |
| Difficulty in recalling autobiographical events   | 1.47           | 1.234 | 1.42               | 1.122 |
| Forgetfulness                                     | 1.56           | 1.270 | 1.51               | 1.113 |
| Lack of concentration while reading               | 1.50           | 1.337 | 1.45               | 1.146 |