Effects of Fatigue in Portuguese Commercial Airline Pilots

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Disclosure Information

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✓ I have no financial relationships to disclose

✓ I will not discuss off-label use and/or investigational use in my presentation
“a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member’s alertness and ability to safely operate an aircraft or perform safety related duties”
Fatigue

Causes

Short/Medium haul (SMH)
- Sleep deprivation
- High workload

Long haul (LH)
- Sleep deprivation
- Circadian disturbances

- Night flights,
- Jet lag,
- Early wakeups,
- Time pressure,
- Multiple sectors,
- Consecutive duty periods without sufficient recovery
Fatigue
Consequences

- Performance
  - Short memory
  - Decision making
  - Reaction times
  - Reduced vigilance

- Mood
  - Degraded mood
  - Irritability
  - Loss of motivation

- Health
  - Cancer
  - Heart problems

Increased incident/accident risk!
Accidents in which fatigue was a contributing factor

- **Guam, 1997**
  - 228 deaths
- **Little Rock, 1999**
  - 11 deaths, 110 wounded
- **Buffalo, 2009**
  - 51 deaths
- **Mangalor, India, 2010**
  - 158 deaths
Objectives

- Determine a self-reported prevalence value of fatigue for Portuguese airline pilots
  - Analyze differences between fatigue levels and type of flights
  - Understand the perception of pilots’ own fatigue levels

- Determine self-reported prevalence values of sleep/sleepiness, anxiety and depression for the study population
  - Analyze differences between type of flights
  - Analyze potential associations with fatigue and supposedly related variables:
    - Sleep disturbances → Duty hours
    - Diurnal sleepiness → Sectors flown
    - Anxiety → Hours of flight
    - Depression → Etc.
**Methods**

**Study Population**

**Inclusion criteria**
- Airline pilots working on Portuguese companies;
- Age between 20 and 65 years old;
- Being flow in the last 6 months.

**Exclusion criteria**
- Haven’t answered all questions;
- Duplication of questionnaires;
- Do not have delivered the questionnaire in the stipulated time (1\textsuperscript{st} of April until 15\textsuperscript{th} May).
Methods

Target Population = 1500 Portuguese Airline Pilot’s

Distributed inquiries, n=1498

- Invalidated, n=23
- Collected, n=456

Invalidated:
- Long haul, n=127
- Short/ Medium haul, n=314
- Medium + Long haul, n=15

Response rate = 30.6%
Baseline Characteristics of the Study Population

- Dimension – 456
- Average Age – 39.31 years
- Male – 442 (96.9%)
- Female – 14 (3.1%)
- Captains – 234 (51.3%)
- First Officers – 222 (48.7%)
- Medium/long haul – 15 (3.3%)
- Short/Medium haul – 314 (68.9%)
- Long haul – 127 (27.9%)
- Duty hours (28 days) – 98.5h
- Flight hours (28 days) – 60.2h
- Sectors flown (28 days) – 22.1
Methods

Self-response questionnaire

- Sociodemographic data
- Labor variables
- Fatigue perception
- Psychological evaluation scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue Severity Scale (FSS)</td>
<td>0.856</td>
</tr>
<tr>
<td>Jenkins Sleep Scale (JSS)</td>
<td>0.839</td>
</tr>
<tr>
<td>Epworth Sleepiness scale (ESS)</td>
<td>0.825</td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale (HADS)</td>
<td>0.922</td>
</tr>
<tr>
<td>Anxiety sub-scale</td>
<td>0.870</td>
</tr>
<tr>
<td>Depression sub-scale</td>
<td>0.859</td>
</tr>
</tbody>
</table>
Results

Target Population: 1500 Portuguese Airline Pilot's

Distributed inquiries: n=1498

- Invalidated: n=23
- Collected: n=456

Fatigue Prevalence: 89.3%

Long haul: n=127
- Fatigue Prevalence: 84.3%

Short/medium haul: n=314
- Fatigue Prevalence: 93%

Medium + Long haul: n=15
- N.S.

Response rate = 30.6%
<table>
<thead>
<tr>
<th>%</th>
<th>Total Sample</th>
<th>SM-H</th>
<th>L-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>89.3</td>
<td>93</td>
<td>84.3</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>35.1</td>
<td>34.4</td>
<td>36.2</td>
</tr>
<tr>
<td>Diurnal sleepiness</td>
<td>57.7</td>
<td>61.8</td>
<td>51.2</td>
</tr>
<tr>
<td>Anxiety</td>
<td>38.6</td>
<td>39.5</td>
<td>37</td>
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<tr>
<td>Depression</td>
<td>49.6</td>
<td>50.6</td>
<td>47.2</td>
</tr>
</tbody>
</table>
Results

Associations with fatigue**

L-H Pilots

- Sleep disturbances **
- Daytime sleepiness *
- Anxiety **
- Depression **
- Night periods **
- Duty hours *
- Sectors flown *
- Hours flown**

Non-labor variables

SM-H Pilots

- Sleep disturbances **
- Daytime sleepiness **
- Anxiety **
- Depression **
- Night periods *
- Early starts *

Labor variables

* p < 0.05     **p < 0.01
Results

**L-H Pilots**

- Sleep disturbances **
- Daytime sleepiness *
- Anxiety
- Depression
- Night periods
- Duty-hours
- Sectors flown
- Hours flown *

\[ R^2 = 0.461 \]

**SM-H Pilots**

- Sleep disturbances **
- Daytime sleepiness *
- Anxiety
- Depression **
- Night periods
- Early mornings

\[ R^2 = 0.305 \]

* *p < 0.05
** *p < 0.01
Results

L-H Pilots
R²=0.461

- Sleep disturbances **
- Daytime sleepiness
  - Anxiety
- Depression
- Night periods
- Duty-hours
- Sectors flown
- Hours flown *

SM-H Pilots
R²=0.305

- Sleep disturbances *
- Daytime sleepiness *
- Anxiety
- Depression *
- Night periods
- Early mornings

* p < 0.05  **p < 0.01
Results

Fatigue Perception

- Piloting error due to fatigue: 91.4%
- So fatigued that should not be at the controls: 86.8%
- Dozing-off/falling asleep in the cockpit without prior agreement: 53.5%
- Not fit for flight due to fatigue: 18.4%
- Reported fatigue to the company (HFCR): 18.6%
Conclusions

- SM-H pilots presents statistically significant higher levels of fatigue than L-H pilots;

- SM-H pilots consequently present higher frequency values for diurnal sleepiness, anxiety and depression, only sleep disorders were higher in L-H pilots, probably due to circadian disruptions;

- SM-H pilots fatigue predictors were: sleep disorders, levels of diurnal sleepiness and depression;

- L-H pilots fatigue predictors were: sleep disorders and number of hours flown;

- Although pilots have conscience of their level of fatigue and its implications, they don’t report it.

Reis, C.; Mestre, C. & Canhão, H. *Multiple Approaches to Airline Pilot’s Fatigue – a survey study*. (submitted)
Thank you for your attention!

Acknowledgements:

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• SPAC – Sindicato de Pilotos da Aviação Civil
Questions ?