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**How to provide an optimal environment for tourists to manage their sleep? The roles of sleep amenities, sleep environment cleanliness, and sleep atmosphere**

Clare P. Y. Fung and Alice H. Y. Hon

*Full Length Research Paper*

# **How to provide an optimal environment for tourists to manage their sleep? The roles of sleep amenities, sleep environment cleanliness, and sleep atmosphere**

**Clare P. Y. Fung\* and Alice H. Y. Hon**

School of Hotel and Tourism Management, The Hong Kong Polytechnic University, 17 Science Museum Road, TST East Kowloon, Hong Kong.

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**For many tourists, a good night sleep is essential for business, creativity, travel and/or enjoyment of a holiday. To have better understanding on an optimal environment for the tourists to manage their sleep, this study aims to examine how the comfortability of sleep amenities and sleep environment cleanliness and sleep atmosphere influences tourists' sleep quality by adopting the Pittsburgh Sleep Quality Index (PSQI). The findings show that the comfortability of sleep amenities, sleep environment cleanliness and sleep atmosphere is significantly related to sleep quality and tourists' satisfaction. Specifically, sleep environment cleanliness is the most important contributing factor to both sleep quality and guest satisfaction. Sleep management and practical implications are discussed.**

**Key words:** Pittsburgh sleep quality index (PSQI), satisfaction, sleep amenities, sleep environment cleanliness, sleep atmosphere.

## **INTRODUCTION**

A good night sleep is very important for everybody. For many tourists, a good night sleep is essential for business, creativity, travel and/or enjoyment of a holiday. Sleep is not only a physiological need but also a luxury activity (Rantala and Valtonen 2014). Sleep and travel are the means for the tourists to gain some rest and recover from their stressful life. Travel and sleep both provide an opportunity for the tourists to excluded from the everyday rush and pressure (Valtonen and Veijola, 2011). To ensure a pleasant travel experience, sleep quality of tourists during their journey is very important.

Rantala and Valtonen (2014) highlighted the importance of "doing" sleep but not just "being" sleep. They suggested that tourists should take an active role to

manage their sleep practices so as to fulfill the physical need as well as rather than sleep solely because of tiredness. For example, Finland is without night time throughout the day in summer. In winter, it becomes dark through the day. If the tourists want to have an enjoyable travel in Finland, they need to manage their sleep because of its seasonality. Therefore, it is particularly important to manage sleep by "doing sleep". "Doing sleep" means that the tourists should take action to manage their sleep habit so as to enhance their travel experience and ultimately achieve the goal of travel, get rest and take a break from daily life.

Sleep environments are crucial for enhancing the sleep quality of tourists. It is not necessary to promise the

\*Corresponding author. E-mail: [clare.fung@polyu.edu.hk](mailto:clare.fung@polyu.edu.hk).



Sleep quality of tourists but it is important to provide an optimal environment for tourists to manage their sleep. To provide an optimal environment for the tourists to manage their sleep, the hospitality sectors have invested a lot in sleep management strategies. For instance, many hotels have designed special rooms or beds, offered premium bedding or made sleep specialists available to recommend sleep strategies to guests. The cruise companies have learnt from the hotel industry and have incorporated design features and developed sleep programmes of their rooms. Many airline companies provide sleep amenity kits with eye mask, earplug and toothpaste so as to improve the rest quality of their customers.

All the practices are related to sleep quality. However, is it effective in helping their customers to get a good night sleep? Until now, little research has investigated sleep quality of tourists or has identified the factors affecting the sleep quality of tourists and the impacts of the factors on sleep quality of different tourist demographic groups. Therefore, this study aims to examine how sleep environment comfort, including sleep amenities, environment cleanliness and sleep environment influence guest sleep quality by adopting the Pittsburgh Sleep Quality Index (PSQI). Developed by Buysse et al. (1989), the PSQI is a widely adopted assessment tool that scholars use to measure sleep quality. Adopting the PSQI should allow this study to accurately measure tourists' sleep quality and evaluate its relationship with sleep environment. This study also examines how tourists' sleep quality influences their satisfaction.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### The importance of sleep

Sleep is often related to 'laziness' or 'luxury' (Nature, 2005). Although sleep is a core physiological activity of daily life, most people overlook its importance. In fact, sleep is one of the most important human physiological activities, and is important for service employees' psychological health, which in turn affects service quality and organisational effectiveness. According to the World Sleep Society (2016), 'sleep is a vital part of your overall health and wellbeing'. A global survey undertaken in 2017 for Phillips indicated that although 92% of people said that sleep was important to them, only 17% were happy with the quality of their sleep. When people have a good sleep, their brains and bodies rest and recover, resulting in improved daily work, learning, performance, vigilance and response to customer demands. In contrast, disturbed sleep or poor sleeping quality has a negative effect on distress tolerance and immunity of the body; it can result in fatigue, psychological pressure, medical expenses, accidents and suicide and is positively

associated with customer complaints, which are detrimental to organisations and their members (Riedel and Lichstein, 2000; Sarma and Konwar, 2016; Short et al., 2016). To arouse awareness of the importance of a good night sleep, the Sleep Council was established in the United Kingdom in 1995. This organisation aims to provide helpful advice and tips on how to improve sleep quality by choosing the right bed (The Sleep Council, 2016). Through a series of promotions, the Sleep Council wants to raise public awareness of the importance of a good night sleep to health and wellbeing.

### Sleep quality

Sleep quality is an influencing factor on tourists' hotel evaluation (Liu et al., 2013; Schuckert et al., 2016). However, defining sleep quality is complex. In the literature, sleep quality is mainly classified into two types: subjective and objective. Subjective sleep quality refers to how an individual perceives his or her sleep quality (Park and Sprung, 2015). Objective sleep quality is defined by statistical methods, such as measuring inter-beat intervals and stroke volume (Zilinskas et al., 2005). Subjective sleep quality is more important than objective sleep quality (Polo-Kantola and Erkkola, 2004), as it relates to an individual's perception of sleep quality and influences his or her motivation to work. Currently, there are three main ways to assess sleep quality. The first is to quantify it. Sleep quantity refers not to the duration but rather to the experience of sleep. Thus, this method of evaluating sleep quality involves a comprehensive evaluation of the sleep process and results, including both quality and quantity (Buysse et al., 1989). In other words, subjective sleep quality is a subjective feeling about sleep based on the evaluative results of an objective sleep condition. The second way to assess sleep quality is through sleep indexes. In creating the PSQI, Buysse et al. (1989) divided sleep quality into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. They suggested the PSQI could be used as an assessment tool to measure sleep quality. The third way to assess sleep quality is to use precision instruments such as a polysomnography system (Chang et al., 2012) to transform physiological indexes into specific sleep quality indexes, such as sleep latency and sleep efficiency indexes. Of these three methods, the PSQI is more common among scholars, as it is a self-evaluated tool that covers the seven components of sleep quality. It is a more convenient method of measuring sleep quality than the other two methods. Therefore, in this study, the PSQI is adopted to measure the sleep quality of tourists.

The World Health Organization (WHO, 2013) stated that more than 40% of people suffer from varying degrees of sleep problems. Sleep quality is affected by

different factors that can be categorised into external and internal factors (Bihari et al., 2012). The internal factors of sleep quality derived from the person can be divided into four categories. The first is physiological factors, such as body disease. The physical pain caused by disease can significantly affect sleep quality. The second is sleep hygiene, such as sleep habits and pre-bedtime activities. The third is psychological factors, including negative emotions such as anxiety, depression, anger and nervousness. These negative emotions are significantly related to sleep quality. The fourth is social factors, such as stressful life events. Internal factors are difficult to control and monitor. However, tourists' sleep quality can be improved by monitoring the external factors. From an organization perspective, sleep environment comfort is very important to ensuring guests' sleep quality. It is believed that sleep environment comfort is a dominant factor in tourists' satisfaction (Kivuva et al., 2014; Sohrabi et al., 2012). Sleep environment comfortability can be enhanced through various measures such as sleep environment hygiene, smell, temperature, colour tone and lighting and bed comfortability. Of these measures, the comfortability of sleep amenities and sleep environment temperature and cleanliness are the key concerns in sleep quality (Lee and Park, 2006; Sofaer and Firminger, 2005).

### **Sleep quality and guest satisfaction**

Given that good sleep quality can help guests to get rest and effectively handle their daily work, it can be predicted that guests' sleep quality is positively associated with their satisfaction. The relationship between guests' sleep quality and their satisfaction is shown in the hospitality literature. It is commonly believed that sleep quality is a key predictor of guest satisfaction (Limberger et al., 2014). Sleep quality is always counted as a criterion when a tourist evaluates a hotel (Li et al., 2013; Liu et al., 2013). For the service industry, the root cause of customer satisfaction is perceived service quality. Service quality decides the degree of customer satisfaction. If the perceived service quality is lower than the customer's expectation, the customer is unsatisfied. Thus, the first hypothesis in this study is stated as follows:

*H1: Tourists' perceived sleep quality is positively related to their satisfaction.*

### **Sleep amenities**

In hospitality and tourism industry, different hospitality companies provide different kinds of sleep amenities for their customers. The sleep amenities for hotel and cruise industry include pillows, mattresses, and quilts while the sleep amenities in transportation sectors such as rail and

airlines consist of seat comfort, eye mask and earplug. Sleep amenities are very important in enhancing comfortability, which can affect tourists' sleep quality. For example, pillows and mattresses are important signals for synchronising sleep quality. Use of an inappropriate pillow is an influencing factor that may cause severe neck pain (Gordon et al., 2009) and affect a person's daily activities and performance. To enhance guests' sleep quality, many luxury hotels offer different types of reputable brands of feather pillows and pillow menus to their guests. However, the range of marketing advice provided by pillow manufacturers is confusing to consumers. According to Gordon et al. (2009), although most people think feather and down pillows are the best choice for enhancing sleep quality, in fact, feather pillows should not be recommended because they may cause severe neck pain, neck stiffness, headaches and aching between one's shoulder blades. In addition, popular contour pillows are ineffective in the management of chronic neck pain (Helewa et al., 2007). Furthermore, mattress type and hardness are closely related to sleep quality (Bader and Engdal, 2000; Marin et al., 2006) and increase the possibility of a guest suffering back pain and sleep problems (Enck et al., 1999; Marin et al., 2006). It shows that the sleep amenities are closely related to sleep quality. However, people may have different preferences on sleep amenities and may perceive sleep amenities comfortability differently. On the basis of the aforementioned argument, the following hypotheses are proposed.

*H2a: The sleep amenities are positively related to the tourists' sleep quality.*

*H2b: The sleep amenities are positively related to the tourists' satisfaction.*

### **Sleep environment cleanliness**

In addition to the comfortability of sleep amenities, environment cleanliness is an important attribute of good sleep quality and guest satisfaction. Sleep quality and environment cleanliness are criteria for the tourists to evaluate the hotels (Liu et al., 2013; Schuckert et al., 2016). Scholars have highlighted the importance of sleep environment cleanliness and found that sleep environment cleanliness is closely related to hotel selection and guest satisfaction (Dong et al., 2014; Li et al., 2013). Cleanliness is a common criterion for tourists to evaluate a hotel (Hargreaves, 2015; Liu et al., 2013). Sleep environment cleanliness can enhance sleep quality and resolve the problem of awakening. It can be speculated that bed cleanliness is essential to guests' sleep quality. As mentioned previously, it can be expected that perceived sleep quality is correlated with guest satisfaction. Based on this discussion, the following hypotheses are posed.

*H3a: Sleep environment cleanliness is related to the tourists' sleep quality.*

*H3b: Sleep environment cleanliness is related to the tourists' satisfaction.*

### **Sleep atmosphere**

Sleep environment is also crucial to ensuring guest sleep quality. The environment comfort can be created through appropriate temperature, humidity, lighting and noise. However, there is no universal standard for sleep environment. Research has shown that sleep environment temperature and humidity are closely associated with sleep quality. Appropriate humidity and temperature create pleasant sleep conditions (Lee et al., 2015). An overly high room temperature has been identified as a key external disturbance of sleep, and inappropriate room temperature may lead to poor sleep quality (Chen et al., 2010; Urponen et al., 1988). However, the appropriate room temperature for a good sleep is arguable. Kim et al. (2010) suggested that the best room temperature range should be set at 24 to 26°C. Hyde (2016) pointed out that the room temperature range for good sleep quality varies in different seasons. The best room temperature range during summertime should be higher than during wintertime. The best temperature range also varies for different demographic characteristics such as age and gender. Thus, the optimal temperature for good sleep quality cannot be determined. The link between environment temperature and sleep quality is not tested in this study. However, there is no doubt that an uncomfortable temperature leads to sleep disruption and affects sleep quality (Schweitzer et al., 2004).

Noise is another factor affecting sleep quality. The sources of noises can be air conditioning, outside traffic, the neighbourhoods and television (Muzet, 2007). Noise induces the severe negative effects of sleep disturbance. In terms of immediate effects, noise can lead to delayed sleep onset, earlier final awakenings or nocturnal awakenings, sleep stage or structure changes, arousal and body movements and vegetative or hormonal responses to noise (Muzet, 2007). In terms of secondary effects, noise can lead to a lower subjective estimation of sleep quality, performance decrement and changes in daytime behaviour (Muzet, 2007). Doğan et al. (2005) found that people staying in a new or unfamiliar environment may experience changes in sleep quality, perhaps because they are relatively sensitive to the surrounding noise, such as footsteps or noise from air conditioners.

To create a relaxing sleep environment, the use of dim light settings to create a relaxing and comfortable atmosphere is important. However, Ancoli-Israel et al. (2003) found that both morning and afternoon bright light resulted in more consolidated sleep at night. Increasing light exposure throughout the daytime is likely to have the most beneficial effect on sleep. Higher light contrast

levels cause fewer night time awakenings and lead to 'complete sleep'. In contrast, insufficient light exposure in daytime is a cause of sleep fragmentation and affects sleep quality. Daytime light exposure affects both night time sleep consolidation and the timing of one's peak activity level (Shochat et al., 2000). To manage the sleep quality of tourists, sleep environment lighting control is essential. On the basis of this argument, sleep environments (including light, noise, temperature) are closely related to sleep quality. Therefore, the following two hypotheses are posed.

*H6a: Sleep environment is related to the tourists' sleep quality.*

*H6b: Sleep environment is related to the tourists' satisfaction.*

The research model is as shown in Figure 1.

### **RESEARCH METHODS**

The study was started with literature search. In this study, the literature about sleep quality has been reviewed to identify the key influencing factors of sleep quality. Based on a literature review, the sleep amenities, sleep environment cleanliness and sleep atmosphere including temperature, lighting and quietness were identified as the antecedents of sleep quality in this study. To develop the measurements of the variables, focus group interviews have been conducted. The aim of focus group interviews is to explore the sleep management strategies on sleep amenities, sleep environment cleanliness and sleep atmosphere so as to uncover the items of each variable. The current managers and frontline staff from hospitality sectors were invited as the focus group interviewees. Based on the result of the focus group interviews, the appropriate sleep management practice items were initially identified for the quantitative part of this study and a self-administered questionnaire was developed for data collection.

The aim of the study is to examine how sleep environment comfort, including sleep amenities, environment cleanliness and sleep environment influences tourists' sleep quality by adopting the Pittsburgh Sleep Quality Index (PSQI). The respondents of the study should be the tourists who have had a sleep experience during their travel. Therefore, the target audiences of this study are the hotel guests. The self-administered questionnaire consisted of 11 items (with 3 items related to the comfortability of sleep amenities, 3 items related to sleep environment cleanliness and 5 items related to sleep atmosphere). The statements are shown in Appendix. Exploratory factor analysis (EFA) was conducted to determine the possible factors of the construct and validate the defined variables in the study. The EFA results showed that three factors were extracted (KMO value = 0.774 and Bartlett's test of sphericity significance = 0.000), a finding consistent with the proposed factors.

Table 1 shows the factor loadings of the items on each factor. Three items were used to measure sleep amenities, three to measure sleep environment cleanliness and five to measure sleep atmosphere. The coefficient alpha of reliability test results showed a score of 0.779 for the comfortability of sleep amenities construct, 0.913 for the sleep environment cleanliness construct and 0.746 for the sleep atmosphere construct. The three-item guest satisfaction measurement created by Cronin et al. (2000) was adopted to measure tourists' satisfaction. The coefficient alpha of reliability test result was 0.882. To further validate the variable items, confirmatory

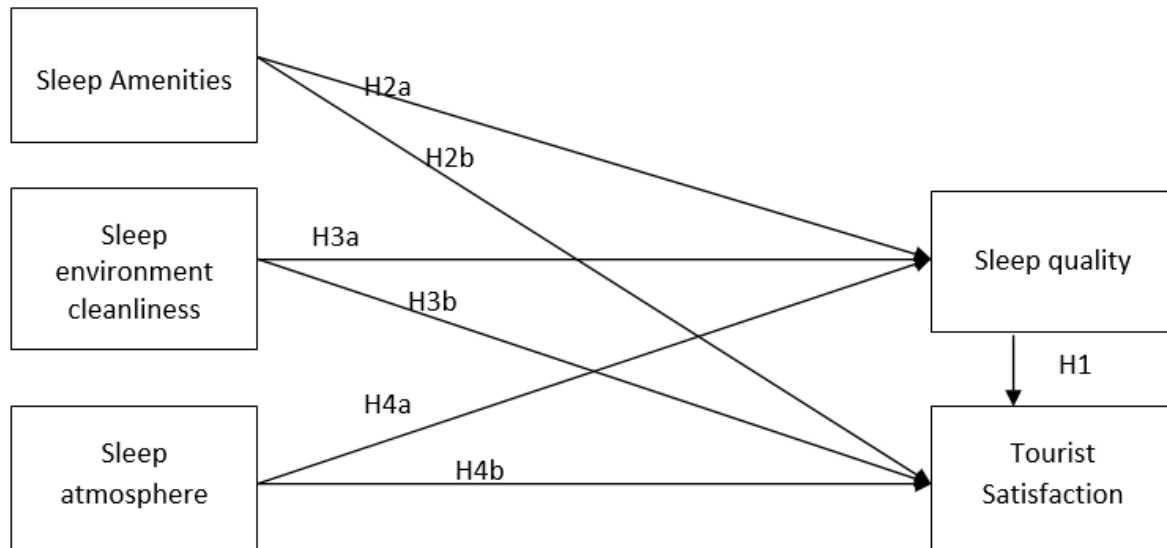


Figure 1. Research model.

Table 1. Factor loading in the exploratory factor analysis.

Rotated factor matrix <sup>a</sup>	Factor		
	1	2	3
SleepAmenities1	-	-	0.789
SleepAmenities2	-	-	0.648
SleepAmenities3	-	-	0.923
Cleanliness1	0.907	-	-
Cleanliness2	0.875	-	-
Cleanliness3	0.734	-	-
SleepAtmosphere1	-	0.664	-
SleepAtmosphere2	-	0.691	-
SleepAtmosphere3	-	0.772	-
SleepAtmosphere4	-	0.582	-
SleepAtmosphere5	-	0.735	-

Extraction Method: Principal axis factoring. Rotation Method: Varimax with Kaiser normalisation. <sup>a</sup>Rotation converged in 4 iterations.

factor analysis was conducted. The results showed that the model was a good fit ( $\chi^2 = 127.974$ ,  $df = 56$ ,  $p < 0.01$ ;  $CMIN/DF = 2.285$ ,  $CFI = 0.95$ ,  $RMSEA = 0.08$ ).

To measure perceived sleep quality more accurately, the PSQI developed by Buysse et al. (1989) was adopted to measure tourists' sleep quality. The PSQI is a well-recognised measure used to assess perceived sleep quality (Doi et al., 2000). It consists of seven components: perceived sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication and daytime dysfunction (Backhaus et al., 2002; Buysse et al., 1989). The global scores of the PSQI range from 0 to 21. A higher PSQI score represents a more problematic and worse sleep quality (Buysse et al., 1989). According to Buysse et al. (1989), a score of greater than 5 indicates a significant level of sleep disturbance (Miaskowski et al., 2011). Therefore, in this study, a PSQI score equal to or greater than 5 was interpreted as 'very

poor sleep quality', while a score equal to or less than 1 was interpreted as 'very good sleep quality'.

After validation of the measurements, the survey was distributed to the target population. As mentioned, the target population for the survey were tourists who had a stay in a hotel for at least one night as they have the most useful information for the present study. The questionnaires were distributed during May 2017. The questionnaire was standardised using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

## RESULTS

In this study, 206 questionnaires were collected and 199 were considered valid for data analysis. The respondent

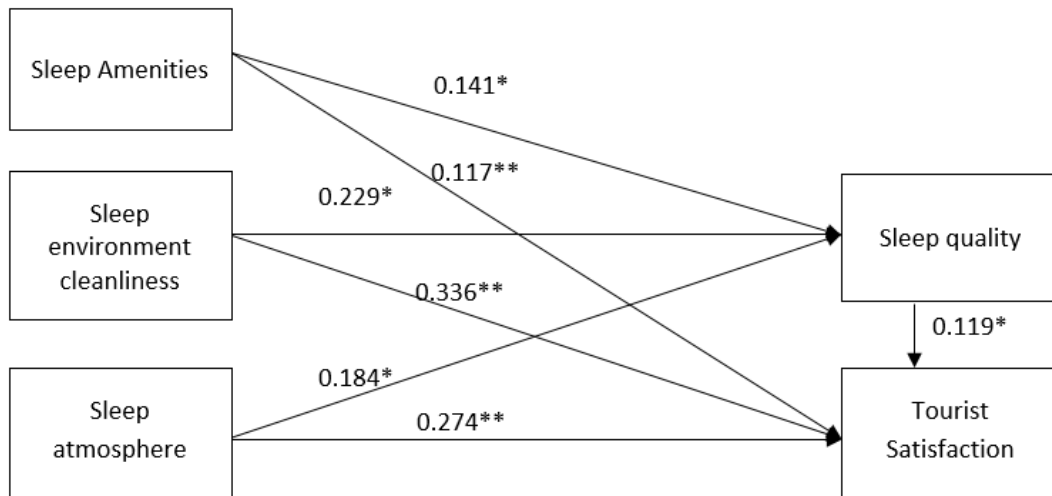
**Table 2.** Respondent profiles.

Characteristics		No. (%)
Gender	Male	102 (51.3)
	Female	97 (48.7)
Country of origin	Asia	84 (42.2)
	Europe	76 (38.2)
	US and Middle East	39 (19.6)
Age group	Under 30	61 (30.6)
	Between 31 and 40	65 (33.7)
	Above 40	73 (36.7)
Education level	Master's level or above	107 (53.8)
	Undergraduate	67 (33.7)
	Other	25 (12.5)
Marital status	Single	61 (30.7)
	Married	125 (62.8)
	Divorced	4 (2)
	Other	9 (4.5)
Number of children	0	124 (62.3)
	1	22 (11.1)
	2	36 (18.1)
	3 or more	17 (8.5)
Occupation	Business	110 (55.3)
	Education	33 (16.6)
	Other	56 (28.1)
Purpose of stay	Leisure	141 (70.9)
	Business	19 (9.5)
	MICE	35 (17.6)
	Other	4 (2)
Number of nights stayed	1-2	74 (37.2)
	3-4	73 (36.7)
	5 or more	52 (26.1)

profiles are shown in Table 2. Of the 199 respondents, 51.3% were female and 48.9% were male; 42.2% were from Asia (e.g., China, Taiwan, Japan, Korea, Singapore), 38.2% were from Europe (British, Belgium, German, Sweden, Norway) and 19.6% were from the US and Middle East, 30.6% were under 30 years of age, 33.7% were between 31 and 40 and the rest were above 40; 53.8% had a master's degree or above and 33.7% had an undergraduate degree; 30.7% were single, 62.8% were married and 6.5% were divorced or had another marital status; 62.3% had no children, 11.1% had one child and the remainder had two or more children; 55.3%

worked in a business-related industry, 16.6% worked in the education sector and 28.1% worked in other fields such as governmental sectors; 70.9% were traveling to Hong Kong for leisure, 9.5% were staying for business and 17.6% were traveling to Hong Kong for a meeting or a conference; and 37.2% were traveling to Hong Kong for 1 to 2 nights, 36.7% stayed for 3 to 4 nights and 26.1% stayed for more than 4 nights.

Generally, the respondents felt satisfied with their stays ( $\mu = 4.678$ ,  $\sigma^2 = 0.315$ ). They also reported a good sleep quality, with 68% showing PSQI scores equal to or less than 1, which was interpreted as 'very good sleep quality',



**Figure 2.** Multiple regression analysis. \*\*Indicates significance at 0.01 level. \*Indicates significance at 0.05 level.

22% showing scores equal to 2, around 9% showing scores of 3 and less than 1% showing scores equal to or greater than 5, which was interpreted as 'very poor sleep quality'. The PSQI covers seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction (Buysse et al., 1989). A PSQI score is higher than 1 when a respondent encounters any sleep disturbance in any components. In this study, it is found that more than 30% of the respondents had different levels of sleep problems (PSQI score is greater than 1). Of the three sleep management attributes, the respondents indicated that sleep environment cleanliness is the most important attribute that improved their sleep quality ( $\mu = 4.658$ ,  $\sigma^2 = 0.420$ ).

Figure 2 shows the multiple regression analysis results. Tourists' sleep quality (measured by the PSQI) was significantly and positively related to their satisfaction ( $\beta = 0.119$ ,  $p = 0.022 < 0.05$ ), supporting H1. Tourist guests' satisfaction dropped when they encountered any sleep disturbance during their stay. Moreover, tourists' sleep quality was significantly correlated with the comfortability of sleep amenities ( $\beta = 0.141$ ,  $p = 0.020 < 0.05$ ), sleep environment cleanliness ( $\beta = 0.229$ ,  $p = 0.011 < 0.05$ ) and sleep atmosphere ( $\beta = 0.184$ ,  $p = 0.018 < 0.05$ ), supporting H2a, H3a and H4a. Any single component of sleep environment, including its design, environment cleanliness or sleep amenities choice, could have affected tourists' sleep quality. Of the three sleep management attributes, sleep environment cleanliness ( $\beta = 0.229$ ) was the most significant contributing factor to perceived sleep quality. Tourists' satisfaction was positively related to the sleep amenities ( $\beta = 0.117$ ,  $p = 0.003 < 0.01$ ), sleep environment cleanliness ( $\beta = 0.336$ ,  $p = 0.000 < 0.01$ ) and sleep atmosphere ( $\beta = 0.274$ ,  $p = 0.000 < 0.01$ ), supporting H2b, H3b and H4b. Compared

with the sleep amenities and sleep atmosphere, sleep environment cleanliness had the strongest correlation with tourists' satisfaction. Sleep environment cleanliness was more important for enhancing tourists' sleep quality and satisfaction.

This study also tested the difference between demographic groups, revealing significant differences between nationality groups on sleep amenities ( $p < 0.05$ ) and sleep environment cleanliness ( $p < 0.05$ ). European guests were more concerned about the sleep amenities ( $\mu = 4.359$ ) and sleep environment cleanliness ( $\mu = 4.803$ ). In addition, the different 'purpose of travel' groups differed significantly on sleep environment cleanliness ( $p < 0.05$ ) and sleep atmosphere ( $p < 0.05$ ). Business guests were more concerned about sleep atmosphere ( $\mu = 4.629$ ), while leisure guests were more concerned about sleep environment cleanliness ( $\mu = 4.726$ ). Otherwise, there was no significant difference between the demographic categories on sleep amenities and sleep environment cleanliness and sleep atmosphere, meaning the three attributes were equally important to other demographic categories.

## DISCUSSION

The findings indicate that sleep environment cleanliness, sleep atmosphere and sleep amenities are the important factors contributing to tourists' sleep quality and satisfaction. Sleep environment cleanliness is particularly important for enhancing tourists' sleep quality. To ensure tourists sleep well, it is essential to provide them with a clean, comfortable and homely environment. The tourists who completed the questionnaire were more concerned about sleep environment cleanliness, which they indicated was a more important contributing factor to their

sleep quality and satisfaction level. It gives an insight for tourism sectors to improve their environment and provide an optimal environment for the tourists to manage their sleep. For instance, the cruise companies should focus more on the cleanliness of their rooms. Similar to hotels, cruise companies have undoubtedly put a lot of effort into designing rooms, providing bed amenity choices and ensuring environment cleanliness through quality housekeeping services. Although cruise companies put a lot of effort into monitoring the cleaning work of their housekeepers, they should also pay attention to bed and room design. Cruise managers and designers sometimes overlook the issue of whether room design allows housekeepers to clean a room effectively. Bed and room cleanliness relies not only on the housekeepers, but also on the room design, as this affects the housekeepers' work and cleaning procedures.

The result also supports the importance of cabin cleanliness for airlines and other transportation sectors. It shows that cabin cleanliness is a key attribute of airline service quality as well as sleep quality of the passengers. In literature, how to improve the cabin cleanliness for airlines are under investigated. For the long haul passengers, they are required to stay in their seats for many hours. The personal space is limited that the passengers are difficult to have a good sleep. Every single details may help a lot for the passengers to have a good sleep inflight. Vink et al. (2012) have identified the cabin cleanliness problems such as old and shabby cabins, dirty worn out seat cushions and dirt in the seat pocket and window. Unlike cruises or hotels, the airline passengers flow is very high because the airlines have to make use of every minute to utilize their aircrafts. The time for the airlines to do cleaning work is limited. However, the airlines are still recommended to investigate how to improve the cabin cleanliness.

This study also reveals that the sleep atmosphere and sleep amenities are significant contributing factors to tourists' sleep quality and satisfaction. The finding indicated that the ambient noise has a great effect on sleep environment. Ambient noise can come from various sources. For cruise and hotel sectors, it can come from sources such as the bathroom, television or air conditioner. Cruise companies should investigate how to minimise in-room noise. Besides, the cabin noise is a big problem for airlines and transportation sectors. It can come from engines, crew work and other passengers. Cabin noise is a significant part of sleep atmosphere especially in long haul flights (Yan and Dando, 2015). Therefore, the airlines and transportation sectors should investigate how to minimise cabin noise.

Furthermore, according to the literature, higher light levels during the daytime can improve sleep quality. Therefore, the high-intensity interior light should be provided. In addition to lighting design, cruise companies should offer individual spring-designed mattresses to guests who have spouses or bed partners to improve

their sleep quality and satisfaction. As mentioned earlier, appropriate room humidity and temperature create pleasant sleep conditions (Lee et al., 2015). Most hotels allow their guests to control the room temperature, but some hotels do little to ensure the appropriate room humidity. An air-conditioned room is usually relatively dry. The cruise companies may learn from hotels and consider to improve room humidity by humidifiers.

In terms of sleep amenities, cruise or airline companies provide different sleep amenities for their customers. The sleep amenities for airlines includes pillows, duvets, earplug and eye mask. Similar to hotels, many cruises provide mattress, pillows and duvets. The cruise and airline companies are recommended to evaluate the quality of sleep amenities carefully. In literature, the scholars have shown that feather and contour pillows are not recommended, as they may cause severe neck pain (Gordon et al., 2009; Helewa et al., 2007). More importantly, some scholars (Inase et al., 2006; Koschel et al., 2010) have found that feather duvets and pillows may induce a severe allergy known as 'feather duvet lung'. To ensure guests' health and positive experience during their stays, hotels should properly understand the function of bed amenities including mattresses, pillows and duvets rather than take their competitors' offers as references. Although pillow and duvet menus may be provided to their guests, they should still pay attention to the pre-set choices of pillows and duvets in their rooms. Sometimes the customers have no idea of the functions of sleep amenities and simply use what has been pre-set for them. Therefore, more information should be provided on menus so that guests can choose more appropriate bed amenities.

This study found that European guests were more concerned about the comfortability of sleep amenities ( $\mu=4.359$ ) and sleep environment cleanliness ( $\mu=4.803$ ), while Asian guests were less concerned about these two attributes ( $\mu=3.916$  and  $\mu=4.429$ , respectively). This may be because the long-haul travellers usually suffer from jetlag, which makes them relatively sensitive to the sleep environment. Thus, extra care should be taken for long-haul travellers. Doing little things (such as offering warm milk) can do much to help the guests. The frontline staff should proactively offer sleep assistance, such as by introducing sleep menus to guests rather than waiting for guests to request them. Letting guests know about the sleep assistance options available can help them to overcome their sleep problems.

To conclude, even though hotels have invested a lot on sleep management measures, more than 30% of the respondents have different levels of sleep problems. The tourists may encounter more serious sleep problems in cruises or in long haul flights. Therefore, tourism sectors such as cruise and airline companies are recommended to put more effort on their sleep management programmes. To provide an optimal sleep environment to tourists, it is important to improve the sleep environment

cleanliness, to create sleep environment atmosphere and to provide quality sleep amenities. This study works as a start to arouse the awareness of tourism sectors on the importance of an optimal environment for the tourists to manage their sleep. However, this study has a major limitation: the target respondents of the study are hotel guests. As the target respondents are the tourists who have had sleep experience during their travel, we have set the target respondents as hotel guests. In the future study, it is recommended to investigate the sleep quality of the tourists in tourism sectors such as airlines or cruise and further understand their sleep quality. Furthermore, the sleep management attributes were identified based on the literature, presenting another limitation. There may be other important sleep management attributes that have yet to be uncovered. The development of sleep management attributes at hotels can be considered as a basis for future study. In the future, researchers should consider to uncover the possible hidden sleep management attributes.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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## Appendix

### Conformability of sleep amenities

1. The pillow offered makes me sleep well.
2. The mattress offered makes me sleep well.
3. The quilt offered is comfortable to makes me sleep well.

### Sleep environment cleanliness

1. The room cleanliness makes me sleep well.
2. The bed cleanliness makes me sleep well.
3. The toilet cleanliness makes me sleep well.

### Sleep atmosphere

1. The humidity of the room is appropriate to make me sleep well.
2. The room temperature is appropriate to make me sleep well.
3. The room is quiet that makes me sleep well.
4. The noise from neighbor and corridor affect my sleep quality.
5. The fresh smell of the room makes me sleep well.

**Related Journals:**

