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"How'd you sleep?" measuring business travelers' sleep quality and satisfaction in hotels

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Abstract

Purpose – The purpose of this paper is to explore business travelers' sleep experience in hotels by measuring sleep quality and determining the extent to which hotel attributes, demographic characteristics, and hotel quality level influence their sleep quality while staying in hotels.

Design/methodology/approach – This study utilized a self-reported survey to obtain data from business travelers who have stayed in a hotel at least two nights for a business trip in the past 30 days. A total of 304 business travelers were surveyed in this study.

Findings – The results indicated that there was a difference in the factors that influenced business travelers' overall satisfaction with sleep in mid-scale (2.5-3.5 stars) vs upscale hotels (4 + stars). The findings showed that business travelers generally had lower sleep quality at hotels and they were more likely affected by noise both outside and inside the guestroom, as well as material elements inside the room.

Originality/value – This study represents a pioneering attempt at exploring business travelers' sleep quality and satisfaction with sleep in hotels. Furthermore, this study contributes to the limited research addressing sleep quality as a fundamental function of hotel services. Also, this is the first study to measure business travelers' sleep quality in hotels by using the sleep quality scale.

Keywords Customer satisfaction, Hotel design, Sleep quality, Business travel

Paper type Research paper

Introduction

Sleep quality has been identified as an essential characteristic that travelers look for when perusing online hotel reviews to find the perfect hotel (Beyer and Melendez, 2015). To that end, several high-end hotels have started working with sleep consultants and hotel designers to create a better environment to enhance travelers' sleep experience (Beyer and Melendez, 2015; Prunty, 2015). For instance, JW Marriott launched the "Nightly Refresh Program" in 2013 to feature sensory relaxation, such as a mixture of aromatic and detoxifying essential oils in bathroom amenities, a late-night snack, and herbal tea that help travelers recover from stress (*The Luxury Travel Magazine*, 2013). Similarly, Westin Hotels and Resorts' (n.d.) "Well-Being Movement" has focused on its "Sleep Well program" by offering high quality mattresses and bedding. A restful night's sleep not only gives travelers' repose to recover their physical and psychological condition, but also promotes a healthy lifestyle for travelers. Hotels can build their reputation and obtain

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customers' loyalty by enhancing customers' experience and satisfaction of sleep quality (Hotelzone, 2015). Therefore, hotels are seeking solutions that may help hotel guests rejuvenate while traveling.

Business travelers are one of the most important market segments in the hospitality industry (McCleary *et al.*, 1994; Callan and Kyndt, 2001). Global business travel expenditure was $1.2 trillion in 2015 and is expected to show continuous 5 percent growth until 2021 (BusinessWire, 2017; Deloitte, 2016). Business travelers stay in hotels to rest, refresh, and prepare themselves for the next day of business or the next destination. Because a business trip can often be an exhausting journey, it is important for business travelers to find comfortable accommodation and welcoming hospitality services while away from home. However, a hotel room is not always a comfort zone for travelers. Hotel guests may experience uncomfortable beds, poor quality pillows, a loud air conditioner, and noise from the hallway (Valtonen and Veijola, 2011). These issues may affect the hotel guests' sleep quality, which, in turn, may influence their overall experience in the hotel and ultimately their work productivity. Providing an environment for travelers to rest peacefully is an essential function of hotels. However, limited research scrutinizes business travelers' experience in terms of sleep quality while staying in hotels (Pallesen *et al.*, 2016). Given the importance of the business travel market, it is important to understand business travelers' sleep quality at hotels and how hotel attributes influence their experience.

The purpose of this study was to measure business travelers' sleep quality and overall satisfaction in hotels. Although previous studies of business travel focused on travelers' preferences regarding hotel attributes, the questions of how hotel attributes and hotel star levels would impact travelers' sleep quality had not been investigated. Thus, this study addresses the following questions: what hotel attributes are related to business travelers' sleep quality in hotels; which business travelers' demographic characteristics, such as the frequency of business travel, personal sleep assessment, and age, influence their sleep quality in hotels; and is there a significant difference in factors that influence business travelers' overall sleep satisfaction in upscale hotels (4 + stars) vs mid-scale hotels (2.5-3.5 stars)?

Literature review

Sleep quality in hotels

Sleep is an essential element of optimal mental and physical health (Buysse *et al.*, 1989). Acute consequences of sleep deprivation include degraded neurocognitive function and psychomotor vigilance (Minkel *et al.*, 2009), curtailed memory and learning capacity (Harrison and Horne, 2000), diminishment of emotional coping capabilities (Yoo *et al.*, 2007), and altered metabolic functions (e.g. leading to increased hunger) (Benedict *et al.*, 2011). To define "good sleep quality," academic research and clinical studies have utilized both objective and subjective methods to measure sleep parameters. Researchers argue that sleep quality is not only associated with sleep quantity (i.e. sleep duration and hours of sleep); it is largely a subjective experience, such how tired individuals feel upon waking, daytime sleepiness, restfulness, difficulty falling asleep, and difficulty maintaining sleep (Buysse *et al.*, 1989; Harvey *et al.*, 2008; Yi *et al.*, 2006). Thus, the sleep quality experienced by individuals includes the restorative function provided by sleep as well as daytime dysfunctions caused by poor sleep (Yi *et al.*, 2006).

Often, business travelers are engaged in professional activities that require high levels of mental performance. Subsequently, an optimal sleep quality for business travelers staying at a hotel is essential for maximizing business performance. Although previous studies specified sleep quality was a determinant in business travelers' hotel selection criteria, there is a dearth of research regarding satisfaction with sleep quality in hotels (Pallesen *et al.*, 2016;

Valtonen and Veijola, 2011). Gumaste and Shahane (2014) stated that luxury hotels intend to provide better sleep experience by improving bedding quality, using soundproof walls and blackout curtains, and utilizing new technology in climate control. Nevertheless, sleep experience may vary due to individuals' physical and psychological condition. Since people experience various stressors during traveling, such as jet lag, anxiety, exhaustion, and sleeping in an unfamiliar environment, they often encounter sleep disruption (Auger and Morgenthaler, 2009; Kawada *et al.*, 2001).

Moreover, sleep quality represents a "complex phenomenon" related to many personal aspects, such as physical and psychological stress, age, gender, and food intake (Buysse *et al.*, 1989; Yi *et al.*, 2006). A recent study by Pallesen *et al.* (2016) investigated the relationship between hotel guests' general experience of sleep and demographic factors, which were related to sleep disruption in hotels compared to sleeping at home. Interestingly, the research indicates that younger adults, males, and adults reporting symptoms of insomnia tend to have better sleep quality in hotels (Pallesen *et al.*, 2016). Therefore, individuals' demographic information should be considered a significant determinant to evaluate travelers' sleep quality at hotels.

Business travelers' perceptions of hotel attributes

There is a wealth of research that has examined business travelers' hotel selection criteria and comparisons between business and leisure travelers' hotel service requirements (Chu and Choi, 2000; Fawzy, 2010; Gundersen *et al.*, 1996; McCleary *et al.*, 1993; Yavas and Babakus, 2005). Gundersen *et al.* (1996) found that business travelers' satisfaction with hotels can be influenced by tangible and intangible hotel attributes. Tangible attributes include things like room amenities, cleanliness of room, adequate lighting, mattress and pillow quality, and hotel facilities, while intangible attributes represent features like turndown service, staff friendliness, business services, and hotel atmosphere (Callan and Kyndt, 2001; Fawzy, 2010; Lockyer, 2002; McCleary *et al.*, 1993). Chu and Choi (2000) categorized hotel attributes into six hotel selection factors, which include service quality, business facilities, value, room and front desk, food and recreation, and security. The results showed the most important hotel attribute factor for business travelers was room/front desk service (Chu and Choi, 2000). However, Callan and Kyndt's (2001) study reported that quietness of a hotel was rated the most important factor for business travelers. In addition, comfortable beds, flexible lighting control, and choices of pillows were considered vital elements in a hotel guestroom (Callan and Kyndt, 2001; Lockyer and Roberts, 2009). Rhee and Yang (2015a) compared hotel star-classification and customer ratings to determine the six attributes affecting travelers' decision making in hotel selection: value, service, rooms, sleep quality, location, and cleanliness. In their study, business travelers ranked sleep quality as the most important attribute. The comfort of beds, pillows, temperature of the room, and a quiet environment were associated with the quality of sleep in a hotel room (Liu *et al.*, 2013; Rhee and Yang, 2015a).

Based upon previous studies, the current research categorized that hotel attributes that feasibly relate to guests' sleep may include out of room influences, such as noise from the hallway, noise from other rooms, noise outside the hotel; sensory elements inside the room, such as smell of the room, room too light or too dark, sound of air conditioner, and temperature control in the room; and material elements inside the room, such as the quality of mattress, quality of bed linen, quality and quantity of pillows.

Furthermore, travelers' satisfaction with hotels may also differ in terms of hotel star levels (Chu and Choi, 2000; Fawzy, 2010; Rhee and Yang, 2015b). Fawzy (2010) stated that business travelers at a five-star hotel rated the bedroom attributes as the most important criterion while selecting a hotel. Rhee and Yang (2015b) indicated that hotel guests staying at higher star-level hotels would consider room amenities, cleanliness, and services as

important attributes. However, hotel guests staying at lower star-level hotels would consider the location of a hotel and sleep quality essential due to limited amenities and services at the hotels (Rhee and Yang, 2015b). As such, travelers' may obtain different expectations of hotel attributes based upon different hotel star levels. For this study, respondents were asked to self-identify the last hotel they stayed in as either mid-scale (2.5-3.5 stars) or upscale and higher level hotels (4 + stars) in addition to their sleep quality experience at these hotels.

Methodology

Survey instrument

This study utilized a self-reported survey method to obtain data from business travelers who have stayed in a hotel at least two nights for a business trip in the past 30 days. Participants were asked to recall their last business trip and answer the survey based on that experience. This method of self-reported survey was found in Pallesen *et al.* (2016) and Yi *et al.* (2006). The first section of the survey asked participants about their business travel experience, the type of hotel they stayed in, and their sleep quality in the hotel. Sleep quality was measured using a modified version of the sleep quality scale (SQS) identified in Yi *et al.* (2006). The SQS measures six domains of sleep quality including daytime dysfunction, restoration after sleep, difficulty falling asleep, difficulty getting up, satisfaction with sleep, and difficulty maintaining sleep (see Table AI, $\alpha = 0.90$). The sum score of the SQS is used as an SQS. The SQS assessment has been found to be valid and reliable, and it has been widely used in self-reported sleep quality studies (Howell *et al.*, 2008). In this study, we modified the questions in order to address business travelers' sleep experience from their recent stays in hotels. All items were rated on a four-point scale, from 0 "Never" to 3 "Almost always," based upon the origin of the SQS assessment. The range of SQS score was from 0 to 84; participants who had a higher total SQS score indicated poorer sleep quality in hotels (Yi *et al.*, 2006).

In the second section of the survey, participants were asked to indicate on a 1 (did not bother me at all) to 5 (extremely bothersome) scale hotel attributes (out of room influences, sensory elements inside the room, and material elements inside the room) that influenced their sleep quality while staying in hotels. The items of hotel attributes were adapted from Fawzy (2010), McCleary *et al.* (1993), and Yavas and Babakus (2005). The participants were also asked to evaluate their overall satisfaction with sleep quality in the hotel. Based on previous literature (Chiou *et al.*, 2010; Oliver, 1992), overall satisfaction with sleep quality was defined as affective evaluation resulting from sleep quality in this study. Thus, the question "Overall, I am satisfied with the decision to stay at this hotel" was utilized in this study.

Next, the questions related to business travelers' sleeping aids with sleep disruption were included. The sleeping aids often used by business travelers included ear plugs, eye masks, sound machines, and medication for getting better sleep at hotels (Portillo, 2015). The third section of the survey was related to participants' demographic information, including age, gender, current marital status, frequency of travel, and the average duration of one business trip.

Data collection

Data collection was conducted through Qualtrics online survey distribution company, which provides access to a large and reliable participant pool (Brandon *et al.*, 2013). The survey was randomly distributed by Qualtrics in January 2016 to a national consumer panel based upon the screening criteria. Explicitly, since the target population was business travelers, the researchers only recruited business travelers who have traveled in the past 30 days and stayed at a hotel at least two nights. Additionally, in order to avoid personal health conditions which may affect participants' sleep quality in their day-to-day life, a filter question of health diagnosis was

applied: if participants suffered from depression, sleep disorders, cancer, or any condition that has already affected their quality of sleep, they were excluded from the process of data collection (Harvey *et al.*, 2008). In summary, a total of 304 completed surveys were collected.

Statistical analysis

Data analysis was conducted by IBM SPSS Statistics Software, version 23. A multiple linear regression analysis was utilized to measure one dependent variable (overall satisfaction with sleep quality in the hotel) and several independent variables (a total of sleep quality score, hotel attributes, and demographic variables) between two groups – business travelers who stayed in upscale to higher level (4 + stars) hotels and those who stayed in mid-scale (2.5-3.5 stars) hotels. In addition, a preliminary analysis was conducted to ensure the assumptions of normality, linearity, and homoscedasticity were met.

Results

Demographic profile of participants

Among 304 participants, 63 percent were male and 37 percent were female, 43 percent ranged from 26 to 35 years old, and 61 percent were married with children. Approximately, 56 percent of participants traveled once a month, while 25 percent traveled twice a month and 19 percent traveled three times and more a month. A total of 55 percent of participants stayed 3-4 days for a single business trip most times. In regard to what type of hotel they stayed at during their recent business trip, 40 percent of participants stayed in upscale to higher level hotels (4 + stars) and 51 percent stayed in mid-scale hotels (2.5-3.5 stars). The detailed demographic profile is show in Table I.

Analysis of overall sleep quality in hotels and hotel attributes

Since 91 percent of participants ($n = 277$) stayed either in mid-scale (2.5-3.5 stars) or upscale and higher level (4 + stars) hotels, these two groups were selected to proceed with the data analysis. The mean score of overall satisfaction of sleep quality in upscale and higher level hotels was 3.8 (SD = 0.99, $n = 122$), and the mean score in mid-scale hotels was 3.4 (SD = 0.89, $n = 155$). The mean score of the SQS in upscale and higher level hotels was 29.3 (SD = 13.4, $n = 122$) and in mid-scale hotels was 30.9 (SD = 13.8, $n = 155$). Table II shows the results of sleep quality in upscale and mid-scale hotels. In addition, a *t*-test at the 0.05 level of significance was conducted to evaluate whether the mean of overall satisfaction of sleep quality and SQS were significantly different between the two groups. The *t*-test was significant in terms of overall satisfaction of sleep quality in hotels: $t\ (275) = 3.32$, $p < 0.01$, $\eta^2 = 0.04$. The 95% confidence interval for the difference in means ranged from 0.15 to 0.60. However, The *t*-test of the SQS was not significant between the groups, $t\ (275) = -0.98$, $p > 0.05$.

Figure 1 shows the percentage of participants who answered "bothersome" to "extremely bothersome" by various disturbing attributes while staying in a hotel. When we considered the attributes in three categories: 31 percent of participants answered "out of room influences," such as noises, were bothersome to extremely bothersome; 30 percent of participants answered "sensory elements inside the room," such as smell, light, or temperature of the room, were bothersome to extremely bothersome; and 29 percent of participants answered "material elements inside the room," such as quality of mattress, quality of bed linen, quality and quantity of pillows were bothersome to extremely bothersome.

Participants were also asked what sleeping aids they have used to overcome sleep disruption while staying in a hotel. The results show that over 25 percent of participants have used an eye mask, 25 percent have taken their own pillows, and 24 percent have used ear plugs (see Figure 2). Most participants indicated they use more than one sleeping aid when traveling for business. Participants could indicate all sleeping aids that applied.

Variable	Frequency	Percent
Gender		
Male	191	63
Female	113	37
Age		
⩾25	18	6
26-35	130	43
36-45	73	24
46-55	42	14
56-65	28	9
<66	13	4
Marital status		
Single	65	21
Married without children	39	13
Married with children	184	61
Divorced	4	1
Separated	3	1
Living with partner	9	3
Travel frequency		
Once a month	169	56
Twice a month	77	25
Three times a month	34	11
Four times a month	11	4
Five or more times a month	13	4
Average duration of one trip		
1-2 days	92	30
3-4 days	166	55
5-6 days	36	12
1 week or more	10	3
Hotel levels		
Economy (1-2 stars)	10	3
Mid-scale (2.5-3.5 stars)	155	51
Upscale or higher levels (4 + stars)	122	40
Missing data	17	6

Note: $n = 304$

Table I. Demographic profile of participants

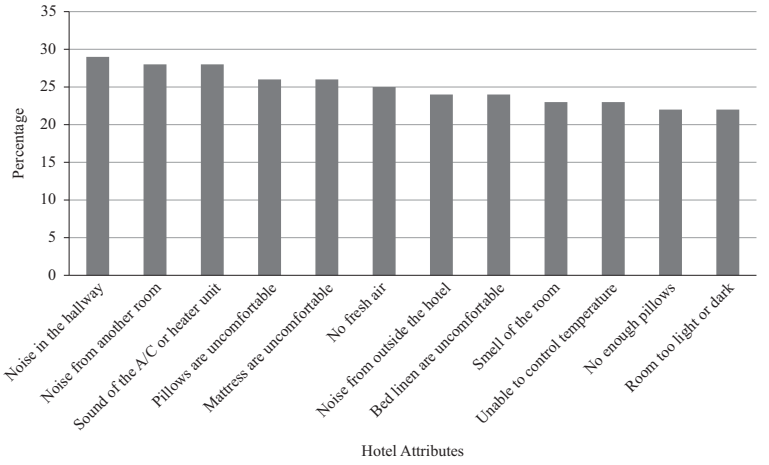
	Group								
	Upscale+			Mid-scale					
Outcome	*M*	SD	*n*	*M*	SD	*n*	95% CI for mean difference	*t*	*df*
Overall satisfaction of sleep quality	3.8	0.99	122	3.4	0.89	155	0.15-0.60	3.32*	275
SQS	29.3	13.4	122	30.9	13.8	155	−4.87−1.64	−0.98	275

Notes: The SQS items were rated on a four-point scale, from 0 "Never" to 3 "Almost always." The higher total score indicated participants had poorer sleep quality. *$p < 0.01$

Table II. The results of *t*-test between two groups

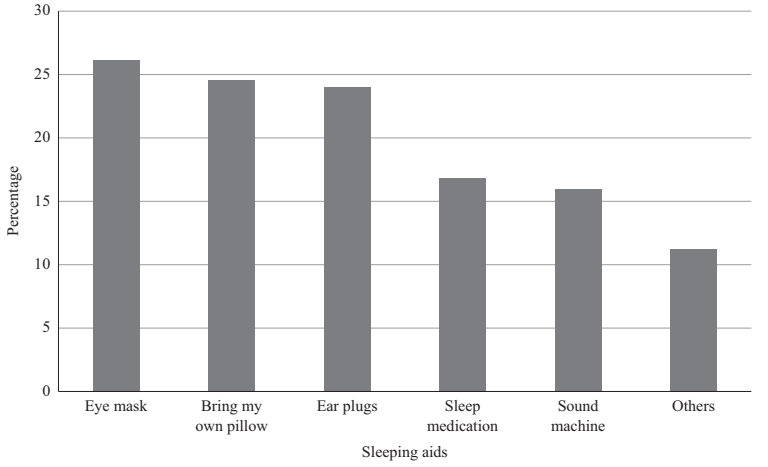
Results of multiple regression analysis

The multiple regression analysis was conducted to predict business travelers' overall satisfaction with sleep quality in hotels. The independent variables included the SQS, three aspects of hotel attributes (out of room influences, sensory elements inside the room,



Note: $n=277$

Figure 1.
The percentage of participants who answered "bothersome" or "extremely bothersome" by disturbing attributes while staying in a hotel



Note: $n=277$

Figure 2.
The percentage of participants who selected sleeping aids to overcome sleep disruption while staying in a hotel

and material elements inside the room), frequency of travel, length of travel, age, gender, and marital status. The assumptions of multiple regression analysis were checked, and there was no concern of normal distribution, multicollinearity, and homoscedasticity (i.e. Kolmogorov-Smirnov test was not significant; Levene's test was not significant; a correlations matrix of all predictors was < 0.70; VIFs ranged from 1 to 8; and Durbin-Watson statistic = 1.78) (Field, 2009). The results of the regression in the group of upscale or higher level hotels (4 + stars) indicated the two predictors explained 18 percent of the variance ($R^2 = 0.18$, $F(13, 108) = 1.78$, $p = 0.05$). Age ($\beta = -0.32$, $p < 0.01$) and frequency of travel ($\beta = 0.26$, $p < 0.05$) significantly predicted business travelers' overall satisfaction of sleep quality in upscale or higher level hotels. The results of the regression in the group of mid-scale hotels (2.5-3.5 stars) indicated three predictors explained 15 percent of the variance ($R^2 = 0.15$, $F(13, 141) = 1.87$, $p < 0.05$). Three predictors, sensory

elements inside hotel rooms ($\beta = 0.57$, $p < 0.05$), the SQS ($\beta = -0.31$, $p < 0.01$), and marital status-single vs others ($\beta = -0.19$, $p < 0.01$), were significantly predicted business travelers' overall satisfaction of sleep quality in mid-scale hotels. Tables III and IV show detailed information of the multiple regression analyses.

Discussion and implications

Discussion

The results show that business travelers' overall satisfaction of sleep quality was significantly between those stayed mid-scale and upscale/higher level hotels. However, the

Table III. Summary of hierarchical regression analysis for variables predicting overall satisfaction of sleep quality in upscale or higher level hotels

Variables	Model 1			Model 2			Model 3			Model 4		
	B	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*
SQS	−0.006	0.007	−0.08	−0.004	0.01	−0.05	−0.01	0.01	−0.15	−0.01	0.01	−0.15
Out of room				−0.04	0.14	−0.06	−0.08	0.14	−0.10	−0.08	0.14	−0.10
In-room-sensory				−0.03	0.18	−0.04	0.003	0.18	0.004	0.003	0.18	0.004
In-room-material				0.03	0.18	0.04	0.05	0.18	0.06	0.05	0.18	0.06
Frequency of travel							0.21	0.08	0.26*	0.21	0.08	0.26*
Length of travel							−0.01	0.13	−0.02	−0.01	0.14	−0.01
Age										−0.14	0.04	− 0.32**
Gender (male = 1, female = 2)										0.07	0.19	0.03
Marital status												
Single										−0.07	0.24	−0.03
Married without children										−0.11	0.29	−0.04
Married with children										−0.04	−0.40	−0.04
Divorced										0.67	0.70	0.09
Separated										0.36	0.88	0.03
Living with partner										−0.34	0.39	−0.07
R^2		0.01			0.01			0.08			0.18*	

Notes: $n = 122$. Marital status was represented as six dummy variables with 0 single serving as the reference group. *$p < 0.05$; **$p < 0.01$

Table IV. Summary of hierarchical regression analysis for variables predicting overall satisfaction of sleep quality in mid-scale hotels

Variables	Model 1			Model 2			Model 3			Model 4		
	B	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*
SQS	−0.01	0.01	−0.12	−0.02	0.01	−0.28**	−0.02	0.01	−0.28**	−0.02	0.01	−0.31**
Out of room				−0.07	0.12	−0.10	−0.07	0.12	−0.10	−0.09	0.12	−0.13
In-room-sensory				0.50	0.17	0.64**	0.46	0.18	0.59**	0.44	0.18	0.57*
In-room-material				−0.25	0.13	−0.34*	−0.24	0.13	−0.33	−0.23	0.13	−0.30
Frequency of travel							0.14	0.08	0.15	0.14	0.09	0.15
Length of travel							0.03	0.12	0.02	0.01	0.12	0.01
Age										−0.04	0.03	−0.12
Gender (male = 1, female = 2)										0.04	0.15	0.02
Marital status												
Single										−0.40	0.18	−0.19*
Married without children										−0.20	0.22	−0.08
Married with children										0.17	0.02	0.04
Divorced										−0.16	0.64	−0.02
Separated										0.36	0.88	0.03
Living with partner										−0.34	0.39	−0.07
R^2		0.01			0.08**			0.11**			0.15*	

Notes: $n = 155$. Marital status was represented as six dummy variables with 0 single serving as the reference group. *$p < 0.05$; **$p < 0.01$

SQS was not significant. It is possible that business travelers may not perceive sleep quality differently in terms of hotel levels; yet they may have different expectations toward mid-scale and upscale hotels, which, in turn, influences overall satisfaction of sleep quality. In other words, since mid-scale hotels have limited amenities and services, travelers may expect that providing a good sleep environment and a well-maintained room is the bottom line of guest satisfaction (Rhee and Yang, 2015b; Xiang *et al.*, 2015). Thus, business travelers' satisfaction can be linked to their overall evaluation of essential functions (i.e. a good sleep environment) provided by hotels (Gundersen *et al.*, 1996).

Based upon the results from the multiple regression analysis, social demographic information significantly contributed to the predictability of customers' overall sleep quality satisfaction in hotels. Specifically, regarding the relation of demographic characteristics and sleep quality at hotels, the overall sleep quality satisfaction of those who stayed in upscale or higher level hotels (4 + stars) was more likely determined by their age and frequency of travel. Previous studies in sleep disruption research have widely investigated the relationships between age and sleep quality (Vitiello *et al.*, 2004). Thus, it is expected that age negatively influences business travelers' sleep quality. Furthermore, business travelers reported that as they travel more frequently, they experience better sleep quality at upscale hotels. Perhaps frequent business travelers have developed their own strategies to overcome travel discomfort, or they mostly stay in the same hotel chain during their business trips. In this case, they may be less sensitive to environmental stimuli that cause sleep disruption (Rubin, 2016). Interestingly, there was a relationship between the marital status of business travelers who stayed in mid-scale hotels (2.5-3.5 stars) and their sleep quality. Comparatively, business travelers who were single had a lower satisfaction of sleep quality at hotels. A possible explanation is these business travelers were younger and had less autonomy regarding job assignments. Thus, they may feel stressed during the business trips, thereby affecting their sleep quality (Chen, 2017; DeFrank *et al.*, 2000).

Regarding hotel attributes that are related to business travelers' sleep quality in hotels, over 25 percent of business travelers reported that "noise in the hallway," "noise from another room," "sound of the A/C or heater unit," "pillows are uncomfortable," and "mattress are uncomfortable" were major attributes disturbing their sleep quality. These results indicate that business travelers are affected by noise both outside and inside the guestroom, as well as material elements in the room. This finding is slightly different from Pallesen's *et al.* (2016) study that indicated pillow quality, room temperature, mattress quality, and bedding quality were the main sources of sleep disruption for travelers. However, the current study's finding is in line with the notion that there is a strong relationship between noise and sleep quality in hotels (Stringam and Gerdes, 2010; Rhee and Yang, 2015b). Environmental noise can be a substantial stimulus that causes poor sleep (Muzet, 2007). Therefore, the results of this study could provide implications to sleep research and further investigate how travelers' noise sensitivity and potential effects of environmental noise influence their sleep quality at hotels.

Practical implications

Business travelers may suffer from travel-related or work-related stress on the road, which may cause sleep disruption at hotels (Chen, 2017). Thus, this study suggests the necessity of providing a good sleeping environment that could decrease business travelers' stress and improve their sleep quality while staying at hotels. Based on our findings, it is critical that hotels provide a quiet environment for business travelers to improve their sleep quality. Although noise caused by other guests may be hard to control, noise in the hallway can be caused by a housekeeping team when they are working, such as the sound of vacuuming, knocking on the door, and staff chatting. These are common complaints of hotel guests with

respect to hotel noise (Gumaste and Shahane, 2014; Valtonen and Veijola, 2011). Hotel management could address this issue with the housekeeping team regarding service arrangement and schedule. Particularly, in the situation of hotels, expect for early arrivals and late departures, the housekeeping team has to start early in the morning to finish the work before new guests' arrivals. Therefore, hotels should consider implementing noise-minimizing practices to decrease sound in the hallway, for example, using a sound-minimizing vacuum machine, instructing housekeepers to keep their voice down in the morning, or using a flooring system designed to decrease sound (Baskas, 2008). Valtonen and Veijola (2011) argued that hotels focus on visual design, such as décor and lighting, to enhance sensory experience at hotels, but do not address soundproofing methods. Therefore, hotels should consider installing a soundproofing system to reduce unwanted noise for hotel guests. Furthermore, some hotels implement a "quiet zone" policy, which mandates limited housekeeping and engineering work in the hotel from 9 pm to 10 am (Churchill, 2016). Thus, hotel management should contemplate how to provide a quiet zone in the hotel and offer travelers a good sleep environment. Moreover, since this study shows that business travelers utilized at least one sleeping aids to help them overcome sleep disruption, hotels may consider providing complimentary ear plugs or eye masks in rooms to prevent noise and light that interfere with sleep quality.

The results of the SQS show that there was no significant difference between business travelers who stayed in upscale and higher level hotels (4 + stars) and those who stayed in mid-scale hotels (2.5-3.5 stars). However, regarding those who stayed in mid-scale hotels, the SQS influenced business travelers' overall satisfaction of sleep quality in hotels. In addition, sensory elements inside the hotel room (smell of the room, room too light or too dark, sound of air conditioner, and temperature control in the room) significantly influenced business travelers' overall satisfaction with sleep quality in mid-scale hotels, but not upscale or higher level hotels. It is possible that upscale or higher level hotels implement soundproof material, lighting control, and temperature control systems within the room, which, in turn, contribute to a comfortable sleep environment (Gumaste and Shahane, 2014). Kim and Perdue (2013) indicated that hotels should address sensory attributes to enhance the experimental value, which in turn, differentiates the hotels from the market. As such, this study provides implications to hotel designs and suggests that hotels can address essential room quality and experience by providing a good sleep environment for travelers.

Theoretical implications

Previous research in examining travelers' perceptions of hotel attributes focused on how hotel attributes may determine travelers' accommodation choices and satisfaction. Although sleep quality at a hotel has been considered an important factor that influences travelers' satisfaction toward the hotel (Lockyer and Roberts, 2009; Rhee and Yang, 2015a), few studies have scrutinized travelers' sleep quality and its relation to overall satisfaction at hotels. Furthermore, sleep studies focused on how in-room materials, such as the quality of mattress, pillow offerings, and the quality of bedding, influence hotel guests' sleep experience (Enck *et al.*, 1999; Gumaste and Shahane, 2014). However, the findings from this study indicate that material elements did not influence business travelers' overall satisfaction of sleep experience at hotels. As such, the current study could influence a new way of thinking regarding potential factors that influence travelers' sleep quality, satisfaction of sleep experience at hotels, and sleep quality's relation to hotel attributes.

Yi *et al.* (2006) stated that the mean score of sleep quality scale (SQS) for normal individuals who did not have sleep deprivation was 15.8, and for those who had insomniac symptom, sleep deprivation was 31.1. Another study by Yi *et al.* (2009) showed the mean SQS score of sleep quality in daily life for normal individuals was 9.7 while the mean score of

participants with obstructive sleep apnea syndrome was 27.3. These studies were both administered with a control group and a non-control group and were performed in the sleep study medical context. The mean SQS score for participants in the current study was 30.23. While this score should not be used to diagnose a sleep disorder, the high SQS score implies business travelers may have sleep disruption issues (Cohen and Gössling, 2015). Researchers can extend the finding from the current study and further investigate the comparisons of business travelers' sleep quality at home and at hotels. In this way, additional evidence could be provided to determine business travelers' sleep disruption issues while staying at hotels. Moreover, future research should attempt to conduct an objective sleep assessment of sleep during hotel visits to more adequately assess the impact of a hotel's environment on sleep quality.

Conclusion

Sleeping is a fundamental human need and helps travelers recover from their journey. Having a good night's sleep in a hotel is also an important part of travelers' experience, which is substantially associated with travelers' satisfaction of hotel products and service (Xiang *et al.*, 2015). Hotels provide accommodation and service to aid travelers while staying away from home. Particularly, a comfortable sleeping arrangement is essential for business travelers in order to ease their exhaustion from work. This study aimed to understand how business travelers evaluate their sleep quality and what factors may influence their sleep in hotels. Additionally, this study contributes to the scarce research in travelers' sleep experience in hotels and provides insight for hotels to assist travelers in getting a better night's sleep. This study took an initial attempt at exploring business travelers' sleep quality and satisfaction in hotels. Researchers can continue to investigate the ways to provide business travelers' with a better night's sleep in hotels.

Limitations and future research

There are several limitations in this study. First, although the participants were asked to evaluate their sleep quality and satisfaction while staying in hotels, the individuals' physical and psychological conditions may affect their sleep experience during business trips. More specifically, people typically compare their sleep experience at home with staying in hotels (Pallesen *et al.*, 2016; Rubin, 2016). Thus, future research could include individuals' physical assessments, such as measuring business travelers' sleeping pattern and quality, by using wearable technology devices (e.g. Fitbit activity trackers). First, data from an activity tracker may provide more accurate and quantifiable information regarding travelers' sleep quality in hotels. Second, sleep quality may be related to travel stress and pattern, such as jet lag (Cohen and Gössling, 2015). In addition, travel patterns (e.g. time and distance of travel) that might potentially influence sleep quality could be investigated together. In future studies, researchers could include travelers' stress level and travel patterns (e.g. international or domestic travel) to determine the factors that influence business travelers' sleep quality in hotels. Third, the participants' job levels were not included in this study. It is possible that job levels (e.g. manager vs executive) may influence business travelers' hotel selections and their sleep experience in hotels. All of these factors may potentially improve the goodness of fit of the model proposed by the authors. Fourth, although the SQS has been validated against polysomnography and the standard for evaluating sleep, it is a recall questionnaire as is susceptible to both recall and social desirability bias. Future research should replicate this study using both sleep diaries and accelerometers in a prospective fashion. Finally, this study only investigated business travelers' overall satisfaction of sleep quality. Future studies could incorporate and compare the differences of sleep quality between business and leisure travelers.

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Appendix

The survey question is as follows: based on your most recent business travel experience within the last month staying in hotels, please select the most appropriate response (from 0 "Never" to 3 "Almost always") for each of the following statements regarding sleep quality in hotels.

Variable	Item
Sleep quality (Daytime dysfunction)	Difficulty in thinking due to poor sleep
	Difficulty in concentrating due to poor sleep
	Increase of mistakes due to poor sleep
	Irritated feeling due to poor sleep
	Decrease of interest in work or others due to poor sleep
	Getting tired easily at work due to poor sleep
	Sleepiness that interferes with daily life
	Painful life due to poor sleep
	Decrease of desire due to poor sleep
	Increase of forgetfulness due to poor sleep
	Headache due to poor sleep
	Decrease of appetite due to poor sleep
Sleep quality (restoration after sleep)	Relief of fatigue after sleep (reversed score)
	Regaining vigor after sleep (reversed score)
	Clear-headed feeling after sleep (reversed score)
	Refreshed feeling of body after sleep (reversed score)
Sleep quality (difficulty in falling asleep)	Difficulty in getting back to sleep after awakening
	Never falling asleep after awaking during sleep
	Difficulty in falling asleep
	Tossing and turning sleeplessly
Sleep quality (difficulty in getting up)	Wish for more sleep after getting up
	Difficulty in getting up after sleep
	Feeling unlikely to sleep after sleep
	Satisfaction with sleep (reversed score)
Sleep quality (satisfaction)	Deep sleep (reversed score)
	Enough sleep time (reversed score)
Sleep quality (difficulty in maintaining a sleep)	Waking up easily due to noise
	Waking up during sleep

Source: Adopted and modified from Yi *et al.* (2006)

Table AI. Sleep quality scale (SQS)

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