Universal therapy: A two-stage mediation model of the effects of stargazing tourism on tourists' behavioral intentions

Tao Li [*]

School of History, Culture and Tourism, Jiangsu Normal University, Xuzhou, China

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ABSTRACT

Stargazing tourism has recently gained more academic attention. However, whether destinations are willing to develop this market largely depends on if stargazing tourism can become a sustainable competitive advantage for them. This study explores this important issue from the perspective of tourists. Based on the theories of peak experiences and conservation of resources, this study proposed a two-stage mediation model to examine how stargazing positively affects tourists' revisit and recommend intentions. Through two surveys, the study found that stargazing is positively related to tourists' revisit and recommend intentions. The positive relationship is mediated jointly through peak experiences and stress. The variable 'peak experiences' is the first-stage mediator, and the variable 'stress' is the second-stage mediator. In addition, the study also finds that the two-stage mediation is unique to stargazing tourism compared to other forms of leisure tourism (e.g. city sightseeing tourism). The findings of this study show the mechanism of how stargazing tourism positively influences tourists' perceptions and behavioral intentions. These findings show that stargazing tourism is valuable and inimitable from the perspective of tourists. Thus, developing stargazing tourism will create sustainable competitive advantages for destinations with rare starry night skies from the perspective of a resource-based view. This study reveals the academic and practical value of stargazing tourism. The findings of the study indicate the importance of reconsidering the effects of different forms of tourism. The study also has important implications for the development of stargazing tourism in areas with clear starry night skies.

1. Introduction

Stargazing tourism, or star-watching tourism, refers to people's visits to a place free from artificial light pollution to observe nocturnal celestial phenomena, e.g. the Milky Way, a meteor shower, a comet, or auroras. Although stargazing tourism has existed for a long time, it has only recently been viewed as a subset of ecotourism or special interest tourism (Farajirad & Beiki, 2015). Due to the influence of artificial light pollution, starry night skies that are visible to the naked eye are becoming rare (Gallaway, 2010; Mitchell & Gallaway, 2019). Compared to decades ago, people are increasingly paying attention to the importance of dark skies (Culesza, Le, Littlejohn, & Hollenhorst, 2013; Rodrigues, Rodrigues, & Peroff, 2015; Simpson & Hanna, 2010). These changes provide opportunities for the development of stargazing tourism (Collison & Poe, 2013; Mitchell & Gallaway, 2019).

Recently, scholars have begun paying attention to stargazing tourism. Some scholars have discussed the overview and prospect of stargazing tourism (Soleimani, Bruwer, Gross, & Lee, 2019; Weaver, 2011), whereas others have introduced the development of astronomical tourism at specific destinations (Collison & Poe, 2013; Mitchell & Gallaway, 2019; Rodrigues et al., 2015). An increasing number of works have introduced methods to measure the quality of dark skies for stargazing tourism (Sánchez-Medina, Alonso-Hernández, & Voltes-Dorta, 2019; Wei, Chen, Xiu, Yu, & Liu, 2019; Yuna & Premadi, 2018). Recently, Mitchell and Gallaway (2019) showed the impact of stargazing-related tourism on economic growth in the Colorado Plateau. Although existing studies show the bright prospects of stargazing tourism, this tourism market is still not well developed. Whether stargazing can be a sustainable competitive advantage for destinations is an important issue for the future development of this niche market. Based on Rothaermel's (2012) resource-based view, only when stargazing tourism is valuable, rare, and inimitable is it worth developing.

The success of a tourism product depends largely on being recognized by consumers. For stargazing tourism, stargazing tourists usually have high levels of satisfaction and strong revisit and recommend intentions. The reason for this phenomenon requires further exploration.

Exploring why this phenomenon exists will reveal the value of stargazing tourism to tourists. In addition, this study seeks to examine if traditional forms of tourism have similar effects on tourists. Exploring this topic will determine whether the effects of stargazing tourism are inimitable compared to traditional tourism. Since scholars have already pointed out that starry night skies are becoming rarer (Gallaway, 2010; Mitchell & Gallaway, 2019), answering the two abovementioned research questions will not only uncover details about how stargazing tourism influences tourists but also reveal whether stargazing tourism can be a sustainable competitive advantage for destinations. This study will also provide valuable suggestions for developing stargazing tourism, as well as other forms of astronomical tourism and ecotourism.

2. Stargazing tourism and starry night skies

2.1. Astronomical tourism and stargazing tourism

Compared to stargazing tourism, the scope of astronomical tourism is wider. Astronomical tourism, or astrotourism, refers to people's interest in visiting places to observe and enjoy celestial phenomena (Sánchez-Medina et al., 2019; Soleimani et al., 2019). Stargazing tourism focuses more on nocturnal natural phenomena observations, e. g. the Milky Way and meteor showers. However, astronomical tourism also includes observations of diurnal and crepuscular phenomena, e.g. solar eclipses and sunrises (Weaver, 2011).

This study will focus on exploring the effects of stargazing instead of astronomical tourism on tourists. The reason for this is that starry night skies are relatively stable compared to diurnal astronomical phenomena. For example, although a solar eclipse will attract many tourists, it cannot be the characteristic of a particular destination because the location at which an eclipse occurs is different each time. However, destinations that have starry night skies can develop stargazing tourism. Thus, stargazing can be the specialty brand of a destination.

2.2. Starry night skies as a resource

Stargazing tourism relies on starry night skies (Sánchez-Medina et al., 2019; Soleimani et al., 2019; Wei et al., 2019). According to the resource-based view (Barney, 1991), a resource is worth developing for an origination only when it has four attributes, namely, when it is valuable, rare, imperfectly imitable, and cannot be equivalent substituted. Rothaermel (2012) further developed this idea by proposing the value, rarity, inimitability, and organization (VRIO) analysis framework. The VRIO framework analyzes whether a resource has the potential to be an organization's sustainable competitive advantage.

According to the VRIO framework, a resource can develop into an organization's sustainable competitive advantage when it is (a) valuable, which means that it provides development opportunities or neutralizes threats for a firm; (b) rare compared to competitors; (c) inimitable by or nonsubstitutable for others; and (d) explored by the organization that owns it. This framework is also applicable for stargazing tourism development analysis since stargazing tourism relies on an important resource, namely, starry night skies (e.g. Mitchell & Gallaway, 2019; Wei et al., 2019).

2.2.1. Valuable

Starry night skies have various values (Gallaway, 2010). For example, each constellation and planet has its own legend. Recognizing different constellations and planets has both educational and cultural-symbolic values. Night skies also have great recreational and spiritual values (Gallaway, 2010). Starry night skies are romantic, mystical. Skies may be the best thing in the world for spiritual inspiration (Gallaway, 2010). Starry night skies also have economic value. Through a case study of the Colorado Plateau, Mitchell and Gallaway (2019) found that stargazing-related tourism makes a great contribution to local economics. It is estimated that nonlocal stargazing tourists will spend nearly $5.8 billion from 2015 to 2024 within the Colorado Plateau. This will also create more than 110,000 additional jobs for the region.

2.2.2. Rare

Although night skies are shared globally, light pollution in the process of urbanization has made high-quality views of starry skies rare. Most astronomical objects are no longer visible to the naked eye to urban dwellers (Gallaway, 2010). Statistics have found that the Milky Way is invisible to 80% of North Americans from home (Mitchell & Gallaway, 2019), and more than 75% of China is subject to light pollution (Wei et al., 2019). In addition, destinations that are best for stargazing tourism have many other requirements, such as high elevation, vast amounts of space, and average annual cloud coverage (Collison & Poe, 2013). These restrictions make the starry night sky a scarce resource.

2.2.3. Organization exploration

Many international organizations have paid attention to the preservation of night skies. Among them, the International Dark Sky Association (IDA) is the first and largest organization within the dark-sky movement (Wei et al., 2019). IDA offers five types of dark sky designations: International Dark Sky Communities, International Dark Sky Parks, International Dark Sky Reserves, International Dark Sky Sanctuaries, and Urban Night Sky Places. By the end of 2020, more than 150 places had been designated by IDA. Some scholars have also provided suggestions for measuring night sky quality to develop stargazing, as well as other forms of astronomical tourism (e.g. C-Sánchez, Sánchez-Medina, Alonso-Hernández, & Voltes-Dorta, 2019; Wei et al., 2019; Yuna & Premadi, 2018).

Some destinations with high-quality night skies have carried out stargazing tourism. Bryce Canyon National Park (BCNP) in the southwestern United States has developed many astronomy and dark sky evening programs with which to serve visitors (Collison & Poe, 2013). Approximately 10% of the visitors to BCNP participate in these programs. The Colorado Plateau, which is known for its starry night skies, also attracts many stargazing tourists every year (Mitchell & Gallaway, 2019).

Existing studies have shown that starry night skies are valuable and rare, which makes stargazing tourism a potential market (Mitchell & Gallaway, 2019; Rodrigues et al., 2015). However, few studies have explored whether stargazing is a valuable experience for tourists. In addition, few studies have tested whether the stargazing experience is inimitable by traditional leisure tourism. The two research questions mentioned previously in the introduction section will provide support to show that stargazing tourism is valuable and inimitable from the perspective of tourists.

3. Hypothesis development

3.1. Stargazing and behavioral intentions

Stargazing tourism relies on a clear night sky. The starry night sky is nearly invisible for city citizens. Many young people have not even seen the beauty of the night sky (Collison & Poe, 2013). Stargazing tourism provides tourists the opportunity to embrace the starry sky, meteor showers, and other phenomena. These experiences are extraordinary and memorable for most tourists, and scholars find that memorable experiences positively affect tourists' revisit intention (e.g. Jeong & Shin, 2019; Kim, 2017). If the destination image is good, satisfied tourists will have the intention to revisit and recommend that others visit (e.g. Afshardoost & Eshaghi, 2020; Kim, 2017; Scarpi, Mason, & Raggiotto, 2019; Stylos & Bellou, 2018). For stargazing tourists, richer tourism experiences are associated with stronger effects of stargazing on their revisit and recommend intentions. Therefore, stargazing tourism should have a positive effect on tourists' revisit and recommend intentions. Thus, the following hypothesis is proposed:

Hypothesis 1: Stargazing is positively related to tourists' revisit and recommend intentions.

3.2. The mediating effect of peak experiences

Peak experiences are "moments of highest happiness and fulfillment" (Maslow, 1964, p. 45). According to Maslow's (1943) hierarchy of needs, peak experience plays an important role in people who have self-actualization needs. When the highest level of need is satisfied, self-actualizers will have momentary peak experiences. While having peak experiences, people transcend their ordinary reality and perceive an ultimate reality. They reach truth, beauty, goodness, wholeness, and other being values when experiencing peak experiences (Mathes, 1982). Although having frequent peak experiences is a characterization of self-actualization, peak experiences are not restricted to self-actualizers. According to Maslow (1972), most individuals also have peak experiences, e.g. moments in a completely peaceful state or a state in which consciousness seems to be beyond the limitations of time and space (Travis, Harung, & Lagrosen, 2011). The difference between self-actualized individuals and other people is that self-actualizers will experience more peak experiences.

It is worth noting that in the tourism research field, there is a different concept, namely, 'peak touristic experiences' (e.g. Quan & Wang, 2004; Volo, 2009). Quan and Wang (2004) argued that travel experiences are in sharp contrast or opposing to daily experiences. They defined tourists' peak touristic experiences as "a way to experience something different from their daily lives" (Quan & Wang. 2004, p. 298). A peak touristic experience is an experience with maximum intensity, or a most memorable experience, e.g. novel food experiences, visiting a major attraction (Hung, Lee, & Huang, 2014; Kolar, 2017; Komppula & Gartner, 2013; Stienmetz, Kim, Xiang, & Fesenmaier, 2020). Meanwhile, other experiences support such experiences, e.g. sleeping. The concept of peak touristic experiences is different from the 'peak experiences' examined in this study.

Although peak experiences have been criticized as being impractical (e.g. Wahba & Bridwell, 1976), they now comprise a well-accepted concept (e.g. Jirásek & Hanuš, 2020; Sheldon, 2020). Peak experiences make people see things from a nonutilitarian perspective instead of considering how things are related to human concerns. People are unmotivated and impersonal in such moments. Although peak experiences are momentary, they are impressive. Scholars have found that immersive experiences in nature are a common way to generate peak experiences (Sheldon, 2020). For example, during a spiritual tour to the Sahara Desert, tourists have peak experiences such as feelings of achievement or peace of mind (Moufakkir & Selmi, 2018). Dog sledding in the immense Arctic wilderness could also generate peak experiences for tourists who enjoy this activity (Lindberg, Hansen, & Eide, 2014). Tourists also obtain peak experiences in adventure tourism (Buckley, 2012). Tourists who are keen on adventure tourism seek peak experiences instead of risks during adventures in nature (Jirásek & Hanuš, 2020; Pomfret, 2006; Weber, 2001).

For stargazing tourism, immersion in the night skies connects tourists' souls to nature (Sheldon, 2020). Scholars have found that people are more likely to have peak experiences when resting and in natural or wilderness environments (Pearce, 2017; Travis et al., 2011). Thus, stargazing can easily generate peak experiences among tourists. The more times a tourist partakes in stargazing tourism, the more likely the person will be to have peak experiences. Peak experiences are meaningful and unforgettable. People want to reexperience these desirable moments when they recall peak experience memories (Maslow, 1964). Thus, if tourists have peak experiences during stargazing tourism, these remarkable experiences will further influence their revisit and recommend intentions. For tourists with a higher level of peak experiences, the influence will be stronger. Thus, the following hypothesis is proposed:

Hypothesis 2: Tourists' peak experiences mediate the relationship between stargazing and their revisit and recommend intentions.

3.3. The mediating effect of stress

Tourism is a way to reduce stress and gain happiness (Chen, Petrick, & Shahvali, 2016; Jordan, Spencer, & Prayag, 2019; Zhu, Gao, Zhang, & Jin, 2020). Conservation of resources theory is a model of how people view and deal with stress (Hobfoll, 1989). According to the theory, people will strive to retain, protect, and build resources that they value. Self-esteem, status, positive affections, and a relationship can all be resources that people value. If someone experiences the potential or actual loss of these valuable resources, then this person will feel stressed. People are not simply passive in dealing with stress. To relieve or prevent stress, people will strive to retain, protect, and build the resources that they value. Generally, people will expect positive and/or different experiences through tourism. These experiences are also valuable resources that can be used to fight stress. According to the theory, stargazing tourism and other forms of tourism offer two ways of reducing and preventing stress.

First, for stressed tourists, tourism is a replacement resource to offset the stress they suffer from life or work. Such replacement is the most direct way of reducing stress (Hobfoll, 1989). Stargazing tourism provides an experience that people cannot get from city life or other forms of tourism. Therefore, the different experience of stargazing tourism is a valuable replacement for tourists' stress. Second, for tourists with no significant stress, according to conservation of resources theory, people will "strive to develop resource surpluses in order to offset the possibility of future loss" (Hobfoll, 1989, p. 517). Thus, unstressed tourists can enrich their resources through stargazing tourism that will reduce the potential stress level that may occur in the future. Therefore, for both stressed and unstressed tourists, stargazing tourism lowers stress levels, and the more tourists partake in stargazing tourism, the lower their levels of stress will be.

A lower level of stress contributes to a series of positive outcomes, e. g. higher positive but lower negative emotions (Jordan et al., 2019). According to conservation of resources theory, when partaking in stargazing tourism effectively relieves tourists' stress or accumulated their resources to deal with future stress, they have more intentions to repeat the behavior. The lower their stress becomes, the stronger their revisit and recommend intentions will be. Therefore, the following hypothesis is proposed:

Hypothesis 3: Tourists' stress mediates the relationship between stargazing and their revisit and recommend intentions.

3.4. Two-stage mediation of stargazing's effect on behavioral intentions

Scholars find that peak experiences relieve stress (Maslow, 1972) and make people psychologically healthier (Mathes, 1982). Peak experiences also change people's view of life in a positive direction (Maslow, 1959, 1964). According to conservation of resources theory, peak experiences are the resources people need to relieve stress, so peak experiences during a tour also relieve tourists' stress. The stronger peak experiences are, the lower the stress level will be. Based on hypotheses 2 and 3, peak experiences and stress should jointly mediate the relationship between stargazing tourism and tourists' revisit and recommend intentions. Stargazing tourism first generates tourists' peak experiences. Peak experiences further lower tourists' stress, and a lower stress level increases tourists' revisit and recommend intentions. Based on the theories of peak experiences and conservation of resources, peak experiences and stress are two-stage mediators of the influence of stargazing tourism on tourists' revisit and recommend intentions. Of them, the variable 'peak experiences' is the first stage mediator and the variable 'stress' is the second stage mediator. Consequently, the following hypothesis is proposed:

Hypothesis 4: Stargazing has a positive indirect effect on tourists' revisit and recommend intentions, mediated jointly through peak experiences (the first stage mediator) and stress (the second stage mediator).

The research model is shown in Fig. 1.

4. Method

4.1. Study 1

4.1.1. Sample

In recent years, people's enthusiasm for stargazing and other kinds of astronomical tourism has gradually increased in China. Ali in Tibet has built the first dark sky park in China, which covers an area of 2500 square kilometers. According to the 2019 Astronomical Tourism Report of China issued by the Trip.com Group, the number of astronomical tourism products provided on Trip.com had increased 50%, and the number of astronomical tourism bookings had increased 60% compared to the previous year in China. The most famous stargazing and astronomical tourism destinations include the Five-hundred-meter Aperture Spherical Radio Telescope (FAST) in Guizhou, Qinghai Lake, Daocheng Yading in Sichuan, etc (China Daily, 2019). Tourists from two stargazer groups on the social networking software 'QQ' who had previously experienced stargazing tourism were invited to participate in the current study from May 15, 2020, to June 12, 2020. The group members were from areas around China. Many of them enjoyed traveling to places with clear night skies. They were invited to participate voluntarily in the online survey. The participants were told that this survey aimed to investigate their travel and life experiences over the past year. First, the definition of stargazing tourism was shared with the participants. The question 'According to the definition of stargazing tourism, have you ever partaken in this form of tourism?' was used to identify whether the participants had stargazing tourism experiences. Only those who had stargazing tourism experiences were able to finish the survey. In sum, 208 valid questionnaires were collected. Table 1 shows the demographic statistics of the sample.

4.1.2. Measures

Stargazing. The times for the tourists' stargazing experiences were collected. Participants responded to the question 'How many times have you participated in stargazing tourism?' using a rating scale that ranged from 1 (1–2 times) to 5 (more than 8 times).

Peak experiences were measured using the 'peak experiences scale' (Travis et al., 2011). Participants were asked to evaluate to what extent they experienced the specified feelings when stargazing (e.g. During the tourism, did you experience a completely peaceful state?). Participants responded to 3 items using a rating scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

Stress was measured using the 'stress as threat scale' (Roesch & Rowley, 2005). Participants were asked to evaluate how they generally think and feel when encountering a stressful event. Participants responded to 5 items (e.g. I perceive stress as threatening) using a rating scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

Revisit and recommend intentions were measured using the 'behavioral intentions scale' (Fu, Ye, & Xiang, 2016). Participants responded to the items (e.g. I would recommend this destination to others.) using a rating scale that ranged from 1 (strongly disagree) to 5 (strongly agree).
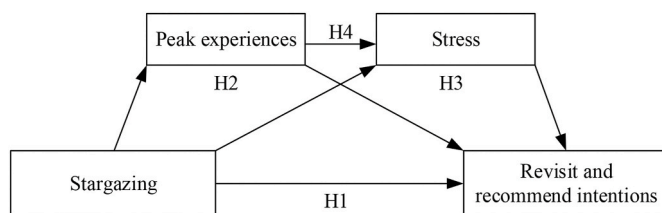

Fig. 1. The two-stage mediation model of the effects of stargazing tourism on tourists' behavioral intentions.

Table 1
Demographic statistics of the samples in study 1.

Variables		Frequency	Percent %
Gender	Male	129	62.02
	Female	79	37.98
Age	18–29	71	34.13
	30–44	94	45.19
	45–59	43	20.67
Monthly Income	¥0 - ¥4999	27	12.98
	¥5000- ¥9999	80	38.46
	¥10,000 - ¥14,999	63	30.29
	¥15,000 - ¥19,999	25	12.02
	¥20,000 and more	13	6.25
Education	High school diploma or GED	8	3.85
	College certificate	88	42.31
	Bachelor's degree	89	42.79
	Master's degree	20	9.62
	Doctoral degree	3	1.44

Control variables. Demographic information including participants' gender, age, monthly income, and education were collected as control variables.

4.1.3. Results

Common method variance (CMV) refers to the presence of the spurious correlation between two variables, which is caused by a common third variable when these variables are measured by the same method. CMV is an important issue that needs attention in self-reported surveys. An unmeasured latent common methods factor was used to assess the presence of CMV (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Through the comparison of values of the comparative fit index (CFI), the difference between the CFI was shown to be less than the suggested 0.05 threshold (Little, 1997). These results suggest that CMV was not a serious problem for the study's validity.

Table 2 shows the descriptive statistics of the sample in study 1. Hayes's regression process was used to test the hypotheses (Hayes & Cai, 2007). Breusch-Godfrey serial correlation LM tests showed that the residuals were not autocorrelated for the regressions. As shown in Table 2, the values of the Cronbach's α and the composite reliability (CR) were all no less than 0.80, suggesting that the scales had relatively high internal consistency. The values of the average variance extracted (AVE) were all more than 0.50, suggesting that the scales had relatively high convergent validity. In all tables, the symbol * means p < 0.05, ** means p < 0.01, *** means p < 0.001.

Table 3 shows the results of the regressions. In Steps 1 and 4, Table 3, the variable 'revisit and recommend intentions' was used as the dependent variable. In Step 2, Table 3, the variable 'peak experiences' was used as the dependent variable. In Step 3, Table 3, the variable 'stress' was used as the dependent variable. Table 4 shows the total, direct, and indirect effects of stargazing on revisit and recommend intentions. Boot SE represents the bootstrap standard error. Boot LLCI represents the lower-level bootstrap confidence interval. Boot ULCI represents the upper-level bootstrap confidence interval.

As shown in Step 1, Table 3, stargazing has a significant positive relationship with revisit and recommend intentions (B = 0.36, t = 10.49, p < 0.001). Hypothesis 1 is supported. As shown in Step 2, Table 3, stargazing has a significant positive relationship with tourists' peak experiences (B = 0.32, t = 13.99, p < 0.001). As shown in Step 4, Table 3, peak experiences have a significant positive relationship with tourists' revisit and recommend intentions (B = 0.67, t = 6.81, p < 0.001). Moreover, as shown in Table 4, the indirect effect of stargazing on tourists' revisit and recommend intentions through peak experiences is significant (Boot LLCI = 0.13, Boot ULCI = 0.30, both greater than 0). These results indicate that peak experiences have a significant mediating effect on the relationship between stargazing and tourists' revisit and recommend intentions. Hypothesis 2 is supported.

As shown in Step 3, Table 3, stargazing is negatively related to

Table 2
Descriptive statistics of the sample in study 1.

		Mean	SD	Cronbach	AVE	CR	Correlations (*p < 0.05; **p < 0.01)						
				α			1	2	3	4	5	6	7
1	Gender	–	–	–	–	–							
2	Age	2.87	0.73	–	–	–	−0.10						
3	Monthly Income	3.60	1.06	–	–	–	0.01	0.06					
4	Education	3.63	0.77	–	–	–	0.05	−0.21**	0.15*				
5	Stargazing	2.35	1.27	–	–	–	0.02	−0.07	0.15*	0.13			
6	Peak experiences	3.74	0.56	0.90	0.76	0.90	0.03	−0.03	0.13	0.02	0.70**		
7	Stress	2.76	0.60	0.93	0.73	0.93	−0.01	0.04	−0.07	−0.01	−0.61**	−0.59**	
8	Revisit and recommend intentions	3.95	0.77	0.80	0.67	0.80	−0.01	0.06	0.15*	−0.01	0.59**	0.69**	−0.54**

Table 3
Results of regressions.

Independent variables	Step 1		Step 2		Step 3		Step 4		
	B	t	B	t	B	t	B	t	VIF
Constant	2.92	8.40***	3.06	13.58***	4.23	11.93***	1.54	2.83**	
Gender	−0.01	−0.10	0.03	0.44	0.01	0.16	−0.03	−0.33	1.01
Age	0.09	1.54	0.01	0.13	0.01	0.12	0.09	1.73	1.07
Monthly Income	0.05	1.26	0.02	0.69	0.01	0.34	0.04	1.13	1.05
Education	−0.07	−1.28	−0.05	−1.35	0.03	0.74	−0.03	−0.59	1.10
Stargazing	0.36	10.49***	0.32	13.99***	−0.19	−5.23***	0.09	2.07*	2.32
Peak experiences					−0.32	−4.06***	0.67	6.81***	2.17
Stress							−0.21	−2.50*	1.73
R square	0.37		0.50		0.42		0.53		
F	23.74***		40.67***		24.57***		32.01***		

Table 4
Total, direct, and indirect effects of stargazing on revisit and recommend intentions.

		Effect	Boot SE	Boot LLCI	Boot ULCI
Total effect	Stargazing- > Revisit and recommend intentions	0.37	0.04	0.30	0.44
Direct effect	Stargazing- > Revisit and recommend intentions	0.09	0.05	0.00	0.18
Indirect effect	Stargazing- > Peak experiences- > Revisit and recommend intentions	0.21	0.04	0.13	0.30
	Stargazing- > Stress- > Revisit and recommend intentions	0.04	0.02	0.01	0.08
	Stargazing- > Peak experiences- > Stress- > Revisit and recommend intentions	0.02	0.01	0.00	0.04

tourists' stress (B = −0.19, t = −5.23, p < 0.001). Step 4, Table 3 shows that stress has a significant negative relationship with tourists' revisit and recommend intentions (B = −0.21, t = −2.50, p < 0.05). In addition, as shown in Table 4, the indirect effect of stargazing on tourists' revisit and recommend intentions through stress is significant (Boot LLCI = 0.01, Boot ULCI = 0.08, both greater than 0). These results indicate that stress has a significant mediating effect on the relationship between stargazing and tourists' revisit and recommend intentions. Hypothesis 3 is supported. As shown in Table 4, the indirect effect of stargazing on tourists' revisit and recommend intentions through peak experiences and stress is significant (Boot LLCI = 0.00, Boot ULCI = 0.04). Hypothesis 4 is supported.

4.1.4. Summary

Study 1 provides support for the two-stage mediation model of the effects of stargazing tourism on tourists' behavioral intentions. The study finds that the relationship between stargazing and tourists' revisit and recommend intentions is mediated jointly through their peak experiences and stress. However, it is important to further explore another

question, whether the two-stage meditation model can be used to distinguish stargazing tourism and traditional types of tourism. Therefore, an additional survey was carried out to answer the question mentioned above.

4.2. Study 2

4.2.1. Research ideas

The idea of confirming and disconfirming sampling (Suri, 2011) was used to explore whether the two-stage meditation model can be used to distinguish stargazing tourism and traditional types of tourism. Confirming cases are samples that fit a specific research model. Disconfirming cases are samples that do not fit a specific research model (Patton, 2002). Making comparisons between confirming and disconfirming cases is "a way of placing boundaries around confirmed findings" (Patton, 2002, p. 239). In this study, stargazing tourism is considered the confirming case, while city sightseeing tourism is chosen as the disconfirming case because it is one of the most common forms of traditional tourism. If the two-stage meditation model does not apply to city sightseeing tourism, then stargazing tourism should be inimitable to a large extent.

To compare whether stargazing and city sightseeing have different effects on people's peak experiences and stress, a new dummy variable, 'stargazing experience', was constructed. Those who did not have stargazing experience were coded as 0 (the sample from study 2 was used as the city sightseeing group). Those who had stargazing experiences were coded as 1 (the sample from study 1 was used as the stargazing group).

A regression analysis (as shown in Formula 1) was used to test whether the effects of stargazing experience and city sightseeing were different. The formula is as follows:

Formula 1 : *Revisit and recommend intentions* $= B_1 + B_2 * Gender + B_3 * Age + B_4 * Monthly Income + B_5 * Education + B_6 * Peak experiences + B_7 * Stress + B_8 * Stargazing experience + B_9 * (Peak experiences * Stargazing experience) + B_{10} * (Stress * Stargazing experience).$

B_i (i = 1 to 10) is the coefficient. *Peak experiences * Stargazing experience* is the interaction of the variables of 'peak experiences' and 'stargazing experience'. *Stress * Stargazing experience* is the interaction of the

variables 'stress' and 'stargazing experience'.

For stargazing tourism (Stargazing experience = 1), the formula is as follows:

Formula 2 : *Revisit and recommend intentions*= $(B_1 + B_8) + B_2 * Gender + B_3 * Age + B_4 * Monthly\ Income + B_5 * Education + (B_6 + B_9) * Peak\ experiences + (B_7 + B_{10}) * Stress.$

For city sightseeing tourism (Stargazing experience = 0), the formula is as follows:

Formula 3 : *Revisit and recommend intentions* $= B_1 + B_2 * Gender + B_3 * Age + B_4 * Monthly\ Income + B_5 * Education + B_6 * Peak\ experiences + B_7 * Stress.$

For stargazing and city sightseeing tourism to be seen as having similar effects on tourists' peak experiences, stress, and revisit and recommend intentions, then the coefficients of B_8, B_9, and B_{10} must be nonsignificant. Only under this situation will the two-stage meditation model not be a unique feature of stargazing tourism. Alternatively, the effects of stargazing and city sightseeing on tourists can be considered as different when the coefficients of B_8, B_9, and B_{10} are significant.

4.2.2. Samples

An online survey of tourists who had no stargazing tourism experience was conducted. The study chose city sightseeing as an example of traditional tourism. The study asked the people who participated in study 1 to voluntarily invite their friends who had no stargazing experiences to participate in the survey from June 15 to 26, 2020. To ensure that the participants did not have stargazing tourism experiences, the definition of stargazing tourism was provided at the beginning of the survey. The question 'According to the definition of stargazing tourism, have you ever partaken in this form of tourism?' was used to identify whether the participants had any stargazing tourism experiences. Only these who chose the answer 'No' were able to continue participating in the survey. Ultimately, 81 valid samples were obtained. The sample size was sufficient for the study because it is more than 10 times the number of the variables in the study. Table 5 shows the demographic statistics of the samples in study 2.

4.2.3. Measures

Stargazing. Because all valid samples had no stargazing experience, stargazing was coded 0 for each sample. Peak experiences, stress, revisit and recommend intentions were collected through the same scales used in study 1. Of them, peak experiences were measured by asking participants to evaluate their peak experiences during a city sightseeing tour. The same control variables were also collected.

4.2.4. Results

The data collected in study 1 were also used to test the research question regarding whether the two-stage mediation model reflected the

feature of stargazing tourism. Thus, the total sample size is 289. The variable stargazing was coded as 1 for each sample collected in study 1. Therefore, the variable 'stargazing experience' was coded as a dummy variable.

An unmeasured latent common methods factor was also used to test the common method variance. The results showed that CMV was not a serious problem for the validity of study 2. A liner regression was used to test the research question. The variable 'revisit and recommend intentions' was used as the dependent variable. The variables 'peak experiences and stress' were centralized before further analysis, and the interactions of stargazing experience with peak experience and stress were calculated separated as new variables. Breusch-Godfrey serial correlation LM tests also showed that the residuals were not auto-correlated for the regressions. Table 6 shows the results of the regression to test the differences between stargazing and city sightseeing tours.

As shown in Table 6, the interaction of peak experiences and stargazing experience has a significant positive relationship with tourists' revisit and recommend intentions (B = 0.68, t = 4.14, p < 0.001). This result indicates stargazing tourism (stargazing = 1) and city sightseeing tourism (stargazing = 0) have different effects on tourists' peak experiences. Tourists' peak experiences of stargazing tourism are 0.68 higher than city sightseeing. Similarly, stargazing tourism and city sightseeing tourism have different effects on tourists' stress. The stress of tourists who partook in stargazing tourism is 0.32 lower than those who did not (t = −1.98, p < 0.05).

Moreover, when using the samples of study 2 (city sightseeing tourism) to test the effects of peak experience and stress on tourists' revisit and recommend intentions, the results show that the regression model is not significant (F = 1.77, p > 0.05). In addition, the coefficients of the variables of 'peak experiences' and 'stress' are both nonsignificant. This means that for city sightseeing tourists, the effects of peak experiences and stress on their revisit and recommend intentions are both nonsignificant. This outcome indicates that city sightseeing tourism can neither generate peak experiences nor relieve tourists' stress levels significantly.

4.2.5. Summary

The results of study 2 provide the support that stargazing tourism and traditional types of tourism (e.g. city sightseeing in this study) have different effects on tourists' peak experiences and stress. Stargazing tourism should be more efficient in generating tourists' peak experiences and reducing their stress. These findings reveal the unique value of stargazing tourism and will be further discussed in the following section.

5. Discussion

Through two surveys, this study explored how stargazing tourism affects tourists' behavioral intentions. Specific findings are as follows:

Table 5
Demographic statistics of the samples in study 2.

Variables		Frequency	Percent %
Gender	Male	36	44.40
	Female	45	55.60
Age	18–29	29	35.80
	30–44	31	38.27
	45–59	18	22.22
	≥ 60	3	3.70
Monthly Income	¥0 - ¥4999	8	9.88
	¥5000- ¥9999	26	32.10
	¥10,000 - ¥14,999	33	40.74
	¥15,000 - ¥19,999	11	13.58
	¥20,000 and more	3	3.70
Education	High school diploma or GED	8	9.88
	College certificate	22	27.16
	Bachelor's degree	33	40.74
	Master's degree	9	11.11
	Doctoral degree	9	11.11

Table 6
Results of the regression to test the differences between stargazing and city sightseeing tourism.

Variables	B	t	VIF
Constant	3.24	8.04***	
Gender	−0.17	−1.87	1.04
Age	0.14	2.34*	1.11
Monthly Income	0.06	1.43	1.05
Education	0.07	1.21	1.14
Stargazing experience	−0.31	−1.77	3.08
Peak experiences	0.10	0.85	5.81
Stress	0.05	0.43	3.00
Peak experiences × Stargazing experience	0.68	4.14***	3.57
Stress × Stargazing experience	−0.32	−1.98*	3.26
R square	0.31		
F	13.93***		

5.1. Theoretical contributions

First, based on theories of peak experiences and conservation of resources, this study builds a two-stage mediation model to explain why stargazing tourists generally have strong revisit and recommend intentions. Findings from study 1 show that stargazing's effects on tourists' revisit and recommend intentions are jointly mediated by tourists' peak experiences and stress. According to the model, stargazing is positively related to tourists' peak experiences. Peak experiences further relieve tourists' stress. A lower level of stress contributes to stronger revisit and recommend intentions. Existing studies have discussed the relationship between either tourism and peak experiences or tourism and stress (e.g. Jordan et al., 2019; Moufakkir & Selmi, 2018). This study shows that peak experiences and stress are also related. These findings contribute to a better understanding of stargazing tourism's positive effects on tourists. These findings provide support that stargazing tourism is valuable from the perspective of tourists.

Second, the study finds that the effects of stargazing tourism and other leisure tourism (e.g. city sightseeing) on tourists' behavioral intentions are different. Through the comparison between stargazing and city sightseeing, the study finds that stargazing tourists reported a significantly higher level of peak experiences and a lower level of stress. Findings from study 2 show that the two-stage mediation model is a unique feature of stargazing tourism compared to traditional leisure tourism. These findings provide support that stargazing tourism is inimitable by other forms of leisure tourism. Because stargazing tourism has only been viewed as a type of eco-tourism or interest-oriented tourism (Farajirad & Beiki, 2015), its effects have been ignored. This study shows that the effects of stargazing tourism require more academic attention.

5.2. Practical implications

Findings of this study show that stargazing tourism is valuable and inimitable from the perspective of tourists. Besides, high night sky quality is required to develop astronomical tourism (C-Sánchez et al., 2019). Existing studies have shown the resources for developing stargazing tourism (clear night skies) are scarce. Only for destinations with less light pollution are suitable for stargazing tourism. For example, according to a study on the dark sky reserves (DSR) in China, Wei et al. (2019) find that less than 13% of the territory is suitable for DSR construction. Thus, based on Rothaermel (2012) VRIO analysis framework, stargazing tourism will become a sustainable competitive advantage if the destinations that own the resource are willing to develop it. Stargazing tourism provides an ecotourism development opportunity for remote areas with clear night skies. Homestays and eco-hotels can provide accommodations for stargazers. Local economic income will increase through developing stargazing tourism (Mitchell & Gallaway, 2019). Moreover, given the influence of COVID-19, many people would like to partake in less crowded tourism. This provides a development opportunity for stargazing tourism to attract more tourists in the post-COVID-19 period. In addition, stargazing tourism is also a way to foster people's interests in space tourism (Spennemann, 2007).

Stargazing tourism has differentiated competitive advantages compared to traditional leisure tourism. It generates peak experiences and relieves tourists' stress, factors that can be its promotional highlights. Stargazing tourism is also different from other tourism forms that can generate peak experiences (e.g. desert tourism, peak climbing tourism). Compared to these tourism forms, stargazing is one type of leisure travel. It does not require tourists to have a strong will or physique. The target market for stargazing tourism is broader.

Although stargazing tourism is attractive and of great perspective, it must still overcome several difficulties. First, tourism resource combinations are important in developing stargazing tourism (Collison & Poe, 2013; Soleimani et al., 2019; Wei et al., 2019). An attractive landscape will increase the competitiveness of a stargazing destination. Second,

places suitable for stargazing tourism development are generally in remote places. Traffic conditions need to be considered (Wei et al., 2019). Therefore, although the night sky quality may not be as good in some places, stargazing tourism is still a good choice for destinations in the outer suburbs of cities or rural areas.

5.3. Limitations and future research directions

Given the theoretical and practical contributions, the study has several limitations that need to be further explored. First, tourists' needs were not considered in this study. For example, tourists with a relatively high level of work and life stress may have a stronger need to relieve stress from stargazing tourism. Thus, the mediating effect of stress may be stronger. In the future, the moderating effect of tourists' needs can be explored. Second, although other forms of tourism can also generate peak experiences, e.g. spirituality desert tourism (Moufakkir & Selmi, 2018) or adventure tourism (Jirásek & Hanuš, 2020), stargazing tourism is more recreational. Thus, the mediating effect of peak experiences should be different. In the future, scholars could compare the different effects of these tourism forms on tourists' peak experiences, stress, and behavioral intentions. Third, developing stargazing tourism will increase human activities and infrastructure constructions. This will destroy the clear night sky resource that stargazing tourism relies on to some extent. Addressing the contradiction in stargazing tourism development requires further exploration.

6. Conclusion

Based on the theories of peak experiences and conservation of resources, this study builds a two-stage mediation model to examine how stargazing tourism influences tourists' behavioral intentions. The study findings show that peak experiences and stress jointly mediate the relationship between stargazing and tourists' behavioral intentions. Through a comparison between stargazing and city sightseeing, the study also finds that the two-stage mediation model is unique to stargazing tourism. These findings show that stargazing tourism is valuable and inimitable from the perspective of tourists. In addition, starry skies are becoming rarer. Thus, as the VRIO framework suggests, the development of stargazing tourism will create sustainable competitive advantages for those destinations with starry night skies. Given the bright prospects of stargazing tourism, more academic attention is required to develop this market effectively in the future.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jdmm.2021.100572.

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Tao Li is an associate professor in School of History, Culture and Tourism at Jiangsu Normal University. He received his Ph. D. degree from School of Management, Fudan University. His research interests are tourist behavior, destination management and marketing.