

Sleep pattern disruption of flight attendants operating on the Asia – Pacific route

Bo LIN*, Yifan QIU and Jose D PÉREZGONZÁLEZ
School of Aviation, Massey University, New Zealand

***Abstract.** Jet lag is a common issue with flight attendants in international flights, as they have to cross several time zones back and forth, while their sleep patterns get disrupted by the legally required rest times between flights, which are normally carried out at different locations. This research aimed to investigate the sleep quality of a sample of flight attendants operating between New Zealand and Asia. Twenty flight attendants were surveyed in this research. The research found that flight attendants typically took a nap immediately after arriving into New Zealand, reporting a sound sleep time of about 6 hours. After the nap, however, they had problems falling sleep in subsequent nights. After their first nap, some flight attendants try to adapt to local light conditions, while others prefer to keep the sleep patterns they had back home. Both groups report different trends of sleep quality.*

Introduction

Nowadays, people can travel across time zones to their destinations in a matter of hours, although their body clock can take days, or even weeks, to become attuned to the destination time zone (Gander, 2003). As aviation professionals, flight attendants are among those who travel across time zones very frequently. Many studies have indicated that flight attendants usually get deep, calm, and good quality sleep during the first layover sleep after a flight, mainly due to fatigue, and prolonged and extended wakefulness during their work shift. On the second and third nights of a layover, however, they usually appear to have disturbed sleep patterns and poor sleep quality, as this is the time when jet lag shows unhindered by fatigue and extended wakefulness (Samel and Wegmann in Jensen, 1989; Stone, 2002; Grajewski et al., 2003).

A number of studies have demonstrated that the recovery rate of sleep disturbance experienced by travellers and flight attendants depends largely on two factors; the number of time zones that are crossed, and the direction of the flight (Zammit, 2000; Jensen, 1989). Obviously, the first factor makes sense and is easily understood, because the more time zones crossed, the larger the shift in the circadian clock that has to be made, and greater the effort required for circadian rhythm alignment (Gander, 2003). Why, however, does such a difference exist in the direction of the flights after time zone transition? Almost all of the laboratory experiments' (e.g., EEG tests, sleep latency tests, etc.) results using different subjects and difference variables lead to one conclusion; that the rate of adaptation to an eastward time zone shift (when the new time is ahead of the old time) is relatively slower than that for a time zone transition after a westward journey (Minors and Waterhouse, 1981; Jensen, 1989; Gander, 2003; Nicholson, 2006). Graeber (1986) further suggested that travellers adjust at an average rate of 1.5 hours per day following westward flights, and at an average rate of 1 hour on per day following eastward flights. For example, on average, it will take an individual

* Correspondence author: Mr Bo LIN, School of Aviation, Massey University, Turitea Campus, Private Bag 11222, Palmerston North 4442, New Zealand. <http://aviation.massey.ac.nz/>

only 2 days to adjust to a new time zone after 3 westward time zone transitions, whereas 3 days may be required after the return journey. Stone (2002) also found that cabin crew layover sleep after a westward time zone transition appears to be of good quality in the first part of the night and disturbed in the second part of the night; however, after an eastward time zone transition, cabin crew usually find difficulty in getting to sleep at the normal local sleep time, but appear to have improved sleep quality after they fall asleep.

Most research regarding sleep and wakefulness patterns of flight attendants travelling across several time zones have been conducted by researchers in Western countries, with few sleep studies specifically focusing on Asian flight attendants. Therefore, the purpose of this study is to analyse Asian flight attendants' sleep behaviours after travelling across several time zones.

Methodology

For our research sample, we search for an Asian airline whose operations were between an Asian country and New Zealand, and settled for one whose cabin crew would be working on a time zone difference between both countries were of four hours.

The sleep and wakefulness questionnaire survey was divided into five sections: General information; Sleep at home; Sleeping in aircraft bunk; Layover Sleeping at hotel; and Post-flight information. The answer included both quantitative and qualitative data. A 5-point scale, from 1 (very bad) to 5 (very well) was adopted to measure the average sleep quality. The Layover sleeping in hotel and Post-flight information sections were the main part of the survey. In those two sections, crewmembers were asked to fill out sleep diaries during their layover in the hotel and to continue recording sleep quality and quantity on the day they arrived at their home base. For each separate sleep a participant had during recovery days, their sleep quality was evaluated on several aspects: time taken to fall asleep, wake up time, and number of awakenings, as well as some self-rated questions including difficulty falling asleep, difficulty arising, how deep the sleep was, and how rested the participant felt.

The subjects were asked to fill in the survey and the sleep diary throughout their recovery days, both in New Zealand and during the first day after they arrived at their home base.

Our sample thus consisted of 20 cabin crew members: 13 female flight attendants around 30 years old (age ranged between 26 and 45) with average flight experience of 60 months (ranging between 8 and 240 months). And 7 male flight attendants around 28 years old (age ranged between 25 and 39), with an average flight experience of 55 months (ranging between 8 and 144 months). These sample of flight attendants averaged 71 hours a month flying on this Asia-Pacific route.

Results

The average sleep and wake pattern (both at home and in New Zealand) for the 20 participants showed that they went to bed at home approximately at 00:48 AM (Asian time), and woke up at around 10:13 AM (Asian time). The average total sleep duration at home was 10.03 hours.

Subjects also reported that it usually took them 16 minutes to fall asleep (mean = 15.8) and that they usually awakened 1 or 2 times during the night. The causes of these awakenings were grouped into 4 categories, with the two most frequently reported causes being physiological needs and noise from outside. Only 4 participants out of the 20 (20%) reported that they suffered regular sleep problems at home. However, overall, they described the quality of their sleep at home as being 'rather good'.

The outbound flight from Asia (eastward) was characterised by an extended period of wakefulness (17 hours). Sleepiness was elevated during the flight and most participants (18 out of 20) took naps onboard, although the mean length of these naps was only 1.4 hours in a 3 hour bunk rest.

	Home	1 st Layover Sleep	Layover Night Sleep (Day 1)	Layover Night Sleep (Day 2)	Layover Night Sleep (Day 3)	Day Sleep (Post Flight)	Night Sleep (Post Flight)
Overall Sleep Quality (1-5)	4.15	4.35	3.45	3.25	3.55	4.5	4
Average Sleep Duration (hours)	10.03	6.03	9.3	8.82	9.2	5.02	8.06
Average Bedtime	00:48 am	9:36am	4.22am	4.36am	4.02am	10.06am	1.46am
Average Waking Time	10:18 am	4.28pm	1.46pm	1.08pm	1.01pm	3.23pm	9.52am
Mean Awakening Time	1.3	.65	1.75	1.75	1.55	0.25	1.05
Time Required to Fall Asleep (mins)	16	13	88	112	108	15	33
Difficulty Falling Asleep	1.5	1.3	3.4	3.7	3.55	1	2.35

Figure 1: Sleep quality summary

The results also showed that all participants (100%) took an immediate nap, or sleep, of 6 hours on average (ranging from 3 to 8) after arriving at the hotel in New Zealand, after crossing 5 time zones. In fact, the participants reported that they slept extremely well during their first layover day sleep at the hotel. Several sleep parameters used in this research, such as sleep latency time, awakening frequency, and self-rated overall sleep quality indicate that the first layover day sleep was a very calm, deep sleep and was very difficult to be awakened from. As noticed, the overall sleep quality of the first hotel day sleep was even rated higher than subjects' overall sleep quality at home.

Nevertheless, participants started to have sleep and rest pattern disturbance after their first layover sleep. In regards to the effects on sleep and wakefulness patterns of the flight direction, it was found that most participants found it very difficult to fall asleep at the local time during layover nights in Auckland (eastward time zone transition), which can be identified from their ratings on the term *difficulty falling into sleep*.

Five participants chose to adapt to the local time zone and had, on average, a 3 hours shorter sleep on the arrival day into New Zealand, than the average sleep length of the other participants. Nevertheless, these participants appeared to not feel refreshed when they awakened from this day nap, and most of them reported that the use of an alarm clock to awaken was necessary. The adapted group scored an average of 3.8 in terms of having difficulty arising (1 = least difficult arising, 5 = most difficult arising), whereas the non-adapting group only scored 2.8 in this regard. For the three main night layover sleeps, the adapted group went to bed at an average time of 0:04 AM (NZ time), which was only 40 minutes later than their usual bedtime at home, and woke at 9:26 AM, which was close to their usual waking time (9:35 AM) at home.

The adapted group reported average sleep duration of 9.1 hours for the 3 main night hotel sleeps, compared with 10 hours at home, and relatively lower average awakening times of less than 1 time during their main layover sleeps were reported. It was also noticed that 90% of the adapted participants (5 out of 6) were more likely to be categorised as morning preference persons than as evening preference persons, because they reported earlier wake-up times (before or at 10:00 AM) at home. No obvious difference on overall sleep quality between the adapted group and the population mean were observed, except in the case of the first layover night sleep. For the second and third layover night sleeps, it was observed that the adapted group only scored slightly better than the population mean on overall sleep quality. It was also found, however, that the adapted participants felt that it was much less difficult to fall asleep through the layover nights, and they spent a significantly shorter average time falling to sleep through all three layover nights compared with the population mean.

After the homeward flight back to Asia (westward time zone transition), most participants reported improved overall sleep quality (mean = 4) during their first night sleep at home, and less time was also reported to fall asleep (33 minutes). It was also found that the average bedtime of participants was delayed 2 hours, from 10:40 PM (usual bedtime at home), to 00:35 AM (Asian time) for the first night sleep on returning home.

Discussion

The results of the present study confirm past research findings, which suggested that rapid time zone transitions after trans-meridian flights would cause jet lag and sleep disorders (Lafontaine et al., 1967; Gander, 2003). In this study, the results indicate that participants had relatively better sleep quality for their first layover sleep after arriving in New Zealand, with their sleep and rest patterns then disturbed in subsequent layover nights.

The results also showed that all participants (100%) took an immediate nap, or sleep, of 6 hours on average after arriving at the hotel in New Zealand, and reported a good sleep. As Gander (2003) suggested, sleep deprivation, as well as cumulative wakefulness, could be two major causes of this deep sleep. It was still more than 12 hours before local night-time when participants arrived at the hotel, so this was obviously too long a time to stay awake when they were already feeling tired. In addition, this extremely high sleep quality and fast sleep onset also reflected the need

for participants to sleep at a time equivalent to a late bedtime in their home time zone (Gander et al., 1991).

Moreover, the study clearly demonstrate that participants who chose to expose themselves to daytime light and local social cues had different sleep and wakefulness patterns from those participants who did not. Obviously, those participants who chose to adapt to local time appeared to have a similar sleep and rest pattern to their sleep and rest pattern at home, which was also closer to local time cues.

Limitations and conclusion

Obviously, the present study contains several research limitations. First of all, a questionnaire/survey study has the limitation that the data gathered from participants are subjective, which means that questions are answered from the subject's perception, memory, and interpretation of the question, with individuals possibly making inaccurate estimates of their sleep durations, awakenings, sleep latency times, and other related parameters. In other cases, some quantitative data may be interpreted differently by different individuals. For example, in questions such as *Rate your overall sleep quality for the first layover sleep in 1-5*, a rating could mean something completely different to each individual. Therefore, the subjective nature of survey data limits the generalizability of these results. To obtain more accurate data for future flight attendant sleep studies, the use of some scientific evaluation methods is suggested, such as EEGs, body temperature tests, eye movement observations, and wrist activity monitoring, together with a sleep log, or a questionnaire.

Another major limitation of this study was that the data were statistically limited by the small sample size. The whole population of this study was only 20 participants, and the targeted groups for hypothesis 3 (participants who chose to adapt to local time) had even smaller sample sizes of 5. Moreover, the results gathered from this study have lower generalizability to other flight attendants and research, as this study examined a unique case in which the participants are not required to fly to different international destinations, but only fly on a particular Asia–Pacific route. Flying on only one route means that the participants may have developed more familiarity with their layover than in many other cases.

Last but not least, the *directional theory* was not extensively discussed in this study. This was because the sleep record was only collected for one day after the westward flight back to Asia, and the insufficient number of data has limited the study to an in-depth exploration of how flight direction can affect flight attendants' sleep and wakefulness patterns after a transmeridian flight.

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