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The Effect of Sleep Environment on Sleep Quality and Behavior in Firefighters

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ABSTRACT

Firefighting is a demanding profession with high physical and psychological demands. Additionally, shift work results in abnormal working hours, decreased work-life balance, and poor recovery, impacting sleep behaviors. Poor sleep has been associated with health issues such as increased cardiometabolic risk, mental health disorders, and reduced cognitive function. While this population is prone to disrupted sleep while on shift, little research exists describing the effect of the on-duty sleeping environment on sleep quality in firefighters. **PURPOSE:** Examine the effect of the sleep environment on sleep quality in firefighters. **METHODS:** Sixty-six firefighters (Age= 40.89±11.05; Body Mass Index = 29.01±3.84) enrolled in a wellness program completed a health history questionnaire as part of their annual evaluation. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Subjects completed the questionnaire twice (On-Duty and Off-Duty), and each version was scored using the PSQI scoring manual. A Wilcoxon Signed Ranks Test was used to examine differences in PSQI scores On-Duty vs. Off-Duty. A Mann-Whitney U test was used to determine differences in PSQI scores in Bunk vs. Dorm style sleeping quarters on-duty. **RESULTS:** Data revealed a significant difference in PSQI variables between On-Duty and Off-Duty, with Sleep Duration ($Z = -5.078$; $p < 0.001$), Sleep Efficiency ($Z = -3.991$; $p < 0.001$), Sleep Quality ($Z = -4.466$; $p < 0.001$), and the Total PSQI ($Z = -4.424$; $p < 0.001$) scoring significantly better Off-Duty compared to On-Duty. Additionally, no significant differences exist in PSQI variables or the Total PSQI score between Bunk and Dorm style sleeping quarters. **CONCLUSIONS:** Results of the current investigation indicate no significant differences in sleeping quality between different styles of fire station sleeping quarters but demonstrate significant differences in the place of sleep (Off-Duty vs. On-Duty). Specifically, Sleep Duration, Efficiency, Quality, and Total PSQI values were greater, resulting in better sleep, when sleeping off-duty. Future research should be done examining the relationships between call volume and sleep quality, as well as the effects of sleep related interventions for improving on duty sleep, as well as off-duty to aid in recovery from the acute sleep deprivation experienced on-duty.

INTRODUCTION

- Firefighters (FF) are a special population and typically work on an irregular schedule in 24 hours on/48 hours off shifts.
- An increase in non-emergency fire calls and family commitments limit opportunities for firefighters to sleep during their shifts and on “off days.”
- Poor sleeping behaviors in firefighters are associated with health issues such as cardiometabolic risk, lower cerebral brain fluid, and reduced working memory performance.

PURPOSE

The purpose of this investigation was to examine the effect of the sleep environment (Off-Duty vs. On-Duty; Bunk Style vs. Dorm Style) on sleep quality and sleep behaviors in firefighters.

METHODOLOGY

Study Population

- 66 total firefighters
- 65 Male, 1 Female
- All subjects from two departments in Northeast Ohio, participating in an employee-based wellness program.

Table 1: Demographic Characteristics

Characteristic	Mean ± SD
Age (years)	40.89 ± 11.05
Body Mass Index (kg/m ²)	29.01 ± 3.84
Resting Blood Pressure (mmHg)	
SBP	128.06 ± 9.63
DBP	76.70 ± 7.40
Percent Body Fat (%)	22.61 ± 6.35
Waist-to-Hip Ratio	0.92 ± 0.07

Procedures

- Subjects completed an annual fitness and wellness evaluation, including a Health History Questionnaire.
- As part of the questionnaire, Sleep Quality was assessed using the Pittsburgh Sleep Quality Index (PSQI)
 - Subjects completed the questionnaire twice with answers specific to sleep environment (On-Duty vs. Off-Duty).
 - Each version was scored using the PSQI scoring manual resulting in a Total PSQI score, where scores >5 are associated with poor sleep quality.
 - Additionally, sub-scores for Sleep Duration, Sleep Disturbance, Sleep Latency, Sleep Efficiency, Overall Sleep Quality, Day Dysfunction due to Sleepiness, and Medication Use for Sleep were calculated.

ANALYSES

Statistical Analysis

- Data was analyzed using SPSS 22.0
- Normality was assessed and the appropriate nonparametric statistical tests were applied; Alpha level was set at $p < 0.05$ a priori.
 - A Wilcoxon Signed Ranks Test was used to examine differences in PSQI scores in On-Duty vs. Off-Duty.
 - A Mann-Whitney U test was used to determine differences in PSQI scores in Bunk vs. Dorm style sleeping quarters On-Duty.

RESULTS

- Total PSQI scores indicated that firefighters have poor sleep quality both On-Duty (mean= 7.34 ± 3.30) and Off-Duty (mean = 5.66 ± 3.24).
- Statistically significant differences in PSQI variables were identified between Off-Duty and On-Duty, resulting in significantly better PSQI scores Off-Duty for:
 - Sleep Duration ($Z = -5.078$; $p < 0.001$)
 - Sleep Efficiency ($Z = -3.991$; $p < 0.001$)
 - Sleep Quality ($Z = -4.466$; $p < 0.001$)
 - Total PSQI ($Z = -4.424$; $p < 0.001$)
- No significant differences in PSQI variables or the Global PSQI score between Bunk and Dorm style sleeping quarters were observed.

CONCLUSIONS

- Results of the current investigation indicate that sleep quality is poor in firefighters both on-duty and off-duty.
- Overall, sleep is worse on-duty regardless of sleeping environment (Bunk vs. Dorm).
- Future research and interventions should look to improve on-duty and off-duty sleep as part of a wellness program in firefighter education. Greater research should be conducted to examine these programs and undermine potential sleep deprivation factors.

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