Smart tourism destination experiences: The mediating impact of arousal levels

Abstract

This research explored the relationship between environmental stimuli and tourist experiences by considering the mediating impact of arousal level. Designed around the arousal theory of environmental psychology, this framework suggests that novel environmental stimuli create optimal arousal levels and lead to optimal performance. An on-site survey was distributed to tourists at Hu Li Shan Fortress in Xiamen, Fujian Province, China, which is a smart tourism destination recognized by the Chinese government. Completed self-administered questionnaires were obtained from 372 respondents who had used the smart facilities. The findings through the SEM (structural equation modeling) method revealed that physical and psychological stimuli had positive effects on arousal levels and tourist experiences and arousal level was a moderator between environmental stimuli and tourist experiences. Thus, destinations should offer optimal environmental stimuli to tourists by increasing smart facilities and services and continuously updating them.

Keywords: Tourist experiences; arousal theory; arousal levels; smart tourism destinations; information-sharing service platform (ISSP); environmental stimuli; destination management; China

1. Introduction

The concept of smartness is thought to have originated in the 1990s, corresponding to the introduction of new information communication technologies or ICTs (Angelidou, 2015). Since then, it has been attracting great attention (Hollands, 2008; 2015). Smart cities are often seen as urban areas making intelligent use of social media, big data, artificial intelligence (AI), cloud computing, Internet of Things (IoT), mobile communications, and other technologies to improve

the information infrastructure and urban living services (Bakici et al., 2013). However, there are broader conceptions of the meaning of smartness. For example, Cohen (2014) defined six 'smartness' dimensions as governance, environment, mobility, economy, people, and living. Not all smart destinations and cities are exactly the same as the smart dimension emphasis can vary from country to country, and even from city to city. Smart tourism was derived from the smart city concept (Coca-Stefaniak, 2019). Logically, smart destinations have similar strategies to smart cities and the support provided by institutions for the development of smart destinations is mostly related to their management (Boes et al., 2016). In Spain, smart tourism destinations are innovative, sustainable and accessible to everyone. They adopt the most advanced technologies to increase the quality of visitor experiences and also improve resident quality of life (Ivars-Baidal et al., 2019; Molinillo et al., 2019). However, in China there is much greater emphasis on smart destinations using ICTs rather than on broader and 'softer' management and governance strategies (Wang et al., 2013; Wang & Xiang, 2012; Xiang et al., 2015). Smart destinations in China are based on advanced ICTs that improve tourist flows (due mainly to overcrowding issues) and increase visitor engagement.

With the support of the Internet and mobile Internet technology, smart tourism is gradually changing patterns of travel, profoundly affecting the enjoyment tourists experience and amenities they require (Buhalis,1998; Buhalis & O'Connor, 2005; Neuhofer et al., 2013). Smart infrastructure at the destination effectively integrates physical spaces of destinations with virtual spaces, providing tourists with multiple experiences. This generates diversified experiences and greater personalization, which enhance tourist experiences and satisfaction (Lee et al., 2018; Neuhofer et al., 2013; Zatori et al., 2018). For example, people enjoy interpersonal communications by sharing their experiences with others in the virtual world, which allows the

senders to receive comments and feedback anytime and anywhere (Neuhofer et al., 2015), and they also can promptly respond. During the feedback process, positive feelings can be expressed about tourist experiences, as well as satisfaction associated with physical and virtual spaces. However, negative emotions are also attracting wider attention, such as “technology anxiety” (Meuter et al., 2001) and the need for “digital detox” (Li et al., 2018; Floros et al., 2019). This implies that some travelers are unwilling or unable to use smart technologies, or lack contacts with whom to communicate. Smart facilities have changed the social interaction of temporal-spatial organization (Dickinson et al., 2014) and allowed for a continuous “absence state”. There are still significant research gaps to fill before we can fully comprehend the interaction of smart technologies and experiences (Hunter et al., 2015; Gretzel et al., 2015; Zhong et al., 2017).

This research utilizes the arousal theory of environmental psychology to investigate the impacts of smart technologies on tourist experiences. Arousal theory has been widely used in environmental aesthetics, environmental emotional response, environmental psychology, and other aspects (Mehrabian & Russell, 1974; McDonnell et al., 2015). Arousal theory can predict different outcomes caused by low-arousal behavior (the sleep end of the continuum) and high arousal behavior. Also, it can effectively explain the behavioral consequences of environmental factors such as temperature, congestion, and noise (Gnoth,1997; Kagan & Snidman, 1991).This theory may partially explain how smart environments influence tourist experiences with the support of technology, by indicating the relationship between environmental stimuli and individual emotions or behavioral changes (Reisenzein,1994). Environmental stimuli supported by technology at smart destinations, and characterized by complexity, novelty, and accidentality, are key factors affecting tourist experiences (Buhalis & Amaranggana, 2013). Amato and McInnes (1983) reported significant pleasure-arousal interactions on affiliation measures of city

environments, corresponding to Mehrabian and Russell's (1974) research findings. Wirtz et al. (2000) tested the pleasure-arousal interaction with affiliation behaviors in Russell's framework. Furthermore, the extant research indicates that emotional arousal has a mediating effect on natural 'tourscapes' and tourist experiences and the level of arousal is dependent on visitors' purposes for being in particular environments, hence reflecting goal-directed behavior (Wirtz et al., 2000; Zhang & Xu, 2019).

Therefore, the principal goal of this research is to contribute more on the antecedents of tourist experiences at smart destinations. Two specific objectives were to utilize arousal theory of environmental psychology to investigate the impacts of environments at smart destinations on tourist experiences with the support of ICTs, by revealing the relationships between environmental stimuli and individual emotions and behavioral changes; and to determine whether arousal level is a mediating variable critical to understanding the interplay between environments and people's experiences at smart destinations.

2. Literature review, conceptual framework, and research hypotheses

2.1. Arousal theory

Arousal theory, also known as activating theory, is a theory about the relationship between individual emotional changes and environmental stimuli in environmental psychology and was put forward by Berlyne (1960), a British behavioral psychologist. Berlyne pointed out that people gained pleasurable emotions in aesthetic activity caused by two types of arousal. One is gradualness arousal, meaning the intensity of aesthetic emotion increases gradually with the process of perception and acceptance and finally reaches the critical point of degree to produce pleasurable experience. The other is hyperactivity arousal in which emotions are rapidly raised to a summit by sudden shock and then a drop-off pleasure relieves intensity when arousal

dissipates. Arousal is widely used in environmental psychology because it is deemed to be a variable that influences behavior (Carrol et al., 1982; Picard et al., 2015). Arousal theory holds that a specific environment will stimulate individuals' perceptions and make them aroused, thus affecting their behavior (Loewen and Suedfeld, 1992).

Tourist experiences represent a special process in which people perceive pleasure (Vandenbosch and Dawar, 2002). This process is relaxing, changeable, experienced, and real psychological pleasure sensed by tourists in the process of watching, communicating, imitating and so on (Agapito et al., 2013). Xie and Peng (2006) suggested that the ultimate purpose of tourist experiences is to seek happiness or pleasure and its basic level of expression is in emotions. The surrounding environment often plays a subtle role in influencing these emotions and behaviors. The essence of tourist experiences may result from the interaction among tourism environmental stimuli and tourists' emotions and behavior. Thus, this research adopted arousal theory to explore the relationship between tourism environmental stimuli and tourist experiences. Individuals have varying preferences for complex environments. This affects the degree to which people respond physically and psychologically, as well as how much influence there is on emotions and behavioral changes. Therefore, arousal levels play an important role in individual emotional and behavioral changes (Wirtz et al., 2000). Due to the variety of individual preferences, the degrees of individual arousal are different. People who are well-planned or goal-oriented, will first experience low-level pleasure; those who pay more attention to the current situation and lack goals, experience high-level arousal pleasure first (Kerr & Tacon, 1999). On the basis of this theoretical model, this research constructed a conceptual framework and evaluation model (Figure 1) of environmental stimuli - arousal level-tourist experience to measure the antecedent relationships of tourist experiences.

[Insert Figure 1 about here]

2.2. Conceptual framework and research hypotheses

Experiences are becoming a popular topic in tourism studies (Moon & Han, 2019) and in destination management practice. The research literature mainly focuses on connotations, experience dimensions, satisfaction, motivation, preferences, and behavior based on a multiplicity of approaches from phenomenology, psychology, anthropology, management, and economics (Russell and Lanius, 1984; Radic, 2019; Ritchie et al., 2011; White, 2005;).

Tourist experiences are a special process in which people feel or do not feel pleasure, through relaxation, change and real psychological perception, in the process of admiration, communication, and imitation (Rojas and Camarero, 2008). They are also considered to be a general impression of something cognitive and perceptible, produced by a variety of sensory stimuli in a particular tourism situation (Chhetri et al., 2004). The tourist experience process is assumed to be complex. It can be measured by experience intensity, perceived coupling, emotional factors, and tourist diversity. Tourists absorb local experiences and overall experiences of destinations through perception, involving visual, auditory, tactile, olfactory, and taste. So, perceptions, emotions, cognitions, physiology, and relationships also can be used to measure the tourist experience (Uriely, 2005). Kastenholz et al. (2012) have shown that tourist experiences are not only functional or have utility, but also include social, emotional, entertaining, and symbolic dimensions. Compared with other places, tourist experiences within smart tourism destinations can be more comprehensive and consist of multi-functional, smart service, and new interactive experiences (Buonincontri & Micera, 2016). Scholars have not yet established any concrete tourist experience scales for smart destinations (Xu et al., 2018). In fact and in general, the dimensions of tourist experience vary from one study to another (Vespestad &

Lindberg, 2011; Filep & Laing, 2018). Considering the specific characteristics of smart tourism destinations, this research proposed the five dimensions of functional, perceptual, entertainment, interactive, and emotional experiences as the observed factors.

In the 1970s, the analysis emerged of the influential factors in creating tourist experiences. Ryan (2008) suggested that these factors should be divided into previous experience, mediator variables, behavior, and results. This implies that experience quality is impacted by tourists themselves, residents, practitioners, tourism products, and all other related factors. For example, tourists' relative knowledge and the group to which they belong have been proven to be significant factors (Kim, 2010). Furthermore, the environment, activities, infrastructure, and level of service have an impact on experiences (Loureiro, 2014; Teixeira et al., 2012).

Some scholars have noted that the environment is one of the most important indicators affecting tourist experiences (Binkhorst & Dekker, 2009; Volo, 2009). People try to acquire the necessary details on environments to reduce the uncertainty that they feel when they are stimulated by destination information. They adjust their emotions correspondingly, which greatly affects their experiences (Gnoth, 1997). For example, according to the theory of staged authenticity (Ryan, 1997), tourism spaces and staging (Rojas and Camarero, 2008) play an important role in influencing experiences.

2.2.1. Relationships between tourism environment stimuli and tourist experiences

Environmental stimuli are external environmental factors that may affect and change tourist experiences in different ways (Ali & Amin, 2014). Generally, these can be divided into two types: physical and psychological environmental stimuli. Arousal theory proposes that the tourist experience can be evaluated from the physical elements of the environment, the

performance of the people around us, and the information on our internal state through answering whether the arousal is pleasant or unpleasant (Sundstrom et al., 1996).

This research used three dimensions to measure physical environmental stimuli: object, human, and natural. Object environmental stimuli is the stimulation on tourists generated by the smart facilities in destinations. Too many or too few people around us can cause psychological anxiety (Wohlwill, 1966), so the extent of crowds and people's behavior surrounding smart facilities is a human environmental stimuli. Natural environmental stimuli are the influence of natural resources in smart destinations, such as plants, landscapes, and scenery (Zhang et al., 2012).

Smart destinations should gather information about tourists' needs and preferences through their technological platforms. With this approach, active engagement between tourists and service providers is encouraged to continuously offer innovations in products that best suit tourist preferences (Schaffers et al., 2011). According to arousal theory, pleasant environmental stimuli raise arousal levels and provide more pleasure for individuals.

Tourist experiences are considered to be principally psychological (Ritchie et al., 2011). Therefore, instinct motivation, part of the psychological environment, is also an important determinant of all tourist experience factors (Iso-Ahola, 1981). Instinct motivation is when an individual wants to engage in activities to experience pleasure and satisfaction (Deci & Ryan, 2008). Personal demands, interests, and emotions are significant factors influencing intrinsic motivation, which refers to curiosity, interest in activities, enjoyment, and individual growth. Gnoth (1997) found that tourist motivation depended on satisfaction with products and services, including in relation to their thirst for knowledge and curiosity. Tourists with a high interest in the smart products, facilities and services of smart destinations have more desire for knowledge

exploration (Bion,1963). As a type of instinct motivation, the essence of curiosity is to seek excitement, while the expression of curiosity is that individuals take the initiative to explore the environment (Berlyne, 1960).

Instinct motivation is often accompanied by a positive emotional experience (Fanselow, 2018). People who are stimulated by instinct motivation will more readily have enjoyable feelings. So, if tourists are very interested in exploring and are continuously curious, they will tend to make greater effort to explore and be fascinated by the environment.

Chhetri et al. (2014) concluded that tourist experiences were influenced by attitudes based on the social cognitions of visitors. Attitude is defined as a consumer's evaluative inclinations toward or against any element in his or her market domain (Rahman &Reynolds, 2019). Attitudes have the function of cognition; to understand the world, humans must know and try to control the world around them, giving their behavior a clear direction. Therefore, people need to attach a significance to all objects surrounding them through forming attitudes (Giddy & Webb, 2018). When tourists are content with the overall environment, they are likely to have a positive attitude toward destinations and intend to revisit them (Loureiro, 2014). Favorable attitudes toward a destination are related to perceptions of experience quality and value (Moon & Han, 2019). So, if people have more positive attitudes about a smart destination, they may be more willing to use the smart facilities and more inclined to have in-depth participation in tourism activities, even if the activities require greater effort. Tourists judge their experiences to be more meaningful and satisfactory when they are engaged in the process of traveling. Thus this research hypothesizes that each variable in the environment has a positive effect on tourist experiences and the hypotheses were as follows:

H_1: Physical environmental stimuli positively influence tourist experiences.

H_2: Intrinsic motivation stimuli positively influence tourist experiences.

H_3: Attitude stimuli positively influence tourist experiences.

2.2.2. Relationships between environmental stimuli and arousal levels

Arousal is a state of individual vigilance, whether or not the person is ready to react to a psychological and physiological stimulus. When the environment is calm, it is less stimulating, and people are in a relaxed rather than alert state. People do not readily respond, and so they are not arousable. As a result, a calm environment is pleasant but not arousable. Motivation-arousal theory suggests that people have optimal arousal levels; they reduce stimulation when there is excessive arousal and increase stimulation when there is insufficient arousal (Caber & Albayrak, 2016).

The feelings of stimulation in a novel environment are developed with the repetition and duration of the stimuli. The more the stimuli are repeated and the longer the time, the novelty of the perceived image will gradually decrease. In addition, the theory indicates that experienced individuals prefer stimulation in complex environments, and people always tend to give positive evaluations of moderate levels of arousal (Berlyne, 1960). The smart systems in destinations not only provide dynamic services, but also can be a platform for sharing travel experiences. As such, the systems can capture the real demands and preferences of tourists through collecting data on platforms (Tan, 2017). Then, according to the actual feedback from tourists, the physical environments may be adjusted and constantly changed. This decreases repetition and prolongs stimuli, creating the optimal stimulus environment. It is believed that the environments in smart tourism destinations are complex and novel, but do not have excessive stimuli for tourists. The hypothesis was as follows:

H_4: Physical environmental stimuli positively influence arousal levels.

231 Arousal is derived from motivation and it is the external reflection of the motivation
232 system (Caber, Albayrak, & Ünal, 2016). Arousal level depends on the activation intensity of
233 motivation in the activation system (Bradley et al., 2001). The assessment of arousal indicates
234 the activation intensity of motivation (Bradley & Lang, 2007). Stimulation with high motivation
235 intensity generally induces higher arousal levels, while stimulation with low motivation intensity
236 induces lower arousal levels (Datu, 2017). When people are in comfortable and favorable
237 environments, their intrinsic motivations are activated and they develop higher motivation levels,
238 and arousal levels are also elevated. The hypothesis was as follows:
239 H_5: Intrinsic motivation stimuli positively influence arousal levels.
240 As suggested in past research, people have desired levels of arousal associated with
241 service environments. These arousal levels are dependent on the people's affective expectations
242 for the environment. It is believed that humans are intrinsically pleasure seeking (Holbrook &
243 Hirschman, 1982) and they want to feel pleasure (rather than displeasure) from service
244 experiences (Carbone & Haeckel, 1994). Therefore, it is proposed that affective expectations are
245 determined by attitudes toward environments. For example, if tourists have positive pre-
246 consumption expectations for smart tourism destinations, where they perceive their individual
247 needs will be met (Buhalis & Amaranggana, 2013), they are likely to have positive attitudes
248 toward these destinations leading to higher arousal levels. The hypothesis was as follows:
249 H_6: Attitude stimuli positively influence tourist arousal levels.
250 *2.2.3. Arousal levels and tourist experiences*
251 American psychologist Arnold (1960) believes that once stimuli are perceived,
252 individuals will automatically generate an "evaluation of whether it is good or bad for me at this
253 time," which in turn produces an emotional feeling about the relationship between stimuli and

their own interests. They exhibit behaviors that approach or diverge from the stimuli. How then do environmental stimuli affect tourist experiences?

According to arousal theory, arousal levels are important to performance. Arousal is a dynamic process, which describes the degrees to which individuals' emotional states are activated by their surrounding environments. Arousal states significantly influence subsequent behaviors. Different levels of arousal affect physical activation and have an impact on people's judgment and behavior. Negative arousal directly leads to negative strategic tourist behaviors. The ranges of individual preference levels for complex environments cause differences in arousal levels from environments. Individuals psychologically or physiologically increase or reduce the degree of response, which in turn affects their emotional and behavioral changes. Tourists are affected by their emotions, intelligence and participation levels. Stefanucci & Storbeck (2009) pointed out that arousal has mediating effects on individual perceptions. When tourists immerse themselves in the activities of destinations (medium arousal level), they are more likely to have unforgettable travel experiences. Thus, there is a need for a new mediating variable, arousal level, to understand the interplay between environmental stimuli and tourist experiences. The hypotheses were as follows:

H_7: Arousal levels positively influence tourist experiences.

H_8: Arousal levels mediate the relationship between environmental stimuli and tourist experiences.

3. Methods

3.1. Data collection procedures

Questionnaires were distributed during the Lunar New Year holidays since many people travel with their relatives and friends at that time and it can yield a broader representation of

277 gender, age, occupation, and other demographic characteristics. The forms were distributed near
278 the information-sharing service platform (ISSP) at the Fortress and were randomly handed out to
279 respondents who used the ISSP. Respondents completed the questionnaires and then handed
280 them back directly to the fieldwork team. So, the sample collected was a convenience one. Under
281 the observation of field workers, some of the respondents filled in forms too quickly and in a
282 perfunctory way; after checking, their completed questionnaires were withdrawn. Other forms
283 which showed a distinct tendency in completion (eight consecutive items marked in the same
284 way) were also deleted.

285 Hu Li Shan Fortress is located in Siming District, Xiamen. Xiamen was selected among
286 the first batch of *National Smart Tourism Pilot Cit*ies in China. Taking Hu Li Shan Fortress as a
287 pilot unit for exploring the construction of smart tourism destinations, Xiamen was striving to
288 formulate the *Smart Hu Li Shan Fortress Construction Plan* and built Hu Li Shan Fortress as a
289 model project of national smart tourism destinations. Hu Li Shan Fortress was founded in 1896,
290 with a total area of more than 70,000 m^2 and its castle covers an area of 13,000 m^2. It's a
291 national AAAA tourist attraction. Hu Li Shan Fortress is surrounded by the sea on three sides
292 and has unique natural tourism resources. The architectural style reflects the Ming and Qing
293 dynasties. Its smart tourism system includes free WiFi, self-service audio-guides, information
294 sharing service platforms (ISSP), and other facilities providing convenient services to tourists.
295 Beautiful natural vistas, unique historical and cultural characteristics, and a convenient smart
296 destination service system attract millions of domestic and international tourists every year.

297 Hu Li Shan Fortress is a typical demonstration area of smart tourism in Fujian
298 Province, so Hu Li Shan Fortress was selected as a case study. This research chose the
299 information sharing service platform (ISSP) as the object of investigation in order to support the

theoretical framework. The ISSP provides standard and consistent business process and data access interface for destination service applications and public service systems. Tourists can get information about scenic spots, tour routes, beautiful four-season photos, sightseeing places, and catering services around them. In addition, the way of displaying information on the ISSP is not only in text and photos, but there are also audio and video files. The ISSP delivers more convenient travel services and experiences for tourists. There are two ISSPs in the Hu Li Shan Fortress; one is located at the roadside near the entrance gate, and the other is in front of the washrooms where there is a resting area. Some use the ISSP when they need help; others may just notice the ISSP when they are taking a break. People use the ISSP mainly by selecting and viewing the contents on the display touchscreen. When first viewing the ISSP, tourists explore its main functions and subsequently pick the information they want to peruse. Tourists who are familiar with smart destinations prefer to thoroughly understand its offerings through using ISSPs. Younger children and teenagers may use the ISSP for entertainment, casually clicking the display screen. Middle-aged and older people seemed more reluctant to use ISSP, but they clicked and watched videos onscreen when the researchers invited them to do so. Therefore, the ISSP was chosen as an example for field investigation. Table 1 describes the variable selection as they related to using the ISSP.

[Insert Table 1 about here]

The survey was conducted from December 30, 2018 to January 1, 2019 at Hu Li Shan Fortress. A total of 400 questionnaires were distributed and 400 were returned. Of the completed forms, 372 were valid and the valid response rate was 93%. Forty-nine children with their parents' consent and help were surveyed.

3.2. Measurement development

323 The survey questionnaire used five-point Likert scales (1 = strongly disagree; 5 =
324 strongly agree) and was organized into two parts. The first included the five measurement items
325 of physical stimuli, intrinsic motivation, attitude stimuli, arousal level, and tourist experiences.
326 The second part collected respondents' demographic information including gender, age, income,
327 educational level, occupation, and visit times. A copy of the questionnaire is included in an
328 appendix.

329 **Results**

330 *4.1. Respondent profile*

331 SPSS 22.0 was used to prepare the descriptive statistics and the respondent profile is
332 displayed in Table 2. The proportion of males and females in the sample was balanced; 54.3%
333 were male and 45.7% were female. The majority of the respondents were in their twenties or
334 thirties, showing a normal distribution overall. More than half had a college degree or higher
335 education. Some 41.4% responded that their annual incomes were more than 30,000 yuan
336 ($4,360). More than one third were students, 16.7% were white-collar workers, and the other
337 respondents were freelancers, teachers, civil servants, or in other occupations. Most (66.9%)
338 responded it was the first time they had visited Hu Li Shan Fortress.

339 [Insert Table 2 about here]

340 *4.2. Confirmatory factor analysis (CFA): Reliability and validity*

341 The appraisal of construct validity was accomplished through confirmatory factor
342 analysis (CFA) conducted after an exploratory factor analysis. For the exploratory factor
343 analysis, principal components analyses with a Varimax rotation identified an interpretable
344 solution of five factors from the 16 items (Table 1): physical stimuli, intrinsic motivation,
345 attitude stimuli, arousal level, and tourist experiences. Physical stimuli included object, natural

environment, and human stimuli. Intrinsic motivation was formed by thirst for knowledge, curiosity, and interest. Attitude stimuli comprised attitude, emotion, and willingness. Arousal level just had one item, and this factor was the observation variable. Five items constituted tourist experiences: sense, functional, emotional, enjoyable, and social experiences. The factor loadings of the measurement items were all satisfactory, ranging from 0.505 to 0.769 (Kaiser-Meyer-Olkin = 0.865, x^2 =1578.427, df =120, p < 0.000). Therefore, the validity of the survey questionnaire items was satisfactory. Cronbach's alpha tests were employed to check reliability, and the range was acceptable at from 0.600 to 0.801. In addition, the normality of the data was acceptable as the values of skewness and kurtosis were within the range of ± 2 and ± 5 respectively (Bentler, 2006). The normality distribution tests showed that absolute skewness values of each observation variable were less than two and the absolute kurtosis value were less than five. So, the test results indicated that the data were normally distributed.

CFA was conducted on the observed and latent variables, and reliability and validity were tested. Two items with factor loadings less than 0.5 were eliminated (*The location of ISSP is conspicuous* and *You are interested in ISSP*). CFA and SEM were used to test the conceptual model. CFA was carried out using the maximum likelihood method and the results are presented in Table 3 (Lu et al., 2017; Moon & Han, 2019). The model showed a good fit to the data ($\chi 2/dx$ = 1.842 (< 3), RMSEA= 0.048 (≤ 0.08), CFI = 0.958 (> 0.9), TLI = 0.943 (> 0.9), RMR = 0.032 (<0.05), GFI = 0.955 (> 0.9), AGFI = 0.930 (> 0.9). The factor loadings of all the measurement items were satisfactory, exceeding the threshold of 0.5 at the significance level of p < 0.001. The construct reliability (CR) and the average variance extracted (AVE) were also computed for the latent constructs. The CR of the four latent variables (physical stimuli, intrinsic motivation, attitude stimuli, and tourist experiences) were 0.68, 0.56, 0.67, and 0.80 respectively.

The CR of the latent variables surpassed the suggested threshold of 0.6 except for intrinsic motivation. The AVEs ranged between 0.40 and 0.45. Fornell and Larcker (1981) suggested that an acceptable AVE is between 0.36 and 0.5, and ideally AVE values should be higher than 0.5. Therefore, all constructs of the model had acceptable convergent validity. Discriminant validity was checked and compared with the squared root of AVE and correlations. As the values of the squared root of AVE were all larger than the correlations, discriminant validity was acceptable.

[Insert Table 3 about here]

4.3. Structural equation model (SEM) and hypotheses tests

4.3.1. Model fit and modification

The fit of the research model was tested with AMOS 22.0 software. The results indicated that the suggested model did not fit the data, $\chi 2/dx = 3.089$ (> 3), RMSEA = 0.075 (≤ 0.08),CFI = 0.890 (< 0.9), TLI = 0.859 (<0.9), RMR = 0.083 (>0.05), GFI = 0.921(> 0.9), AGFI = 0.883 (<0.9), and thus the model had to be modified. Allowable model modification generally includes two approaches; one is increasing the fit of the model by increasing the path with the highest modification index (usually MI > 4 is meaningful for model updating). If the chi-square value decreases significantly after the path increases when compared with the original model, it shows that the updated model is meaningful. The other approach is to delete or restrict some paths. If the simplified model shows that the chi-square value of the model does not increase significantly, the deletion of the path is feasible.

4.3.2. First model modification

The path analysis results showed that the modification index (MI) of physical stimuli for attitude stimuli was 31.256 (greater than 4); so, the path of physical stimuli and attitude stimuli was increased. In the modified model, the chi-square decreased significantly; both $\chi 2/dx$ (2.604), RMR (0.062) and RMSEA (0.066) were lower than before. The CFI (0.917), GFI (0.937), and

AGFI (0.905) were all higher than 0.9; however, TLI was lower than 0.9. Therefore, the model still needed to be further modified.

4.3.3. Second model modification

The path analysis results showed the modification index (MI) of physical stimuli for intrinsic motivation was 22.056 (greater than 4) and the path of physical stimuli for intrinsic motivation was increased. The chi-square decreased significantly. The model fit indices indicated that the suggested model fitted the data, ($\chi 2/dx = 2.259$ (< 3), RMSEA = 0.058(≤ 0.08),CFI = 0.936 (> 0.9).TLI = 0.915 (>0.9),RMR = 0.038 (< 0.05), GFI = 0.944 (> 0.9),AGFI = 0.914 (>0.9). Thus, the model modification was reasonable.

4.4. Hypotheses testing

SEM was used to test the proposed structural model (Figure 2). The results are shown in Table 4 and the estimated factor loadings and path coefficients are indicated in Figure 2. Physical stimuli ($\beta = 0.25$, $t = 2.829$, $p < 0.01$), intrinsic motivation ($\beta = 0.23$, $t = 2.787$, $p < 0.01$), and attitude stimuli ($\beta = 0.29$, $t = 3.585$, $p < 0.001$) had positive effects on tourist experiences, which supported H_1, H_2, and H_3. Physical stimuli ($\beta = 0.20$, $t = 2.343$, $p < 0.05$), intrinsic motivation ($\beta = 0.31$, $t = 3.839$, $p < 0.001$), and attitude stimuli ($\beta = 0.23$, $t = 3.119$, $p < 0.01$) were all significant influences on arousal levels. This supported H_4, H_5, and H_6. H_7 was also supported, showing that arousal level was a significant influence factor for tourist experiences.

[Insert Figure 2 about here]

[Insert Table 4 about here]

4.5. Mediation effect of arousal level

Does arousal level play a mediation role between environmental stimuli and tourist experiences? There are three main methods available to test the mediation effect; one was

suggested by Baron and Kenny (1986) and is named the causality regression method, and the others represent a method based on the distribution of the product of two normal random variables and resampling methods. In recent years, many scholars queried the causality regression method. MacKinnon (2002) used a simulation study to evaluate two alternatives (distribution of the product of two normal random variables and resampling methods) and the study demonstrated that more accurate confidence limits are obtained using resampling methods, with the bias-corrected bootstrap the best method overall. The resampling methods are better, as suggested by Efron (1979), and include the nonparametric and parametric bootstrap methods. The most commonly adopted method is the nonparametric bootstrap method, which uses uniform sampling with replacement. Repeated sampling with replacement is carried out under the condition that the probability of each observation until being sampled is equal (all of them are 1/n). The nonparametric bootstrap method was used, and the results are presented in Table 5. Physical stimuli (estimate = 0.307, $p < 0.001$), intrinsic motivation (estimate = 0.090, $p < 0.05$), and attitude stimuli (estimate = 0.055, $p < 0.05$) indirectly influenced tourist experiences through arousal levels.

According to Taylor et al. (2008), the z value should be higher than 1.96. Additionally, at the 95% confidence level, the confidence intervals of the bias-corrected percentile method and percentile method for indirect effects do not contain 0 and this means that the effect is significant. Baron & Kenny (1986) defined the partial mediation effect as if: (1) Independent variables significantly influence dependent variables; (2) in the causal variable model, independent variables significantly influence mediator variables, mediator variables significantly influence outcome variables; and (3) independent variables significantly influence dependent variables after adding mediator variables, then there is a partial mediation effect. If the

independent variables have no obvious influence on dependent variables after adding mediator variables, then there is a complete mediation effect (Judd and Kenny, 1981). The results of the bootstrapping test are presented in Table 5. The z value of the estimated indirect effect of physical stimuli on tourist experiences was 3.987. The confidence intervals for the bias-corrected percentile and percentile methods for indirect effects did not contain 0, indicating that the indirect effect of physical stimuli, arousal level and tourist experience was significant. Because the physical stimuli had a significant effect on tourist experiences, arousal level played a partial mediation role between physical stimuli and tourist experiences. Similarly, arousal levels played a partial mediation role between attitude stimuli (estimate = 0.055, $p < 0.05$) and tourist experiences. Attitude stimuli (estimate = 0.090, $p < 0.01$) indirectly influenced tourist experiences through arousal levels. But the direct effect of intrinsic motivation ($z = 1.872 < 1.96$) on tourist experiences was not significant, so arousal level played a complete mediation role between intrinsic motivation and tourist experiences. Therefore, H_8 that arousal levels play a mediation role between environmental stimulus was supported.

[Insert Table 5 about here]

5. Conclusions, discussion, and implications

5.1. Conclusions

The relationships among environmental stimuli, arousal levels, and tourist experiences were analyzed within a smart tourism destination. The results suggested that environmental stimuli including physical stimuli, intrinsic motivation, and attitude stimuli are antecedents of tourist experiences. Additionally, the mediating role of arousal levels cannot be ignored.

Environmental stimuli had a positive influence on tourist experiences. Specifically, physical stimuli, intrinsic motivation, and attitude stimuli had positive effects on tourist

experiences. The effect values of attitude stimuli were higher than for intrinsic motivation and physical stimuli. After tourists are stimulated by the environment (facilities, equipment, and the natural resources) in a smart tourism destination, their experiences are positively affected.

Intrinsic motivation also had a positive effect on tourist experiences. With more intensive sightseeing and increases in visit duration, tourists are influenced by real or perceived stimuli within smart tourism destinations. For example, increasing curiosity about the facilities, equipment, and natural environment, or increasing desires for information about services available and the history of the destination, make tourists more stimulated and this increases positive tourist experiences.

Attitude stimuli had a positive influence on tourist experiences. Tourist perceptions may constantly change in the process of touring a smart destination. A series of favorable evaluations of smart tourism destinations result from attitude stimuli which influence tourist experiences.

Environmental stimuli had a positive influence on arousal levels and the environment stimuli were not excessive. Intrinsic motivation was the most influential factor affecting arousal levels. Whether tourists are willing to encounter all types of new things in the process of touring depends on their intrinsic curiosity with respect to the smart tourism destination. The more willing they are to explore, the more environmental stimuli they will receive. With constant changes in these stimuli, arousal levels are accentuated.

Arousal levels affected tourist experiences. This research demonstrated that arousal levels have a positive effect on tourist experiences. The level of arousal is an important factor affecting tourist experiences. Arousal level is a mediating variable between environmental stimuli and tourist experiences. Arousal levels play a complete mediation role between intrinsic motivation and tourist experiences, while they perform a partial mediation role between physical stimuli,

attitude stimuli, and tourist experiences. The novel environments of smart tourism destinations and the psychological environment of tourists stimulate tourists' cognition and they are aroused, thus affecting their experiences.

5.2. Discussion

The environment at destination**s** or attractions is considered to be one of the most critical factors affecting tourist experiences and previous research has confirmed that it has an effect on tourist experiences (Binkhorst & Dekker, 2009;Volo, 2009). Generally, in past studies, this environment is defined as the physical environment, including infrastructure and landscapes (Loureiro, 2014; Teixeira et al., 2012). Tourists' prior knowledge, the groups to which they belong, and emotions also are significant factors (Kim, 2010). However, so far scholars have not paid adequate attention to these factors, which belong to the psychological environment. This research had the goal of testing the main factors influencing tourist experiences in a smart destination from the perspective of a more complete set of environmental factors, including physical and psychological. The results indicated that environmental stimuli, involving the three major dimensions of physical, intrinsic motivation, and attitudes affected experiences. Attitude stimuli and intrinsic motivation, both belonging to psychological stimuli, were the main factors affecting arousal levels and tourist experiences.

How do smart environments influence tourist experiences with the support of technology? Arousal theory holds that a specific environment stimulates people's mental processing and makes them aroused, thus affecting their behavior (Loewen and Suedfeld, 1992). This research put forward arousal as a mediating effect in understanding the interplay between environmental stimuli and tourist experiences using arousal theory (Stefanucci & Storbeck ,2009). The results indicated that the novel environments of smart tourism destinations and the psychological environments of tourists stimulate people's perceptions and they are aroused, thus affecting their experiences. Arousal levels had a positive effect on tourist experiences. Environmental stimuli not only had direct effects on tourist experiences, but also had a significant effect on arousal levels. Intrinsic motivation was the key factor in influencing arousal levels.

5.3. Theoretical implications

This research has several meaningful implications for tourist experience research. First, although environmental stimuli and tourist experiences have long been studied in tourism, the interrelationships between these two constructs have not been exhaustively examined. These relationships were investigated based on arousal theory. It was proposed that environmental stimuli had a significant effect on tourist experiences. Furthermore, the research posited that the psychological environment, including attitudes and intrinsic motivation, was also a significant stimulus affecting tourist experiences, which expands the scope of research on environmental stimuli. Consequently, the findings are of significance to theoretical research in exploring the antecedents of tourist experiences.

In addition, this investigation attempted to understand how each facet of environmental stimuli (physical, intrinsic motivation, and attitudes) influenced tourist experiences. Within smart tourism destinations, people are exposed to different and unique physical environments as well as novel social and natural environments. Their experiences are formed via the process of

internalizing interactions and creating responses (Moon and Han, 2019). This research introduced arousal theory to explain this phenomenon. Environmental stimuli affected tourist experiences through arousal levels. If people consider the environment in a smart tourism destination to be more convenient and intellectually fulfilling than other places they have visited before, their arousal levels will be positively strengthened after stimulation. Similarly, individual tourists have their own preferences. Those who prefer smart tools and service will have higher positive arousal levels when they are stimulated by the environment. This suggests that people in novel, dynamic environments are inclined to have more positive arousal levels.

Arousal theory is often used to represent the relationship between environments and individual psychology in the field of environmental aesthetics and environmental psychology. This research introduced the theory into tourism research and expanded the range of its application. The results showed that tourist experiences can be modified by arousal levels and explains how the same stimuli can generate different tourist experiences.

5.4. Practical implications

This analysis also has several meaningful implications for smart tourism destinations. Smart tourism began in China in recent years. It is concluded that smart tourism facilities and services can increase feelings of aesthetic emotions and create pleasant experiences. If the stimuli are not excessive or insufficient, environmental stimuli at an optimal level will lead to pleasant experiences. Thus, the key concern for smart tourism is how to generate an optimal environment. The needs and requirements of tourists should be the first consideration, rather than building as many facilities and other contents as possible. For example, people want to be given introductions on the history, routes and itineraries, weather, and on the destination. This information should be provided in a simple way that can incorporate some humor, and not be

552 overly complicated. Second, destinations must pay attention to the location of smart facilities.
553 such as having them in places which are visible and easy to find, as well as being in pleasant
554 surroundings. This encourages instinct motivation to engage with smart activities and people are
555 more likely to acquire optimal arousal levels. Third, the findings of this study showed that
556 increasing curiosity encouraged intrinsic motivations and improved people's psychological
557 environments, which had a positive effect on experiences. As such, it is advisable for smart
558 destinations to continually vary and update their smart product offers. Outdated facilities and
559 systems should be replaced, including products that create adverse impacts on the environment.
560 Novelty is an antecedent of arousal (Kim, 2010; Ma et al, 2017; Mitas & Bastiaansen, 2018), so
561 providing novel and easily navigable environments for tourists is essential. Intelligent means
562 need to be developed to enhance tourists' desire for understanding the cultural contents of
563 heritage attractions. For example, the history and culture of destinations can be displayed on
564 ISSPs in the form of stories or games encouraging people to be actively engaged and participate,
565 thereby enhancing the desire for greater understanding of historical and cultural information and
566 enhancing experiences.

567 **6. Limitations and future research needs**

568 *6.1. Limitations*

569 Although this research offers useful findings with regard to smart tourism destinations,
570 there are still several limitations. To capture the effects of environmental factors on tourist
571 experiences, people were selected who used the information sharing service platform (ISSP). The
572 two ISSPs are located in areas that are busy and crowded, this might have influenced people's
573 perceptions of the destination and experiences.

574 This research proposed that arousal level was a mediator between environmental stimuli

and tourist experiences. Arousal levels were measured through the completion of survey questionnaires; however, arousal levels are a continuously changing process of physical and psychological status. Sometimes, they cannot be described accurately in words ,which may have affected their mediating effect in either a positive or negative way.

Individual optimal arousal levels vary with differences among tourists. even when being stimulated by a similar environment. For instance, educational background and age may exert and influence, and this research did not classify people according to their socio-demographic characteristics.

Finally, the respondents included in this survey represented a convenience sample with all the attendant limitations of non-representativeness. The results may also not be generalizable to other smart tourism destinations.

6.2. Suggestions for future research

The emergence of smart environments will redefine how customers navigate their experiences (Buhalis, 2019). With greater popularization of smart tourism destinations, the core components of smartness in physical environments will be extended, and more tourists will have experiences with smart tourism. Future research should explore other dimensions of physical and psychosocial environments. For example, people's previous experiences with smart destination can be included as a main factor of the psychosocial environment.

Questionnaires were used to measure arousal levels in this research. Brainwave tests could be carried out, and these have been widely used in psychological studies. However, the environments of tourism destinations are so complex that it will be a challenge to build experimental laboratory simulations.

This research found that optimal environmental stimuli positively influence tourist

experiences. However, how to maintain an optimal environmental stimulus in smart tourism destinations remains a gap in the tourism literature that needs to be addressed.

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