

Shift Working and Well-being: A Physiological and Psychological Analysis of Shift Workers

Erin C. Pease and Kristin A. Raether

Faculty Sponsor: Betsy L. Morgan, Department of Psychology

ABSTRACT

Shift work is defined as “nonstandard schedules requiring that at least 50% of the work be done at a time other than between 8 am and 4 pm” (Jaffe & Smolensky, 1996). An estimated 25% of people now work night shifts in most Western societies (Hossain & Shapiro, 1999), despite the growing concern over the detrimental effects that may result for individual shift workers. The current study was designed to examine the association between shift work and physical and psychological well-being of police officers. It is hypothesized that police officers who work 3rd shift (i.e. 11 pm to 7 am), will have more depressive symptoms, suffer from sleep deprivation and suffer from more health problems than 1st shift workers (i.e. 7 am to 3 pm). The participants consisted of thirty-three male and female shift working police officers of various background and ages from a Wisconsin police department. The Standard Shiftwork Index (SSI) was used to test physical and psychological aspects of shift work on well-being of shift workers. The results of the study found that 2nd shift police officers received less sleep than they thought they actually needed. 2nd shift police officers were also found to have lower well-being than 3rd shift police officers.

INTRODUCTION

Shift work is defined as “nonstandard schedules requiring that at least 50% of the work be done at a time other than between 8 am and 4 pm” (Jaffe & Smolensky, 1996). It is increasingly becoming more popular to work at night. Many occupations require shift work such as: the medical profession (e.g., doctors, nurses, and rescue workers), public safety (e.g., law enforcement and fire), industrial workers, telecommunication workers, transportation and night service workers (e.g., restaurants, shopping, and entertainment). Today, many people view shift work as driving society’s response to the challenges of the need for constant growth and prosperity (Hossain & Shapiro, 1999). An estimated 25% of people now work night shifts in most Western societies, despite the growing concern over the detrimental effects that may result for individual shift workers.

Shift work can have many physiological, psychological, and social effects on a person. The primary reason that these problems occur is due to the disruption of the normal sleep-wake cycle. Humans develop a diurnal rhythm (i.e., they sleep at night and stay awake during the day). This daily cycle is consistent from day to day; therefore, humans are most productive and alert during daytime hours. If this diurnal rhythm is disrupted, the body undergoes dramatic changes and sleep becomes difficult (Schultz & Schultz, 1994). The extent to which the circadian rhythms (i.e., biological rhythms) of the shift worker adjusts to this new routine of nighttime work and daytime sleep may have a great influence on the severity of the problems experienced (Barton, 1994).

Shift work has been found to predict health problems including coronary heart disease and gastrointestinal complaints. Kiviamki et al., (2001) stated that along with rhythm arguments, other explanations of ill health are that shift work may lead to poorer health habits (e.g. increased consumption of alcohol and cigarettes, reduced physical activity, and being overweight). When this is combined with sleep deprivation and stress the immune system is weakened, causing one to be more susceptible to many illnesses and diseases.

In a study conducted using nurses, it was found that recovery from working nightshifts can take up to two days (Totterdell, Spelten, Smith, Barton & Folkard, 1995). This study also found that ratings of alertness increased and reaction time decreased over four night shifts. This may suggest increasing adjustment to night shifts and hence, brings up one of the biggest problems with working at night. It takes at least two days to adjust to night work after a diurnal schedule and then takes at least two days to recover back to a diurnal schedule. The body is constantly being forced to change and adapt to new schedules, which brings about physiological and psychological stress. This would also affect shift workers who are not on a rotating schedule because most adapt back to a diurnal cycle on the weekends.

To give the reader a sense of the atypical schedules associated with shift work the following “typical day” is described. The worker returns home and is wound up and ready to go at 7 a.m. It is rare that a worker will return home and head straight to bed. Many have children that need to get ready for school. Around 8:30 or 9:00 many will start to wind down and get sleepy, so they head to bed for a few hours. Most are up again by about 1:30 or 2:00 and ready to get going for the day. They will spend the rest of the afternoon and evening doing daily life activities such as: shopping, cleaning, cooking, taking care of children and paying the bills. Around 9:00 most will lay down for about an hour-long nap before they get up again for the night to go to work. Some workers may like the fact that they can schedule their sleeping to accommodate their schedule during the day, while others may not. However, this shifting leads to the problem of not getting a good sleeping period and not even getting all of their sleep at one time. Unfortunately, sleep and other behavioral disturbances result in many health problems for shift workers.

A study done by Bourdouxhe and Queinnec (1999), found that on average 40% more diseases such as gastritis, gastric or duodenal ulcers, high blood pressure, chronic anxiety, asthma and allergies, back disorders, musculoskeletal problems, and severe obesity were diagnosed more among former shift workers than among current shift workers. Shift workers tending to underestimate their health problems, is a common finding. Spelten, Barton, and Folkard (1993) found that after a long period of shift work, workers seem to have “lost sight” of what normal life is like. These researchers found that the workers habituate to a gradual lowering of their well being and subjective health, therefore, they will rate themselves as relatively “normal” on any scale designed to measure these variables. Many shift workers today probably do not realize the severity of their health problems or that the effects are chronic.

Ottmann et al., (1989) conducted a study on shift working police officers and health status. The researchers gave 2659 police officers questionnaires that addressed health issues such as abdominal pain, lack of appetite, disturbance of sleep and backache. It was found by the researchers that disturbance of appetite was not a common occurrence. However, nervous symptoms and gastro-intestinal symptoms were more often reported than the other symptoms. The prevalence rates of all symptoms consistently showed a main effect of shift work. Ottmann et al., concluded that actual shift work decreased the well-being of police officers.

Depression is another factor that affects many shift workers. While there has not been a lot of research on depression and shift work, there is research conducted by Ford and Kamerow (1989) that suggests a link between poor sleep and the development of depression. They reported that people suffering from insomnia had a much greater risk for developing major depression than individuals with normal sleep.

There are two methodological drawbacks that complicate the interpretation of shift work results. The first limitation is that the relationship found between shift work and poor health may be due to a third factor. The occupational structure or the types of jobs that shift workers and day workers have systematically vary. Shift workers are usually employed in occupations that represent a lower socio-economic status than day workers (Kiviamki et al., 2001). Males, individuals with lower socio-economic status and lower levels of education, are more likely to live an unhealthy lifestyle than individuals of a higher socio-economic status. To minimize this bias, we will study the relationship of shift workers and health by assessing individuals from the same occupational group (i.e., by comparing day workers and shift workers who perform the same job duties).

The second limitation includes the imprecise methods of measurement. With imprecise measurement methods, the likelihood of finding inaccurate results increases. To prevent this problem, we will be using a standardized measure called the Standard Shiftwork Index (SSI). The SSI was developed to measure shift workers on physical, mental and social satisfaction. This method of measurement is reliable and allows researchers to obtain a reasonably comprehensive scale for shift work satisfaction.

There are two potential problems that we will not be controlling for in this study. Problem number one is the ‘health shift-worker survivor bias,’ a phenomenon resulting in workers switching from shift work to day work due to health problems (Greenland, 1989). To reduce this bias, Streenland, (2000) suggested that researchers should compare health habits in those who had always been shift workers to those who have never been employed in shift work. Problem number two deals with the fact that people who have always done shift work lose sight of a normal way of living. Therefore, when they are surveyed, they may tend to rate themselves as “normal” on any scale of measurement. This may, in fact, alter the results of this study.

The current study was designed to examine the association between shift work and physical and psychological well-being of police officers who work the day shift and the night shift. We hypothesize that police officers who work 3rd shift (i.e. 11 pm to 7 am), will have more depressive symptoms, suffer from sleep deprivation and suffer from more health problems than 1st shift workers (i.e. 7 am to 3 pm).

METHOD

Participants

Our sample was a convenience sample of 33 shift working police officers of various backgrounds and ages from a Wisconsin police department. The ages of police officers ranged from 24 to 53 years old and the participants were 52% male and 48% female. All of the police officers surveyed, except for two, had a bachelor's degree or beyond, which is a typical feature of the Madison Police Department. The ethnicity of the police officers included: 84.4% Caucasians, 6.3% African Americans, 6.3% Chicano/Latino/Hispanic and 3.1% Asian Americans. The marital status of the police officers included: 15.6% single, 6.3% single parents with children, 31.3% married and 46.9% married with children. Six of the participants were shift workers from 1st shift (i.e. day), 11 from 2nd shift (i.e. evening) and 16 were from 3rd shift (i.e. night).

Questionnaire

An abbreviated form of the Standard Shiftwork Index (SSI) was our method of measurement, which can be seen in Appendix A. The purpose of this survey was to have the participant answer multiple questions on sleep duration and quality, chronic fatigue, physical health, such as cardiovascular and digestive problems, and mental health, anxiety, social and domestic problems. On the sleep portion of the SSI, the police officers compared the amount of sleep desired, in minutes, to amount of sleep received. Sleep ranged from -60.00 to 120.00 ($M = 25.56$, $SD = 44.08$). The well-being segment of the SSI consisted of questions that detected minor psychological disorders in the general population and reports a simple measure of mental health status. On the well-being scale, the range was -42.00 to 143.00 ($M = 46.30$, $SD = 45.04$). The Center for Epidemiological Studies Depression Scale contained questions used to determine the depression experienced by the police officers. Depression scores ranged from 20.00 to 54.00 ($M = 28.04$, $SD = 6.87$). Another subdivision of the SSI consisted of questions that measured moodiness of the participants. The scores for moodiness ranged from 6.00 to 20.00 ($M = 10.93$, $SD = 2.91$). Finally, there was a portion of the SSI that measured the total health of the participants. The range for health was 21.00 to 44.00 ($M = 29.93$, $SD = 6.09$). Overall, we wanted to test the physical and psychological aspects of shift work on the well-being of individual workers who work 1st shift compared to those who work 3rd shift.

Procedure

We gave sixty copies of the SSI to the Madison, Wisconsin police department, who distributed them to 20 police officers on each of three shifts: 1st, 2nd and 3rd shift. Attached to the surveys were informed consent forms and a debriefing statement, which included contact numbers for local medical and counseling centers in the area. The participants were instructed to fill out the questionnaire and to return it to their supervisor.

RESULTS

The hypotheses of this study suggested that night shift workers have more physical (i.e. lack of sleep and poor well-being) and psychological (i.e. depression) symptoms than day shift workers. However, because of that lack of response from the police officers surveyed on 1st shift, we compared the results of 2nd shift with 3rd shift.

Overall, there were very few significant differences found between the 2nd and 3rd shift officers. As shown in Table 1, 2nd shift police officers perceive themselves to need more sleep than did 3rd ($t(30) = 2.71$, $p < .05$, two-tailed). In addition, 2nd shift police officers reported a significantly larger gap between their "needed" sleep and "actual" sleep than did 3rd shift police officers ($t(25) = 1.76$, $p < .05$, two-tailed).

Contrary to the hypotheses, 2nd shift police officers reported worse well-being than did 3rd shift police officers. Second shift police officers showed higher levels of negative symptoms than did 3rd shift police officers (two-tailed $t(25) = 1.84$, $p < .05$).

Table 1. Comparison of 2nd and 3rd Shift Police Officers and Variables of Interest

	2 nd Shift (N=11)		3 rd Shift (N=16)	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
Sleep				
Hours needed	8.00	.50	7.00*	1.08
Actual received				
Needed minus actual	7.28	.68	6.78	1.10
	43.64 min	38.80	13.13 min*	47.71
Well-being^a	65.64	40.36	33.03*	48.50

p < .05

^a Higher numbers indicate worse well-being.

DISCUSSION

Overall, there were very few differences found between the 2nd and 3rd shift workers. Second shift police officers reported a larger difference than 3rd shift police officers when asked to compare the amount of sleep needed to the amount of sleep actually obtained. The 2nd shift police officers also scored higher on the well-being scale, which means 2nd shift police officers surveyed reported less healthy attitudes than 3rd shift police officers. This contradicted our hypotheses that 3rd shift police officers would have poorer well-being and sleep needs than 1st and 2nd shift police officers.

A possible explanation for these results is that a 2nd shift worker gets off work late in the evening and unwinds for a few hours before they go to bed. If they have children, they will be up early in the morning getting them ready for school. The rest of the day may be consumed with household chores, doctor appointments and shopping. Hence, sleep and eating cycles may be disrupted, which would also explain why the police officers surveyed stated that they needed more sleep than they actually obtained. On the other hand, 3rd shift workers activities and lifestyles are not as disrupted as those individuals who work 2nd shift because their afternoons and evenings can remain the same as a 1st shift worker.

There are many possible explanations for why our results failed to support our original hypotheses. First of all, the surveys were distributed to 60 police officers and only 33 replied. Therefore, our pool of participants consisted of individuals who chose to fill out the survey and may have different characteristics than individuals who decided not to fill out the survey. Because there was such a low response rate on 1st shift, we were forced to limit our study to 2nd and 3rd shift workers only. If we had obtained more response from 1st shift, we may have found significant differences between 1st and 3rd shifts in the specific areas of focus. Secondly, the SSI failed to ask questions regarding consecutive hours of sleep obtained by workers for each shift. If consecutive hours were measured, we may have found differences between consecutive sleeping patterns between 1st and 3rd shift workers, which could have had an impact on their overall SSI score. Finally, Madison Police Department is an atypical shift work organization in that they mostly hire individuals with higher levels of education, such as a bachelor's degree. Because of a higher education level, we suspect that these individuals may be more aware of health issues and know how to better maintain their own well-being. These individuals also make more money than the average factory shift worker allowing them to appreciate a higher standard of living, which may include better medical care and other access to coping resources.

Future researchers may want to revise the SSI to include a question on how many consecutive hours of sleep are obtained on days of shift. Better quality of sleep is obtained through one session of sleep as opposed to sporadic hours throughout the day. The study could also be improved by increasing the sample size. We expect that a larger sample and a sample that included a comparison of the 1st shift group may have yielded more expected results. In addition, future research would be well served by a sample that was less diverse in terms of demographics so that they could focus more exclusively on shift work. We also had considerable difficulty securing a sample for this study. We were turned down by numerous businesses. Although we may have been turned down for a "nuisance" factor, we were also told that they did not want us to conduct the research due to the possibility of negative findings. Consequently, future researchers need to make sure that companies see the benefits of ascertaining some of this material. Overall, given the high percentage of the workforce engaged in shift work, continued research on its physical and mental health impact is needed.

ACKNOWLEDGEMENTS

We would like to thank the undergraduate research grant committee for their support of this project and the Madison Police Department for their participation.

REFERENCES

- Barton, J. (1994). Choosing to work at night: A moderating influence on individual tolerance to shiftwork. *Journal of Applied Psychology*, 79(3), 449-454.
- Barton, J., & Folkard, S. (1991). The response of day and night nurses to their work schedules. *Journal of Occupational & Organizational Psychology*, 64, 207-218.
- Bohle, P., & Tilley, A.J. (1998). Early experiences of shiftwork: Influences on attitudes. *Journal of Occupational & Organizational Psychology*, 71, 61-77.
- Bourdouxhe, M. A., & Queinnec, Y. (1999). Aging and shiftwork: The effects of 20 years of rotating 12-hour shifts among petroleum refinery operators. *Experimental Aging Research*, 25, 323-330.
- Cervinka, R. (1993). Night shift dose and stress at work. *Ergonomics*, 36(1-3), 155-160.
- Costa, G., Lievore, F., Casaletti, G., & Gaffuri, E. (1989). Circadian characteristics influencing interindividual differences in tolerance and adjustment to shiftwork. *Ergonomics*, 32, 373-385.
- Ford, D. E., & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. *Journal of the American Medical Association*, 262, 1479-1484, Cited in: Goodrich, S. & Weaver, K. A. (1998). Differences in depressive symptoms between traditional workers and shiftworkers. *Work & Stress*, 15, 3-13.
- Goodrich, S., & Weaver, K. A. (1998). Differences in depressive symptoms between traditional workers and shiftworkers. *Psychological Reports*, 83, 571-576.
- Greenland, S. (1989). Modeling and variable selection in epidemiologic analysis. *American Journal of Public Health*, 88, 1030-1036, Cited in: Kivimaki, M., Virtanen, M., & Elovainio, M. (2001). Does shift work lead to poorer health habits? A comparison between women who had always done shift work with those who had never done shift work. *Work & Stress*, 15, 3-13.
- Holbrook, M. I., White, M. H., & Hutt, M. J. (1994). Increasing awareness of sleep hygiene in rotating shift workers: Arming law enforcement officers against impaired performance. *Perceptual and Motor Skills*, 79, 520-522.
- Hossain, J.L. and Shapiro, C.M. (1999). Considerations and possible consequences of shift work. *Journal of Psychosomatic Research*, 47, 293-296.
- Jaffe, M.P., & Smolensky, M. H. (1996). Sleep quality and physical and social well-being in north american petrochemical shift workers. *Southern Medical Journal*, 89, 305-313.
- Kivimaki, M., Virtanen, M., & Elovainio, M. (2001). Does shift work lead to poorer health habits? A comparison between women who had always done shift work with those who had never done shift work. *Work & Stress*, 15, 3-13.
- Oginska, H., Pokorski, J., & Oginski, A. (1993). Gender, ageing, and shiftwork intolerance. *Ergonomics*, 36(1-3), 161-168.
- Ottmann, W., Karvonen, M. J., Schmidt, K. -H., Knauth, P., & Rutenfranz, J. (1989). Subjective health status of day and shift-working policemen. *Ergonomics*, 32(7), 847-854.
- Schultz, D. P., & Schultz, S. E. (1994). *Psychology and work today* (6th ed.). New York: Macmillan.
- Scott, A. J. (1994). Chronobiological considerations in shiftworker sleep and performance and shiftwork scheduling. *Human Performance*, 7(3), 207-233.
- Spelten, E., Barton, J., & Folkard, S. (1993). Have we underestimated shiftworkers' problems? Evidence from a 'reminiscence' study. *Ergonomics*, 36(1-3), 307-312.
- Streenland, K. (2000). Shift work, long hours, and cvd: A review. *Occupational Medicine: State of Art Reviews*, 15, 7-17, Cited in: Kivimaki, M., Virtanen, M., & Elovainio, M. (2001). Does shift work lead to poorer health habits? A comparison between women who had always done shift work with those who had never done shift work. *Work & Stress*, 15, 3-13.
- Totterdell, P., Spelten, E., Smith, L., Barton, J., & Folkard, S. (1995). Recovery from work shifts: how long does it take? *Journal of Applied Psychology*, 80 (1), 43-57.