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Fatigue and Sleepiness in Aircrew: Experience of the Aeromedical Expertise Center of Rabat (CEMPN)

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Abstract: Fatigue is often cited as a contributing factor in air incidents and accidents. Usually, the words "fatigue" and "sleepiness" are used by aircrew to describe the same feelings, a questionnaire has been developed for subjective level assessment of fatigue and sleepiness among Moroccan aircrew. A 4-month prospective study including all aircrew (civilian, military) and air traffic controllers was conducted at the Aero-medical center of Rabat during their review visit. The questionnaire included the Pichot scale for fatigue and Epworth scale for sleepiness. It was filled anonymously. Out of more than 400 cards distributed, only 200 were exploitable. 23% of the subjects in the study had moderate fatigue. 6.5% of the sample presented moderate sleepiness and 4.5% had excessive daytime sleepiness. These two states seem to be preponderant in young aircrew population especially cabin crews. The occurrence of fatigue and daytime sleepiness in aircrew especially at the beginning of their career can be explained by the difficulty of adapting to aeronautical constraints. It is important to remember the countermeasures of fatigue to preserve aviation safety
Keywords: Fatigue, sleepiness, Moroccan aircrew, aviation safety.

INTRODUCTION

Fatigue is often cited as a contributing factor in flight incidents and accidents. Despite the predispositions implemented to prevent fatigue in the aviation environment, it remains a frequent complaint among cabin crew. In this sense, a prospective study was carried out at the aeromedical expertise center of Rabat (CEMPN). Since aircrew members usually use without distinction the words "fatigue" and " sleepiness" to describe the same state, a questionnaire has been drawn up allowing the subjective assessment of fatigue and sleepiness level among civil and military Moroccan aircrew, using Pichot fatigue scale (Figure-1) and Epworth sleepiness scale (Figure-2).

METHODS

The study concerned civil aircrew (both technical and commercial) of national companies, military aircrew and air traffic controllers who attended CEMPN of Rabat for a periodical medical fitness visit.

This is a prospective study spread over a period of 4 months. The questionnaires were completed anonymously and participation in the study was purely voluntary. However, out of more than 400 cards, there were only 200 that were exploitable (fully completed).

According to the Pichot score, we evaluate the degree of fatigue: moderate (8-14), average (15-21), important (22-29), extreme (> 30).

According to the Epworth scale, we talk about sleep impairment if the score is between 9 and 14 and about excessive daytime sleepiness if it's greater than 15.

RESULTS

Based on the results of the Pichot scale, 23% of individuals in the study had moderate fatigue. No other cases of greater fatigue were identified.

Table-1: Distribution of the subjects participating in the study according to the specialty

Specialty	Pilot	Cabin Crew	Air Controller	Flight Engineer	Total
Number	96	47	50	7	200
Percentage	48%	23,5%	25%	3,5%	

Table-2: Distribution of subjects with moderate fatigue according to specialty

Specialty	Pilot	Cabin Crew	Air Controller	Flight Engineer
Number	40	6	17	1
Percentage	41,6%	10,8%	34%	14,2%

Table-3: Mean age of subjects with moderate fatigue

Specialty	Pilot	Cabin Crew	Air Controller	Flight Engineer
Mean age	46,5	26	46,25	44,24

Table-4: Average Years of Service for Subjects with Moderate Fatigue

Specialty	Pilot	Cabin Crew	Air Controller	Flight Engineer
Average years of service	24,95	5,8	28,35	24

Table-5: Distribution of Subjects with Moderate Sleepiness by Specialty

Specialty	Pilot	Cabin Crew	Air Controller	Total
Number	5	4	4	13
Percentage	5,2%	8,6%	8%	6,5%

Table-6: Mean age of subjects with moderate sleepiness

Specialty	Pilot	Cabin Crew	Air Controller
Mean age	37,25	31,25	47,5

Table-7: Average Years of Service for Subjects with Moderate Sleepiness

Specialty	Pilot	Cabin Crew	Air Controller
Average years of service	15,87	9	25,75

Table-8: Distribution of subjects with excessive daytime sleepiness by specialty

Specialty	Pilot	Cabin Crew	Air Controller	Total
Number	3	1	5	9
Percentage	3,12%	2,17%	10%	4,5%

Table-9: Mean age of subjects with excessive daytime sleepiness

Specialty	Pilot	Cabin Crew	Air Controller
Mean age	39	25	50,8

Table-10: Average years of service for subjects with excessive daytime sleepiness

Specialty	Pilot	Cabin Crew	Air Controller
Average years of service	18	3	28,75

According to the Epworth Sleepiness Scale, 6.5% of subjects in the study had moderate sleepiness and 4.5% had signs of excessive daytime sleepiness

ANALYSIS

The population participating in the study consists of 48% of pilots, 25% of air controllers, 23.5% of cabin crew and 3.5% of flight engineers.

Civilians accounted for 52% of the sample, the military 48%.

The prevalence of moderate fatigue is greater for pilots in general, followed by air controllers, flight engineers and cabin crew (Table-2).

The average age is identical for pilots, air traffic controllers and flight engineers, around 45 years, for cabin crew it's about 26 years old (Table-3).

The same tendency is true for the average years of service, which is around 25 years for pilots, air controllers and flight engineers, and only 5.8 years for cabin crew (Table-4).

The occurrence of fatigue among young cabin crews at the beginning of their career can be explained on the one hand by the young age of the hostesses and stewards participating in the study; in fact, 70% are under the age of 30, this is in keeping with the company's commercial aircrew refurbishment policy. On the other hand, to the difficulty of adapting to aeronautical constraints in particular sleep deprivation,

disruption of Circadian rhythm, extended work schedules, onboard workload and insufficient rest time.

With regard to sleepiness, its prevalence is around 6.5% for moderate sleepiness and 4.5% for excessive daytime sleepiness.

The prevalence of moderate somnolence is greater in cabin crews and air traffic controllers, while excessive daytime sleepiness is observed mainly in air traffic controllers.

However, sleepiness cannot be exclusively linked to aeronautical constraints; other factors may be responsible for, like sleep apnea syndrome, which is often unknown.

Among the eight following proposals, select those that best correspond to your feeling
O = not at all, 1 = a little 2 = moderately 3 = much 4 = extremely
-I have no energy..... 0 1 2 3 4
-Everything requires an effort..... 0 1 2 3 4
-I feel weak in some parts of my body..... 0 1 2 3 4
-My legs and arms feel weary..... 0 1 2 3 4
-I feel tired without any reason..... 0 1 2 3 4
-I feel like lying down to rest..... 0 1 2 3 4
-I find it difficult to concentrate..... 0 1 2 3 4
-I feel exhausted, stiff and heavy..... 0 1 2 3 4
Total (out of 32):.....

Fig-1: Scale of Pichot

Situation	Chance of dozing (0,1,2,3)
Sitting and reading	
Watching TV	
Sitting still in a public place (e.g. a theatre, a cinema or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when the circumstances allow	
Sitting and talking to someone	
Sitting quietly after lunch without having drunk alcohol	
In a car or bus while stopped for a few minutes in traffic	
TOTAL	

Fig-2: Scale of Epworth

Use the following scale to choose the most appropriate number for each situation:
0 = would never doze
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

DISCUSSION

Fatigue can be defined as a state resulting from physiological and psychological constraints leading to a decrease in physical or mental performance [1]. It must be differentiated from asthenia, which can be of organic or psychic origin.

Behavioral manifestations of fatigue include sleepiness, decreased attention, slowing of motor activity, difficulties with memorization, comprehension and decision-making, decreased cooperation, deterioration of the mood and the taking of exciting products [2].

In aeronautical activity, several factors intervene to generate a state of fatigue including the aeronautical environment, the working hours and the workload.

In a civilian environment [3, 4]

According to a study carried out by INRS (National French Institute of Research and Security) between 2000 and 2004, the stress-generating constraints on short and medium-haul commercial flights are:

- Those related to sleep deprivation, result of work rhythms, the lifestyle of staff and their needs for sleep.
- Those related to the flight constraints as the schedules of the rotation (hours of service, hours of flight), number of stages, their schedules and duration, working conditions (noise, vibrations, temperature / humidity, workplace).
- Those related to logistical support as the conditions of rest (airport, hotel for extended services) conditions of transfer between airport and hotel (deadlines), accommodation conditions (noise, meals, hotel).

For long-haul flights, crew members suffer in addition micro-sleeping and jet lag syndrome as important as the number of time zones crossed is greater than 3 and the direction of flight is towards the east.

With regard to the military aircrews, other factors are involved in the occurrence of fatigue such as the type of mission, duration and flight schedules with possible use of night vision equipment that are responsible for both visual fatigue (imagery different from the day vision at the origin of a cognitive load for the pilot) than cervical muscle fatigue (secondary to the weight of the head equipment combined with the excessive mobilization of the cervical spine).

For fighter pilots, repeated exposure to + GZ accelerations and repeated anti-G maneuvers are a significant factor in the occurrence of fatigue.

COUNTER MEASURES [5]

In civilian environments, several countermeasures are effective to improve alertness and performance. Long naps of 3 to 4 hours can restore alertness for 12 to 15 hours. Short naps of 10 to 15 minutes can help restore alertness for 3 to 4 hours. However a 15 to 20 minute delay after waking is necessary before resuming any activity due to sleep inertia.

Other countermeasures concern the nature of meals that must be rich in protein and liquids, especially in water and the possible consumption of caffeine that helps to counter the symptoms of fatigue.

In the military environment, the role of the aeronautical doctor is to help aircrew optimize the management of their sleep-wake rhythms by recalling the advice of sleep hygiene (last light meal, adequate sleep environment, promote relaxation). In an operational context these tips are not applicable, however, to promote sleep, it is recommended to customize the sleeping area, the wearing of noise caps and the ritualisation of bedtime. Sometimes he can require a physiological rest by pronouncing a temporary flight unfitness and eventually, using hypnotic drugs to facilitate recovery. To facilitate awakening, the use of psycho-stimulants is possible (Modafinil, extended release caffeine).

CONCLUSION

Complaints of fatigue have become frequent in recent years especially among civil aircrew. They are often linked to the increasing number of night flights scheduled to serve African countries.

However, our study made in the Rabat CEMPN during the medical fitness visits does not reflect the extent of these complaints, hence the need to establish another study possibly within the Moroccan association of airline pilots or companies, to obtain a higher participation rate and therefore to have a more realistic approach to fatigue among our flight crew.

The authors declare having no conflict of interest

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