



# Physical Fitness Testing in Night Shift

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## Opinion

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## Opinion

Today we live in an era when people work round-the-clock. Fitness to work is usually assessed at day or even shifts; in this case fire fighters were assessed for their physical fitness to work during night shift. Concerns were raised by a few fire fighters that impact of fatigue, and day time sleep had on heart rate affected their fitness while assessed during night shift.

The concern was related to fatigue and sleeping during day time having a significant impact on heart rate. To address these concerns and brief review of literature using PubMed was performed. Three different statements were selected for PubMed search as below:

- Impact of fatigue and sleeping during day time on heart rate (while sleeping in day, to understand the changes in physiological patterns versus night sleep): A PubMed search resulted in 5 articles; none of which discussed the impact of sleeping during days with heart rate. A separate search resulted in one article which stated "In conclusion, daytime sleep is associated with a progressive decline in mean arterial blood pressure with deeper levels of sleep. Movement from the upright to the recumbent position accounts for a barge part of the decline in heart rate and mean arterial blood pressure that accompanies daytime sleep. The physiologic mechanisms associated with daytime and night time sleep-associated heart rate and mean arterial blood pressure changes may be different. Further, studies are needed to explore the mechanisms of daytime and night time sleep-rebated hemodynamic changes" [1]. There was no definitive article which I could find which commented on day time sleep and its impact on heart rate. The main concern was should or should we not assess the physical fitness to work in the nightshift; therefore, it seemed this would not be of significant importance hence more effort was not put in finding further studies.
- Impact of fatigue and sleeping during day time on heart

rate in the night (while the individual is working): This was more important to the facts that would these factors independently or collectively have a significant impact on the fitness of a worker in nightshift. A PubMed search resulted in 11 articles; 1 article was selected and summarized below as it discussed the influence of sleep and heart rate. The remaining articles were more focused to flight crew, or specific athletes' and their training schedules impact on their performance. Takahashi, et al. compared the shift work-related problems among nurses in a university hospital with respect to subjective symptoms, physical activity, heart rate, and sleep between 16 and 8 hour evening/night shifts. The nurses doing 16 hour night shift took a 2 hour nap during the shift, and had at least one day off after each shift. Results showed similar or lower levels of sleepiness, difficulty in concentration, fatigue, physical activity, and heart rate during the 16 hour shift compared to the 8 hour shifts [2]. This showed that heart rate was not impacted by both day time sleep and fatigue in both the scenarios.

- Reliability of Physical fitness assessment during nightshift: A PubMed search resulted in no article. The search was modified and only on "Assessment" and "Nightshift" PubMed search had 10 articles; none of which were related to fitness they focused on illness and injuries related to nightshift.

## Discussion

A further detailed search on the topic helped assess the question of impact of fatigue and sleeping during day by understand the physiological mechanism. Heart rate and blood pressure have circadian rhythm that is primarily related to activity. Circadian rhythms can be described as body function which regulates a number of parameters such as temperature, metabolism, digestion, blood pressure, secretion of adrenalin, waking and sleeping. The circadian

rhythm from the body's internal clock it allows for high activity during the day and low activity periods during night time. Therefore, individuals often feel most active around 4-6pm, and most sleepy around 4-6am [3].

There are conflicting reports on nocturnal sleep patterns, a number of articles report that blood pressure normally declines. This decrease/ decline in blood pressure may correlate with depth of sleep (documented by electroencephalogram) [4-6]. Somers, et al. [7] reported a reduction of blood pressure during night time sleep, accompanied by a reduction in heart rate and sympathetic nerve activity. The prevention of night time sleep removes the bimodal pattern of blood pressure in normal subjects [8].

Based on the above discussion once the night sleep is prevented or disturbed the normal circadian or bimodal pattern is prevented; therefore, the changes in heart rate and/or blood pressure which are expected while an individual is a sleep do not occur when he/she is awake and active. There are a number of articles which describe the impact of shift work on the wellbeing of the workers but none of them have questioned the fitness to work during night shift as a fire fighter or army servicemen.

## Conclusion

In my opinion although nightshift may not be the ideal time to perform physical fitness assessment there is no proven medical reason which would exempt this shift from physical fitness assessment based on significant disadvantage to the other shifts due to change in heart rate because of fatigue or sleeping during day time.

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