Restricted sleep and negative affective states in commercial pilots during short haul operations

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ABSTRACT

This study aims to investigate (1) the relationship between restricted sleep and Heightened Emotional Activity (HEA) during normal flight operations, and (2) whether sleep patterns influence the strength of the HEA as a response to threats. Accident investigation reports continue to highlight the relationship between restricted sleep and poor safety outcomes. However, to date we have a limited understanding of how sleep and HEA interact. A total of 302 sectors of normal airline flight operations were observed by trained observers, and instances of heightened emotional activity were recorded. During the cruise phase of each of these sectors, crew members were asked to calculate the amount of sleep they had obtained in previous 24 and 48 h. In the 302 sectors of normal flight operations, 535 instances of HEA were observed. Descriptive analyses of instances of HEA and sleep in the prior 24 and 48 h showed a significant relationship between the occurrence of HEA and recent sleep. The relationship between restricted sleep and HEA suggests that there may well be further implications with respect to operational safety.

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1. Introduction

Optimal performance is critical in high-risk environments such as aviation. Factors in the operating environment such as fatigue can degrade performance (Belenky et al., 2003; Thomas and Ferguson, 2010). Matthews and Desmond (2002) define fatigue as a transient state associated with difficulties in maintaining task-directed effort and attention during sustained performance. A high external load, compounded by fatigue, may impact an individual’s affective response to operational threats. The flight or flight reactions associated with affective responses have evolved as part of our biologically ‘hardwired’ survival skills (Caruso and Salovey, 2004; Ledoux, 1998; Damasio, 1994). Heightened Emotional Activity (HEA) is defined as the affective responses to perceived environmental threats encountered (Drury et al., 2010). Expressed in the form of auditory communication and body language, HEAs are “biological responses to changes in perception as to the nature or level of threats to the environment” (Drury et al., 2010). Heightened Emotional Activity has implications for operational performance as higher-order cognitive processing is impaired, and physiological activation increases as a reaction to fatigue induced emotional responses (Angus et al., 1985; Pigeau et al., 1995).

Airline flight crews are a group that are exposed to the physiological and cognitive decline associated with extended periods of stress and fatigue. The normal flight deck environment can operate between the calm of cruise flight and the intensity of the descent and approach to land. Short-haul airline operations generally operate multiple take-offs and landings as part of a 24/7 operation, sometimes with short layovers (Gander et al., 1998a). Long-haul airline operations are conducted over longer flight sequences, generally with extended layovers in a different time zone disrupting circadian rhythms (Samel et al., 1997; Gander et al., 1998b). Both operational schedules are therefore associated with disrupted sleep patterns and fatigue issues.

Fatigue has been identified as a major contributor to aviation accidents, as documented in aviation accident reports. American International Airways Flight 808 stalled and crashed while attempting to land at the US Naval air station at Guantanamo Bay Cuba (NTSB, 1993). In the analysis of the accident, the National Transportation Safety Board (NTSB) reports that the captain’s fatigue and stress degraded his situational awareness to the point where he was unable to register the concerns from the other crew members that “they were not going to make it” while he continued the unstable, and more difficult, approach to runway 10 (Rosekind et al., 1993). The captain had been awake for 23.5 h and had slept for five of the 28.5 h prior to the accident (Rosekind et al., 1993).

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