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Associations between shift work characteristics, shift work schedules, sleep and burnout in North American police officers: a cross-sectional study

Scott A Peterson,[1] Alexander P Wolkow [ID],[1,2] Steven W Lockley,[1,3,4] Conor S O'Brien,[3] Salim Qadri,[3] Jason P Sullivan,[3] Charles A Czeisler,[3,4] Shantha M W Rajaratnam,[1,3,4] Laura K Barger[1,3,4]

For numbered affiliations see end of article.

Correspondence to
Dr Laura K Barger;
laura_barger@hms.harvard.edu

ABSTRACT

Objectives To examine associations between shift work characteristics and schedules on burnout in police and whether sleep duration and sleepiness were associated with burnout.

Methods Police officers (n=3140) completed the Maslach Burnout Inventory (emotional exhaustion, depersonalisation, personal accomplishment) and self-reported shift schedules (irregular, rotating, fixed), shift characteristics (night, duration, frequency, work hours), sleep duration and sleepiness.

Results Irregular schedules, long shifts (≥11 hours), mandatory overtime, short sleep and sleepiness were associated with increased risk of overall burnout in police. Police working a greater frequency of long shifts were more likely to have emotional exhaustion (adjusted OR 1.91, 95% CI 1.35 to 2.72) than those not working long shifts. Night shifts were associated with depersonalisation (1.32, 1.05 to 1.66) compared with not working nights. Police working mandatory overtime had increased risk of emotional exhaustion (1.37, 1.14 to 1.65) than those who did not. Compared with fixed schedules, irregular schedules were associated with emotional exhaustion and depersonalisation (1.91, 1.44 to 2.54 and 1.39, 1.02 to 1.89, respectively). Police sleeping <6 hours were more likely to have emotional exhaustion (1.60, 1.33 to 1.93) than those sleeping longer, and excessive sleepiness was associated with emotional exhaustion (1.81, 1.50 to 2.18).

Conclusions Irregular schedules and increased night shifts, sleep disturbances and work hours were related to higher burnout risk in police. Future research should evaluate work schedules in law enforcement that optimise shift duration and frequency, and increase consistency in scheduling and control over work hours to limit burnout in police.

INTRODUCTION

A major source of occupational stress for police officers is shift work, which can involve day, night and long duration shifts and long work weeks,[1 2] as well as rotating, fixed and irregular shift schedules.[3] Chronic exposure to occupational stressors can lead to

Strengths and limitations of this study

► The study examined burnout, shift work and sleep in a large sample of police officers (n=3140) from across North America.
► Shift work characteristics and schedules were closely examined in police, providing information on night shifts, long work shifts and long work weeks, overtime (voluntary and mandatory) and different work schedules (irregular, rotating and fixed)
► Sleep and shift information were based on self-reports and thus may be subject to response bias.
► Due to the cross-sectional design of the study, associations between shift work, sleep and burnout can be inferred but not causality.

burnout, which is a psychological syndrome comprising three dimensions: emotional exhaustion (EE), depersonalisation (DP) and a perceived lack of personal accomplishment (PA).[4] Burnout can have a negative influence on the individual worker, the people whom they serve and their organisation, with consequences including reduced productivity and decision making,[5] increased absenteeism and risk of leaving the job.[6] Indeed, retirements due to psychological ill health account for 46% of medical retirements among police in the UK.[7] In North American police, sleep disorders have been associated with increased risk of mental health outcomes, including depression and anxiety, and EE and DP burnout dimensions.[3] In addition to sleep, other work-related factors may also have a negative influence on the health of personnel engaged in shift work; however, few studies have examined how specific characteristics of shift work relate to burnout in police.

Police have traditionally worked 8–10 hour shifts in the USA, although increasingly, departments are implementing compressed

weekly schedules which involve officers working 11, 12 and 16 hour shifts.[1 3 8] Long shifts are related to increased sleepiness[8] and may reduce the opportunity for sleep, potentially impairing police officers' ability to recover from work demands.[9] Short sleep has been found to associate with burnout in shift working occupations,[10] including law enforcement,[11] although few studies have examined the relationship between sleepiness and burnout specifically in police. Recovery between shifts may be further restricted by night work, which can cause sleep loss and circadian misalignment and is shown in other healthcare occupations to confer a greater risk of burnout when compared with day shifts.[10] A high degree of burnout has also been associated with working more night shifts among physicians[12] and longer duration shifts and work weeks in nurses[13 14] and emergency medical technicians (EMTs).[15] Although hours of work were not significantly associated with burnout in resident physicians, burnout was related to increased difficulty concentrating on work.[16] In police, officers who were continuously engaged in shift work were reported to have lower PA, but this study did not describe the relationship between regular shift work and EE or DP nor did it distinguish between the different shift types in policing,[17] such as night and long duration shifts. Furthermore, police also work a variety of different schedules including irregular, rotating and fixed shifts,[9] and often do overtime which may be associated with burnout,[18] but to date, the potential relationship between work schedules and shift characteristics on burnout has not been systematically examined in police.

In this cross-sectional study, we examined whether characteristics of shifts (night, shift duration, frequency, weekly work and overtime hours) as well as shift schedules (irregular, rotating, fixed) were associated with burnout in police. Given that short sleep and sleepiness are also common stressors among police and potential consequences of shift work,[3] a secondary aim was to investigate associations between sleep duration and sleepiness on burnout risk in police.

METHODS
Participants
Volunteers were invited to participate through meetings at police departments and advertisements in police magazines, newsletters and on police-focused websites. In total, 6022 sworn North American police officers expressed interest in the study. Of those, 4957 consented to participate in a survey, either online or, in a few departments, on-site (via pencil/paper). Participant recruitment and survey administration details have been described previously.[3] The survey assessed demographics and health information, and participants reported work and sleep hours in the past 4 weeks and completed the Maslach Burnout Inventory (MBI). Of the 4957 officers who participated, 3140 completed at least one burnout dimension subscale in the MBI and were eligible for analyses. All

participants provided informed consent and were eligible for a prize drawing valued up to US$1000.

MEASURES
Burnout was assessed using the MBI–Human Services Survey,[4] which consists of 22 items that assess the three burnout dimensions: EE, DP and PA. Participants rated the frequency with which they experienced each item on a 7-point Likert scale (0=never; 6=everyday). EE and DP were defined as dichotomous variables, in which a high (vs low–moderate) risk score for these dimensions were determined (high EE ≥27 points; high DP ≥13 points). PA was also a dichotomous variable, but it was scored in the opposite direction to EE and DP, in which low (vs high–moderate) scores indicated low PA (≤31 points). Participants were considered to have high overall burnout if they had both high EE and DP, with or without low PA.[19]

Work information was determined using items from both the baseline and a concurrent monthly report. Participants were asked how frequently they worked night shifts (shifts involving ≥6 hours on-duty between 22:00 and 08:00), with responses from 'never or nearly never', '1–4 times per month', '1–4 times per week' and 'nearly every day'. To determine the frequency of long work shifts, participants reported the shift length they worked each week for the previous 4 weeks (ie, 8–10, 11–15, 16–19, 20–23 or ≥24 hours). Based on previous research in human service occupations,[14] long work shifts were classified as ≥11 hours, from which officers were grouped into those working 0, >0 to <2, ≥2 to <4 and ≥4 long shifts per week.

Participants' usual shift schedules were categorised as 'fixed', 'irregular', 'rotating' or 'other' schedules. Participants reporting that they 'do not have a variable work schedule' were classified as having 'fixed' schedules. Schedules were categorised as 'rotating' if officers reported working shifts that rotated on a day-to-evening, day-to-night or evening-to-night basis. Irregular schedules were defined as shifts that rotated but did not follow a consistent pattern and 'other' comprised schedules that included non-day-to-day rotations (eg, weekly/monthly rotations). Total work hours across the month were recorded using a validated questionnaire,[20] with those recording ≥48 hours per week considered to be working long work weeks. This categorisation was based on prior benchmarking literature in the USA which defines long work weeks as 48 or more hours per week[21] and research which has shown this cut-off to be associated with burnout.[22] Participants also recorded if they completed mandatory and/or voluntary overtime over the last 4 weeks and the total number of hours they slept each week for the previous 4 weeks. For sleep duration, the combined total of the 4 weeks was used to calculate the average sleep duration per 24 hours, and short sleep was defined as <6 hours sleep per 24 hours. Daytime sleepiness was measured using the Epworth Sleepiness Scale

(ESS; range 0–24), and a score ≥11 indicated excessive sleepiness.[23]

Statistical analysis

To check for outliers, z-scores were obtained for each variable. Z-scores of ±3.29 were considered outliers and were changed using the winsorizing method. This involved changing the score of any value that was deemed an outlier to the nearest non-outlier score in the data set. This was done for age, body mass index (BMI), number of hours worked, and years in law enforcement. Multiple logistic regression models were then used for cross-sectional analysis of associations between shift work (shift work characteristics and schedules), sleep duration, sleepiness and burnout (overall burnout, EE, DP, PA). A multicollinearity assessment using variance inflation factor, correlation coefficient and tolerance values showed no collinearity in the predictor variables (see online supplement file 1, tables S1 and S2). The models were adjusted for age, BMI, gender, marital status, hypertension, exercise (per week), cigarette smoking (yes/no), caffeine and alcohol consumption (yes/no during last week), primary police activity (patrol officer, supervisor/manager, detective), years as police officer and seniority. These potentially confounding factors were selected based on prior studies.[3 24–27] Each confounder was tested individually with the burnout outcome, and we only included those that were significant (p<0.10) in initial models.[28] A backwards elimination method was then used to remove those that were not significant at the <0.05 level when all variables were included in a single model. Factors that remained were used in the first step of a hierarchical logistic regression model. The predictor variables were then added in the second step of the model that included the selected confounding factors. Model fit was assessed using the omnibus test and goodness-of-fit indices (−2 log likelihood). Unadjusted and adjusted OR with 95% CIs are reported. Our analysis included several multilevel predictors, such as night shift frequency and shift work schedules. For night shift frequency, we hypothesised a priori that a greater frequency of night shifts would be more strongly associated with burnout compared with lower frequencies. Therefore, we compared never/nearly never working night shifts to working night shifts nearly every day and 1–4 times per week to examine if high frequency compared with low frequency of night shifts were associated with worse burnout. Furthermore, we hypothesised a priori that more variable shift work would be related to high burnout, and thus compared fixed shifts to all other categories of shift work (ie, irregular, rotating and other) to examine whether greater variation in schedules predicted higher burnout. Statistical analyses were conducted using SPSS V.24.0 (IBM) and significance set at p<0.05.

Patient and public involvement

The current study was based on secondary data from a pre-existing data set. Therefore, patients and the general public were not involved in the development of the research questions, outcome measures or design of the study.

RESULTS

Police officers were aged 38.48±8.31 (mean±SD) years and had 12.70±11.00 years of experience in law enforcement. Female officers (16.7%) in our sample were slightly over-represented compared with police in North America (12.2%).[29] The sample was predominantly white (table 1), with racial and ethnic minority groups slightly under-represented compared with national police statistics.[29] The prevalence of overweight or obesity based on BMI were over-represented in the sample (80.0%) (table 1) compared with general population data (70.0%).[30] Overall burnout was found in 17.7% of police. High EE and high DP were observed in 23.8% and 42.6% of the sample, respectively, and low PA was observed in 40.7%. In the last month, 56.7% of police worked ≥1 night shift, 63.9% worked ≥1 long shift, and 33.6% had an irregular or rotating schedule. Mean total work hours were 192.27±74.82 hours/month, mean mandatory overtime was 8.23±14.01 hours/month, and mean voluntary overtime was 12.97±19.76 hours/month. Short sleep duration was observed in 30.4% of police, and 25.8% had excessive sleepiness (table 1).

Shift characteristics and burnout

The odds of high EE increased in a dose–response manner as a function of the number of long shifts worked per week, with police completing ≥4 long shifts per week having the greatest risk (adjusted OR 1.91, 95% CI 1.35 to 2.72), compared with no long shifts. A similar relationship was demonstrated for overall burnout, with police working >0 to <2 and ≥4 long shifts per week more likely to have overall burnout (1.44, 95% CI 1.02 to 2.02 and 1.78, 95% CI 1.21 to 2.61, respectively) compared with no long shifts (table 2); even one long shift per month increased the risk of burnout (1.4–1.5-fold increase; see online supplementary tables S3, S4 and S5). Working ≥48 hours per week was associated with reduced odds of low PA (0.83, 95% CI 0.71 to 0.97) compared with shorter weeks. Neither long shift frequency nor weekly work hours were related to DP. Compared with police who never/nearly never work night shifts, those working night shifts nearly every day were at an increased risk of high DP (1.32, 95% CI 1.05 to 1.66). Working night shifts one to four times per week was associated with lower odds of low PA (0.79, 95% CI 0.64 to 0.98) compared with never working nights. Police reporting mandatory overtime had an increased risk of overall burnout (1.40, 95% CI 1.14 to 1.71), high EE (1.37, 95% CI 1.14 to 1.65) and DP (1.24, 95% CI 1.04 to 1.47), whereas voluntary overtime was only associated with high DP (1.19, 95% CI 1.02 to 1.40). Reporting any overtime (mandatory or voluntary) was also associated with overall burnout

Table 1 Participant characteristics

Characteristic	Data
N	3140
Age, mean (SD) years	38.48 (8.31)
Gender, n (%)	
Male	2609 (83.3)
Female	523 (16.7)
Not known	8 (0.3)
Body mass index, n (%)	
$<25\,kg/m^2$	610 (19.4)
≥ 25 and $<30\,kg/m^2$	1460 (46.5)
≥ 30 and $<35\,kg/m^2$	781 (24.9)
$\geq 35\,kg/m^2$	271 (8.6)
Not known	18 (0.6)
Race, n (%)	
White	2681 (85.4)
Black	257 (8.2)
Asian	34 (1.1)
Native American	21 (0.7)
Pacific Islander	1 (0.03)
Other	100 (3.2)
Not known	46 (1.5)
Ethnicity, n (%)	
Hispanic	162 (5.2)
Other	2806 (89.4)
Not known	172 (5.5)
Overtime hours per month, mean (SD)	
Mandatory	8.23 (14.01)
Voluntary	12.97 (19.76)
Total	19.46 (23.18)
Night shift frequency, n (%)	
Never or nearly never	1290 (41.1)
1–4 per week	612 (19.5)
1–4 per month	584 (18.6)
Nearly every day	615 (19.6)
Not known	39 (1.2)
Long work shifts per week (≥ 11 hours), n (%)	
None	390 (12.4)
>0 -<2	1029 (32.8)
≥ 2 -<4	496 (15.8)
≥ 4	482 (15.4)
Not known	743 (23.7)
Work hours per week, n (%)	
<48 hours	1820 (58.0)
≥ 48 hours	1260 (40.1)
Not known	60 (1.9)
Usual shift schedule, n (%)	

Continued

Table 1 Continued

Characteristic	Data
Fixed	1822 (58.0)
Irregular	274 (8.7)
Rotating	782 (24.9)
Other	239 (7.6)
Not known	23 (0.7)
Average sleep duration over the last 4 weeks*, n (%)	
<6 hours	956 (30.4)
≥ 6 hours	1780 (56.7)
Not known	404 (12.9)
Daytime sleepiness, n (%)	
Normal (<11 ESS) daytime sleepiness	2195 (69.9)
Excessive (≥ 11 ESS) daytime sleepiness	809 (25.8)
Not known	136 (4.3)
Burnout, n† (%)	
High EE	747 (23.8)
High DP	1338 (42.6)
Low PA	1278 (40.7)
Overall burnout‡	556 (17.7)
Police officers that had at least 1 dimension of burnout, n (%)	
No	1072 (34.1)
Yes	2068 (65.9)

*Per 24-hour period.
†The burnout characteristics are not mutually exclusive (eg, a participant could have both high EE and low PA).
‡Defined as high EE, high DP, with or without low PA.
DP, depersonalisation; EE, emotional exhaustion; ESS, Epworth Sleepiness Scale; PA, personal accomplishment.

(1.37, 95% CI 1.06 to 1.75) and high DP (1.45, 95% CI 1.20 to 1.76). Overtime was not related to PA.

Work schedules and burnout

Police working irregular schedules were at greatest risk of overall burnout (2.12, 95% CI 1.57 to 2.85), followed by high EE (1.91, 95% CI 1.44 to 2.54) and high DP (1.39, 95% CI 1.02 to 1.89) compared with those working fixed schedules. Compared with fixed schedules, police reporting rotating and 'other' schedules were more likely to have EE (1.30, 95% CI 1.06 to 1.59 and 1.44, 95% CI 1.05 to 1.98, respectively), but these associations were weaker than those observed for irregular shifts. Furthermore, police working rotating schedules were more likely to have low PA (1.38, 95% CI 1.15 to 1.64) compared with fixed shifts. Rotating or 'other' schedules were not associated with overall burnout or DP, and irregular or 'other' shift schedules were not related to PA (table 3).

Table 2 High burnout outcomes associated with shift work characteristics in police (n=3140)

Shift work characteristic, n*†	Positive result in police with burnout, no./no. total (%)		Unadjusted		Adjusted‡	
	High EE	Low–moderate EE	OR (95% CI)	P value	OR (95% CI)	P value
Night shift frequency						
Never/nearly never	290/734 (39.5)	935/2220 (42.1)				
1–4 per month	154/734 (21.0)	435/2220 (19.6)	1.14 (0.91 to 1.43)	0.252	1.13 (0.90 to 1.43)	0.292
1–4 per week	141/734 (19.2)	411/2220 (18.5)	1.11 (0.88 to 1.40)	0.395	1.06 (0.84 to 1.35)	0.628
Nearly every day	149/734 (20.3)	439/2220 (19.8)	1.09 (0.87 to 1.37)	0.438	1.12 (0.88 to 1.41)	0.363
N	2954					
Long work shifts per week (≥11 hours)						
0	69/575 (12.0)	296/1719 (17.2)				
>0 to <2	255/575 (44.3)	732/1719 (42.6)	1.49 (1.11 to 2.01)	0.008	1.48 (1.09 to 2.02)	0.013
≥2 to <4	123/575 (21.4)	355/1719 (20.7)	1.49 (1.07 to 2.07)	0.020	1.49 (1.05 to 2.11)	0.024
≥4	128/575 (22.3)	336/1719 (19.5)	1.63 (1.17 to 2.28)	0.004	1.91 (1.35 to 2.72)	<0.001
N	2294					
Long work weeks						
<48 hours	417/731 (40.9)	1303/2204 (59.1)				
≥48 hours	314/731 (43.0)	901/2204 (40.9)	1.09 (0.92 to 1.29)	0.324	1.14 (0.96 to 1.36)	0.141
N	2935					
Mandatory overtime						
No	305/653 (46.7)	1056/1911 (55.3)				
Yes	348/653 (53.3)	855/1911 (44.7)	1.41 (1.18 to 1.68)	<0.001	1.37 (1.14 to 1.65)	0.001
N	2564					
Voluntary overtime						
No	306/646 (47.4)	881/1935 (45.5)				
Yes	340/646 (52.6)	1054/1935 (54.5)	0.93 (0.78 to 1.11)	0.417	0.94 (0.78 to 1.12)	0.475
N	2581					
Any overtime (mandatory or voluntary)						
No	143/618 (23.1)	487/1799 (27.1)				
Yes	475/618 (76.9)	1312/1799 (72.9)	1.23 (1.00 to 1.53)	0.055	1.21 (0.97 to 1.50)	0.095
N	2417					
	High DP	Low–moderate DP				
Night shift frequency						

Continued

Table 2 Continued

Shift work characteristic, n*†	Positive result in police with burnout, no./no. total (%)		Unadjusted OR (95% CI)	P value	Adjusted‡ OR (95% CI)	P value
Never/nearly never	481/1320 (36.4)	771/1700 (45.4)				
1–4 per month	285/1320 (21.6)	316/1700 (18.6)	1.45 (1.19 to 1.76)	<0.001	1.21 (0.96 to 1.51)	0.101
1–4 per week	254/1320 (19.2)	314/1700 (18.5)	1.30 (1.06 to 1.86)	0.011	1.07 (0.84 to 1.35)	0.592
Nearly every day	300/1320 (22.7)	299/1700 (17.6)	1.61 (1.32 to 1.96)	<0.001	1.32 (1.05 to 1.66)	0.018
N	3020					
Long work shifts per week (≥11 hours)						
0	151/1027 (14.7)	226/1316 (17.2)				
>0 to <2	476/1027 (46.3)	535/1316 (40.7)	1.33 (1.05 to 1.69)	0.019	1.20 (0.93 to 1.54)	0.157
≥2 to <4	218/1027 (21.2)	268/1316 (20.4)	1.22 (0.93 to 1.60)	0.157	1.09 (0.81 to 1.45)	0.578
≥4	182/1027 (17.7)	287/1316 (21.8)	0.95 (0.72 to 1.25)	0.712	0.96 (0.71 to 1.29)	0.804
N	2343					
Long work weeks						
<48 hours	789/1325 (59.5)	976/1674 (58.3)				
≥48 hours	536/1325 (40.5)	698/1674 (41.7)	0.95 (0.82 to 1.10)	0.492	0.98 (0.83 to 1.15)	0.779
N	2999					
Mandatory overtime						
No	568/1199 (47.4)	814/1424 (57.2)				
Yes	631/1199 (52.6)	610/1424 (42.8)	1.48 (1.27 to 1.73)	<0.001	1.24 (1.04 to 1.47)	0.014
N	2623					
Voluntary overtime						
No	521/1196 (43.6)	694/1444 (48.1)				
Yes	675/1196 (56.4)	750/1444 (51.9)	1.20 (1.03 to 1.40)	0.021	1.19 (1.02 to 1.40)	0.030
N	2640					
Any overtime (mandatory or voluntary)						
No	235/1130 (20.8)	406/1345 (30.2)				
Yes	895/1130 (79.2)	939/1345 (69.8)	1.65 (1.37 to 1.98)	<0.001	1.45 (1.20 to 1.76)	<0.001
N	2475					

Continued

Table 2 Continued

Shift work characteristic, n*†	Positive result in police with high burnout, no./no. total (%) Unadjusted		Unadjusted OR (95% CI)	P value	Adjusted‡ OR (95% CI)	P value
	Low PA	Moderate–high PA				
Night shift frequency						
Never/nearly never	532/1259 (42.3)	676/1674 (40.4)				
1–4 per month	247/1259 (19.6)	329/1674 (19.7)	0.95 (0.78 to 1.17)	0.645	0.94 (0.76 to 1.15)	0.544
1–4 per week	220/1259 (17.5)	341/1674 (20.4)	0.82 (0.67 to 1.01)	0.056	0.79 (0.64 to 0.98)	0.029
Nearly every day	260/1259 (20.7)	328/1674 (19.6)	1.01 (0.83 to 1.23)	0.943	0.92 (0.75 to 1.12)	0.401
N	2933					
Long work shifts per week (≥11 hours)						
0	167/962 (17.4)	201/1314 (15.3)				
>0 to <2	426/962 (44.3)	557/1314 (42.4)	0.92 (0.72 to 1.17)	0.500	0.90 (0.69 to 1.16)	0.399
≥2 to <4	193/962 (20.1)	280/1314 (21.3)	0.83 (0.63 to 1.09)	0.183	0.84 (0.63 to 1.12)	0.234
≥4	176/962 (18.3)	276/1314 (21.0)	0.77 (0.58 to1.02)	0.063	0.77 (0.57 to 1.04)	0.085
N	2276					
Long work weeks						
<48 hours	770/1248 (61.7)	952/1670 (57.0)				
≥48 hours	478/1248 (38.3)	718/1670 (43.0)	0.82 (0.71 to 0.96)	0.011	0.83 (0.71 to 0.97)	0.017
N	2918					
Mandatory overtime						
No	562/1092 (51.5)	781/1463 (53.4)				
Yes	530/1092 (48.5)	682/1463 (46.6)	1.08 (0.92 to 1.26)	0.337	1.01 (0.86 to 1.18)	0.935
N	2555					
Voluntary overtime						
No	524/1093 (47.9)	660/1478 (47.9)				

Continued

Table 2 Continued

Shift work characteristic, n*†	Positive result in police with high burnout, no./no. total (%) Unadjusted		Unadjusted OR (95% CI)	P value	Adjusted‡ OR (95% CI)	P value
Yes	569/1093 (52.1)	818/1478 (55.3)	0.88 (0.75 to 1.03)	0.098	0.89 (0.76 to 1.05)	0.156
N	2571					
Any overtime (mandatory or voluntary)						
No	263/1030 (25.5)	357/1379 (25.9)				
Yes	767/1030 (74.5)	1022/1379 (74.5)	1.02 (0.85 to 1.23)	0.844	0.96 (0.80 to 1.17)	0.704
N	2409					
	Overall burnout	No overall burnout				
Night shift frequency						
Never/nearly never	202/545 (37.1)	1085/2547 (42.6)				
1–4 per month	121/545 (22.2)	489/2547 (19.2)	1.32 (1.04 to 1.71)	0.025	1.25 (0.97 to 1.61)	0.092
1–4 per week	110/545 (20.2)	473/2547 (18.6)	1.25 (0.97 to 1.61)	0.089	1.11 (0.85 to 1.14)	0.449
Nearly every day	112/545 (20.6)	500/2547 (19.6)	1.20 (0.93 to 1.55)	0.154	1.12 (0.86 to 1.45)	0.407
N	3092					
Long work shifts per week (≥11 hours)						
0	51/426 (12.0)	338/1967 (17.2)				
>0 -<2	191/426 (44.8)	835/1967 (42.5)	1.52 (1.09 to 2.12)	0.015	1.44 (1.02 to 2.02)	0.038
≥2 -<4	88/426 (20.7)	408/1967 (20.7)	1.43 (0.98 to 2.08)	0.061	1.36 (0.93 to 2.00)	0.116
≥4	96/426 (22.5)	386/1967 (19.6)	1.65 (1.14 to 2.39)	0.008	1.78 (1.21 to 2.61)	0.003
N	2393					
Long work weeks						
<48hours	309/547 (56.5)	1503/2524 (59.5)				
≥48hours	238/547 (43.5)	1021/2524 (40.5)	1.13 (0.94 to 1.37)	0.188	1.13 (0.94 to 1.37)	0.201

Continued

Table 2 Continued

Shift work characteristic, n*†	Positive result in police with high burnout, no./no. total (%) — Unadjusted		Unadjusted OR (95% CI)	P value	Adjusted‡ OR (95% CI)	P value
N	3071					
Mandatory overtime						
No	222/496 (44.8)	1196/2178 (54.9)				
Yes	274/496 (55.2)	982/2178 (45.1)	1.50 (1.24 to 1.83)	<0.001	1.40 (1.14 to 1.71)	0.001
N	2674					
Voluntary overtime						
No	225/489 (46.0)	1016/2201 (46.2)				
Yes	264/489 (54.0)	1185/2201 (53.8)	1.01 (0.83 to 1.23)	0.952	1.01 (0.83 to 1.24)	0.910
N	2690					
Any overtime (mandatory or voluntary)						
No	97/471 (20.6)	564/2048 (27.5)				
Yes	374/471 (79.4)	1484/2048 (72.5)	1.56 (1.31 to 1.87)	<0.001	1.37 (1.06 to 1.75)	0.014
N	2519					

*The n presented represents the sample for each unadjusted analysis. The n for the adjusted analyses are in online supplementary file 1, table S6.
†Some participants did not provide sufficient information from which to determine their shift work characteristics. The n presented are from those who answered sufficiently.
‡Adjusted for age, BMI, gender, marital status, hypertension, cigarette use, caffeine use, alcohol, second job, primary activity, years as police officer, exercise frequency and seniority. Variables included in each model are in online supplementary file 1, table S6, and model fit is reported in online supplementary file 1, table S7.
BMI, body mass index; DP, depersonalisation;EE, emotional exhaustion; PA, personal accomplishment.

Table 3 High burnout outcomes associated with shift work schedules in police (n=3140)

Shift work schedule, n*†	Positive result in police with high burnout, no./no. total (%)		Unadjusted		Adjusted‡	
			OR (95% CI)	P value	OR (95% CI)	P value
	High EE	Low–moderate EE				
Fixed	382/743 (51.4)	1366/2227 (61.3)				
Irregular	96/743 (12.9)	168/2227 (7.5)	2.04 (1.55 to 2.69)	<0.001	1.91 (1.44 to 2.54)	<0.001
Rotating	200/743 (26.9)	534/2227 (24.0)	1.34 (1.10 to 1.63)	0.004	1.30 (1.06 to 1.59)	0.011
Other	65/743 (8.7)	159/2227 (7.1)	1.46 (1.07 to 1.99)	0.016	1.44 (1.05 to 1.98)	0.024
N	2970					
	High DP	Low–moderate DP				
Fixed	740/1331 (55.6)	1038/1703 (61.0)				
Irregular	146/1331 (11.0)	117/1703 (6.9)	1.75 (1.35 to 2.27)	<0.001	1.39 (1.02 to 1.89)	0.038
Rotating	343/1331 (25.8)	416/1703 (24.4)	1.16 (0.96 to 1.37)	0.096	0.98 (0.80 to 1.19)	0.830
Other	102/1331 (7.7)	132/1703 (7.8)	1.08 (0.82 to 1.43)	0.566	1.07 (0.78 to 1.45)	0.665
N	3034					
	Low PA	Moderate–high PA				
Fixed	695/1271 (54.7)	1030/1679 (61.3)				
Irregular	107/1271 (8.4)	158/1679 (9.4)	1.00 (0.77 to 1.31)	0.978	0.97 (0.74 to 1.27)	0.845
Rotating	366/1271 (28.8)	370/1679 (22.0)	1.47 (1.23 to 1.74)	<0.001	1.38 (1.15 to 1.64)	<0.001
Other	103/1271 (8.1)	121/1679 (7.2)	1.26 (0.95 to 1.67)	0.104	1.27 (0.96 to 1.69)	0.100
N	2950					
	Overall burnout	No overall burnout				
Fixed	279/553 (50.5)	1539/2555 (60.2)				
Irregular	82/553 (14.8)	192/2555 (7.5)	2.36 (1.77 to 3.14)	<0.001	2.12 (1.57 to 2.85)	<0.001
Rotating	146/553 (26.4)	632/2555 (24.7)	1.27 (1.02 to 1.59)	0.031	1.24 (0.99 to 1.56)	0.065
Other	46/553 (8.3)	192/2555 (7.5)	1.32 (0.94 to 1.87)	0.114	1.30 (0.91 to 1.85)	0.153
N	3108					

*The n represents the sample for each unadjusted analysis. The n for the adjusted analyses are in online supplementary file 1, table S6.
†Some participants did not provide sufficient information from which to determine their shift work characteristics. The n presented are from those who answered sufficiently.
‡Adjusted for age, BMI, gender, marital status, hypertension, cigarette use, caffeine use, alcohol, second job, primary activity, years as police officer, exercise frequency and seniority. Variables included in each model are in online supplementary file 1, table S6, and model fit is reported in online supplementary file 1, table S7.
BMI, body mass index; DP, depersonalisation; EE, emotional exhaustion; PA, personal accomplishment.

Sleep and burnout

Police who reported, on average, short sleep (<6 hours) were more likely to have overall burnout (1.49, 95% CI 1.21 to 1.82), high EE (1.60, 95% CI 1.33 to 1.93) and low PA (1.24, 95% CI 1.05 to 1.47) compared with those sleeping ≥6 hours. Short sleep was not associated with DP (table 4). Police with excessive sleepiness were more likely to have overall burnout (1.72, 95% CI 1.41 to 2.11), high EE (1.81, 95% CI 1.50 to 2.18) and high DP (1.48, 95% CI 1.23 to 1.78) compared with police with normal sleepiness (table 4).

DISCUSSION

In this sample of North American police officers, 17% exhibited overall burnout, which is higher than the 10% previously observed in office workers.[19] Almost two-thirds of the sample (65.9%) were also found to have at least one dimension of burnout, and this too exceeds levels reported in other human service occupations and the general population.[31] Long shifts, mandatory overtime, short sleep and sleepiness were each associated with significantly increased risk of overall burnout in police. Among the different schedules, officers working irregular shifts had a twofold higher risk of overall burnout, demonstrating the risk of burnout associated with this schedule for the first time in police. For individual dimensions of burnout, almost half of police had high depersonalisation (42.6%), the same was true for low personal accomplishment (40.7%), while nearly a quarter had high emotional exhaustion (23.8%). The prevalence of DP was higher in this sample of police compared with the US general population (15%), and EE levels were similar to general population data (23%).[31] The risk of EE was higher in police working a greater frequency of long shifts, and

Table 4 High burnout outcomes associated with sleep duration and sleepiness in police (n=3140)

Sleep characteristics, n*†	Positive result in police with high burnout, no./no. total (%)		Unadjusted		Adjusted‡	
			OR (95% CI)	P value	OR (95% CI)	P value
	High EE	Low–moderate EE				
Sleep duration						
≥6 hours per night	371/654 (56.7)	1334/1956 (68.2)				
<6 hours per night	283/654 (43.3)	622/1956 (31.8)	1.64 (1.36 to 1.96)	<0.001	1.60 (1.33 to 1.93)	<0.001
N	2610					
Sleepiness						
<11 ESS	451/714 (63.2)	1652/2158 (76.6)				
≥11 ESS	263/714 (36.8)	506/2158 (23.4)	1.90 (1.59 to 2.28)	<0.001	1.81 (1.50 to 2.18)	<0.001
N	2872					
	High DP	Low–moderate DP				
Sleep duration						
≥6 hours per night	755/1206 (62.6)	989/1469 (67.3)				
<6 hours per night	451/1206 (37.4)	480/1469 (32.7)	1.23 (1.05 to 1.44)	0.011	1.13 (0.96 to 1.33)	0.151
N	2675					
Sleepiness						
<11 ESS	875/1286 (68.0)	1267/1639 (77.3)				
≥11 ESS	411/1286 (32.0)	372/1639 (22.7)	1.60 (1.38 to 1.89)	<0.001	1.48 (1.23 to 1.78)	<0.001
N	2925					
	Low PA	Moderate–high PA				
Sleep duration						
≥6 hours per night	670/1077 (62.2)	1024/1524 (67.2)				
<6 hours per night	407/1077 (37.8)	500/1524 (32.8)	1.24 (1.06 to 1.46)	0.009	1.24 (1.05 to 1.47)	0.011
N	2601					
Sleepiness						
<11 ESS	867/1224 (70.8)	1213/1627 (74.6)				
≥11 ESS	357/1224 (29.2)	414/1627 (25.4)	1.21 (1.02 to 1.43)	0.027	1.18 (0.99 to 1.41)	0.061
N	2851					
	Overall burnout	No overall burnout				
Sleep duration						
≥6 hours per night	279/491 (56.8)	1497/2238 (66.9)				
<6 hours per night	212/491 (43.2)	741/2238 (33.1)	1.54 (1.26 to 1.87)	<0.001	1.49 (1.21 to 1.82)	<0.001
N	2729					
Sleepiness						
<11 ESS	338/532 (63.5)	1852/2464 (75.2)				
≥11 ESS	194/532 (36.5)	612/2464 (24.8)	1.74 (1.42 to 2.12)	<0.001	1.72 (1.41 to 2.11)	<0.001
N	2996					

*The n presented represents the sample for each unadjusted analysis. The n for the adjusted analyses are in online supplementary file 1, table S6.
†Some participants did not provide sufficient information from which to determine their sleep duration and sleepiness. The n presented are from those who answered sufficiently.
‡Adjusted for age, BMI, gender, marital status, hypertension, cigarette use, caffeine use, alcohol use, second job, primary activity, years as police officer, exercise frequency and seniority. Variables included in each model are in online supplementary file 1, table S6, and model fit is reported in online supplementary file 1, table S7.
BMI, body mass index; DP, depersonalisation; EE, emotional exhaustion; ESS, Epworth Sleepiness Scale; PA, personal accomplishment.

working night shifts nearly every day were associated with an increased risk of DP. Long work weeks were associated with reduced odds of low PA, and mandatory, but not voluntary, overtime increased EE. There was an increased likelihood of EE and PA among police reporting short sleep and an increased risk for EE and DP in those with excessive sleepiness.

Police regularly completing long work shifts were at increased risk of overall burnout and high EE. Previous studies in nurses have reported similar associations between increased hours of work on the most recent shift and high burnout.[13 14] We expand on these findings by demonstrating how the risk of EE is dependent on the number of long shifts worked, with working ≥4 long shifts associated with nearly double the risk of EE. Working ≥1 long shift per month and ≥4 long shifts per week were also associated with high EE and overall burnout, but the risk conferred by other shift frequencies (ie, >0 to <2, 2 to <4 long shifts per week) was less consistent for these aspects of burnout. Working ≥48 hours per week was associated with reduced odds of low PA in police, which contrasts research in physicians using a similar definition of weekly work hours,[22] as well as a prior study in UK police that defined long work weeks using a slightly higher threshold (≥49 hours per week).[27] Long work weeks and night shifts (1–4 per week) were the only shift characteristics in this study associated with reduced odds of low PA. Although these findings were unexpected, they may highlight certain aspects of shift work in policing that allow personnel to feel effective and a sense of accomplishment in their work, but further research that explores the relationships between PA and weekly night shifts (eg, comparing 1–2 and 3–4 night shifts per week) and work hours (eg, ≥49 or ≥60 hours) in more detail is needed to confirm these findings. Compared with weekly work hours, however, the associations between long work shifts and burnout were positive, typically stronger and affected more burnout dimensions. This is an important detail, as it demonstrates how the distribution of work hours, not just total overall hours, influences burnout in police. This suggests the need for shorter and less compressed shifts that spread work hours across the week to reduce burnout. For instance, Amendola et al[8] found that police working 10 hour shifts reported longer sleep and higher quality of work–life balance compared 8 or 12 hour shifts, although burnout was not examined in that study. Further research is needed to examine whether shortening shift lengths, as well as limiting the frequency of long work shifts, also reduces burnout in police as it has been shown in EMTs.[15]

Mandatory overtime was associated with an increased risk of overall burnout, high EE and DP among police. Conversely, voluntary overtime was not associated with EE or overall burnout but was associated with high DP. A prior study in police failed to show a relationship between overtime (combined voluntary and mandatory) and burnout.[18] The results of our study suggest the control a police officer has over overtime may influence how closely this shift characteristic is associated

with burnout, in particular overall burnout and EE. This interpretation is supported by research from Beckers et al[32] in full-time workers who reported involuntary overtime was associated with high emotional fatigue and low job satisfaction, and classified involuntary overtime workers as a burnout risk group. In their study, Beckers and colleagues[32] did not examine DP, but based on our findings in police, it is possible that voluntary (and mandatory) overtime may pose a risk to this dimension. Further research determining the specific durations of overtime associated with high burnout and which dimensions of burnout is needed to inform policies regarding the safe provision of work hours in excess of normal shift lengths.

Increased frequency of night shifts was associated with high DP in police, but not overall burnout or EE. Research has reported associations between increased night work and burnout in healthcare personnel, but only for overall burnout and EE.[12 33] Furthermore, the rate of night shifts per month was not found to associate with burnout among healthcare workers.[33] These inconsistencies may reflect differences among human service professions and perhaps their physical environments (eg, lighting levels that affect mood and alertness)[34] that may impact the manifestation of burnout dimensions. For instance, healthcare workers typically develop higher rates of EE,[35] whereas police report greater DP,[36] as demonstrated in the current study. High DP reflects a critical relationship between people and their work, as it refers to negative feelings and attitudes towards one's clients.[4] Therefore, high DP in police could be due to the difficult nature of some of the people with whom police interact. In addition to sleep disruption with night work, police encounter more stressful events at night.[37] Sleep is further disrupted among people with untreated sleep disorders, and common sleep disorders are shown to increase the likelihood of police demonstrating anger towards suspects or citizens.[3] Thus, the combination of poor mood, sleep and difficult clients may explain the increased risk of DP associated with regular night work in police. Further research comparing police attitudes towards clients with whom they interact at night compared with the day is needed to understand the mechanisms underpinning the increased risk of DP conferred by night shifts in police.

Police officers who reported short sleep had a greater risk of overall burnout, high EE and low PA, while sleepiness increased the likelihood for EE, DP and overall burnout. Similar sleepiness levels have been related to high burnout in medical students.[26] Our findings for sleep duration are also consistent with research showing short sleep over a month increases overall burnout in police.[11] Inadequate sleep may impair police officers' ability to recover from occupational demands, potentially explaining the heightened burnout risk in those reporting short sleep in this study. Achieving sufficient sleep can be difficult when working at night and/or long hours, as these shifts may limit sleep opportunities at

night and involve attempts by the shift worker to sleep at times of the day when alertness levels are high (and sleep propensity is low).[38] Indeed, when restricting the sample to police regularly completing long shifts, officers reporting short sleep and excessive sleepiness had a twofold increased risk of EE (online supplementary tables S8, S4 and S5). These findings highlight the health burden of sleepiness and sleep loss in law enforcement and the need for interventions that address sleep in addition to optimising shift schedules.

Police working irregular shifts were more likely to have overall burnout, high EE and DP compared with officers working fixed shifts. Canadian workers completing non-standard schedules (shifts other than fixed 09:00-17:00) have also been found to have increased overall burnout and EE,[39] but to our knowledge, this is the only other study to have investigated the relationship between irregular or non-standard schedules and burnout. A growing body of research suggests that greater variability in sleep duration and bedtimes predict worse mental health.[40] Workers with irregular shifts are likely to have more variability in their sleep patterns,[41] which in turn, may explain the increased burnout risk among police engaged in this schedule. Considering 8.7% of our sample worked irregular shifts, our findings may have implications for arranging work schedules to limit irregular shifts to reduce burnout. Rotating shifts were also common among police in our study (24.9%) and associated with high EE and low PA. Conversely, nurses working fixed shifts compared with rotating schedules are reported to have greater EE and DP,[42] but not low PA, with those working fixed night and morning shifts showing the highest levels of EE and DP.[43] The hazards related to fixed night shifts are well documented,[44] although in the current study it was not possible to specifically identify the types of fixed shifts police completed (eg, fixed night vs fixed day shifts). Despite this limitation, when we restricted the analysis to police only working fixed shifts, those reporting a greater frequency of night shifts had an increased risk of DP (see online supplementary tables S9, S10 and S11), which aligns with previous findings for fixed night work.[43] In addition to the different types of fixed shifts, there is also a diverse range of shift rotations in policing, which were grouped into one variable (ie, rotating schedules) in our study. Specific shift rotations and types of fixed shifts may have varying effects on burnout, thus underspecifying these schedules in the current study may limit the interpretation of our findings. Further research that uses detailed objective shift work information will allow for a more nuanced approach when it comes to examining interactions between different shift schedules and burnout in police and other emergency services.

In addition to subjective shift information, a further limitation of this study was the use of self-reported sleep characteristics. Although some questions used to record police officers' work and sleep hours have been validated,[20] participants were required to report and recall this information for the prior month. An additional limitation was the cross-sectional design. Future longitudinal studies using objective work and sleep measures are needed to examine the causality within our findings.

The results of this study among police contribute to a growing evidence base in shift workers that indicates how the number of long shifts and night shifts, mandatory overtime and short sleep and sleepiness raise the risk of burnout. Importantly, we further demonstrate that irregular schedules present a significant risk for burnout. These findings support future research in police that trials reducing the rate of long shifts and night shifts per week in vulnerable officers and preventing irregular schedules where possible. Although shift work is unavoidable for industries such as law enforcement, optimising work hours in relation to control over overtime, consistency of schedules and reducing duration and frequency of night and long shifts should be explored as a way to lower the high level of burnout among police, leading to improved health for personnel and enhanced performance for their department and communities whom they serve.

Author affiliations

[1]Turner Institute for Brain and Mental Health, School of Psychological Sciences, Monash University, Clayton, Victoria, Australia
[2]Paramedic Health and Wellbeing Research Unit, Monash University, Frankston, Victoria, Australia
[3]Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, Brigham and Women's Hospital, Boston, MA, USA
[4]Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA

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ORCID iD
Alexander P Wolkow http://orcid.org/0000-0001-7845-3104

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