



Development and validation of a tourism fatigue scale

Jinkun Sun, Jin-He Zhang^{*}, Honglei Zhang, Chang Wang, Xiaofang Duan, Min Chen

School of Geography and Ocean Science, Nanjing University, Nanjing, Jiangsu, China

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ABSTRACT

Fatigue is a pervasive physiological and psychological phenomenon in tourism experiences, but remains almost unexplored in the existing literature on tourist perception and behavior. The possible reason for this deficiency is the vagueness of the tourism fatigue concept and the lack of a measurement tool in addition to the influence of the traditional paradigms and ideas of the tourism research. Therefore, the purpose of this study was to develop a scale for measuring tourism fatigue based on its conceptualization. Taking Zhouzhuang Ancient Town and Huangshan Mountain as examples, 926 samples were collected through two rounds of data collection. Following construct definition, initial item production, scale purification, EFA, CFA, reliability and validity testing, a four-dimensional (physical, motivational, affective and cognitive) tourism fatigue model with 16 items was established. This study extends the current knowledge of tourist perceptions and behaviors and provides a tool for further related investigation for academics and managers.

1. Introduction

The high mobility of tourists and the frequent interaction between tourists and destinations in tourism activities will inevitably lead to complex changes in their psychology and physiology (Chen & Li, 2018; Alan & Bob, 2006). Tourists' psychological and physiological states are the main indices used to evaluate the quality of the tourism experience and the important objects of tourism research (H. C. Wu, Cheng, & Ai, 2018). However, under the influence of the value-oriented humanistic research paradigm and positive psychology (Higgins-Desbiolles & Whyte, 2013; Pritchard, Morgan, & Ateljevic, 2011), the current tourism research mainly focuses on the positive states of tourists, including motivation, authenticity, pleasure, sustainability, ethics, justice, poverty alleviation, volunteerism, happiness, welfare, and physical and mental recovery (Filep & Laing, 2018), while the negative states of their physiology and psychology have not received enough attention (Fennell, 2017). The research path of mind-body monism from the perspective of postmodernism shows that the interaction between negative mental and physiological states and positive mental states cannot be ignored (Fennell, 2017). For example, fears of natural disasters, diseases or terrorist attacks are the key factors that interact with tourism motivation, intention and satisfaction (Fennell, 2017). Other factors include horror, tension, anger, and fatigue. Among them, fatigue is a more common complex emotion in tourism activities (Izard, 1991, 2007). Given that attention to the body has become the frontier of some disciplines, such

as sociology, management and geography (Johnston, 2014; Tangenberg & Susan, 2002; Tao, Wang, & Zhu, 2017; Turner, 2007), the influence of aesthetic fatigue and travel fatigue on individual perception and behavior has gradually received scholarly attention (An, Uno, Yang, Liu, & Shiomi, 2012; Li, Cheng, & Xiao, 2018; Zheng, Liao, & Qin, 2017). Therefore, it is particularly important to strengthen the study of tourism fatigue.

Despite the importance of fatigue in the tourism research and from a management perspective, the existing related research is still in its infancy. Fatigue has received great attention in the fields of psychology, behavioristics, sports science, medicine and transportation (Cano, Salazar, & Rodríguez, 2018; Enoka & Duchateau, 2016; Guastello, Corroero, & Marra, 2019; Jason, Evans, Brown, & Porter, 2010; Waldron & Highton, 2014). Since the 1950s, nearly 20,000 papers have been published (English only), and more than 1600 papers were published in 2018. These numbers show the important role of fatigue in the study of human perception and behavior. However, few studies have been performed on tourist fatigue. A possible reason for this deficiency is the vagueness of the tourism fatigue concept and the lack of its measurement tools, in addition to the influence of the traditional paradigms and ideas of the tourism research.

The development of a tourism fatigue scale is an effective means for solving the above problems. Scale development is a quantitative procedure used to determine subjective and abstract concepts, which is conducive to a comprehensive and in-depth understanding of the

^{*} Corresponding author.

E-mail address: zhangjinhe@nju.edu.cn (J.-H. Zhang).

connotations, structure and dimensions of the research object (G. Chen, Bao, & Huang, 2014; G. A. J. Churchill, 1986; J. H. Kim, Ritchie, & McCormick, 2012). It is also a key link in the formation of a knowledge system and the formulation of management decisions. However, the existing fatigue scales in other fields are not suitable for tourism fatigue research. For example, medicine focuses on the relationship between fatigue and disease (Kangas, Bovbjerg, & Montgomery, 2008), psychology focuses on the relationship between fatigue and mental health (Brooks, Chalder, & Rimes, 2017), behavioral science focuses on the relationship between fatigue and human behavior and efficiency (Beckers et al., 2008; Figley, 2002), sports science focuses on the relationship between fatigue and sports performance (Barte, Nieuwenhuys, Geurts, & Kompier, 2017), and transportation science focuses on the relationship between fatigue and traffic safety (Lal & Craig, 2002). The fatigue scales in various fields are clearly targeted focusing on the above core issues, which is reflected in their research purposes, fatigue subjects, fatigue scenarios and fatigue performance. Fatigue in the tourism context is the result of the interaction between tourists and destinations, which are unusual environments to which tourists travel for the purpose of sightseeing, leisure, entertainment, exploration or knowledge-seeking (H. Hu, Zhang, Chu, Yang, & Yu, 2018; Hung & Petrick, 2010; J. H. Kim et al., 2012; Wang, Zhang, Yu, & Hu, 2018). There are significant differences between these specific situations and those of other fields (G. Chen et al., 2014), which are mainly reflected in the sensitivity of tourism motivation and the comprehensiveness of tourism activities (Bello & Etzel, 1985; Chang, Wall, & Chu, 2006; Mitas & Bastiaansen, 2018). Novelty, which is sensitive and changeable, is the core element embedded in all types of tourism motivation (Cohen, 1972; Crompton, 1979; Mitas & Bastiaansen, 2018). As the needs of tourists are gradually met by tourism activities, the corresponding novelty will be weakened (T. H. Lee & Crompton, 1992). In addition, the comprehensive manifestations of tourism activities are that tourists are required to spend much time and energy arranging and implementing their needs in terms of catering, accommodations, transportation, recreation, shopping and entertainment, which involve physical aspects, motivation, affection, emotion, and cognition (Jafari & Xiao, 2016). Hence, rather than directly relying on an existing fatigue scale, it is necessary and important to develop a targeted scale that is more applicable to the tourism research. In light of this point, the purpose of this study was twofold: (1) to explore a conceptual framework of tourism fatigue and (2) to develop a valid and reliable instrument to measure tourism fatigue.

2. Theoretical background

2.1. Concept of fatigue and tourism fatigue

Fatigue was originally a medical term. In the 1950s, E. A. Duchesne, a French physician, analyzed the effects of fatigue on railway workers' health (Veauthier & Paul, 2014). Later, W. H. R. Rivers, J. M. Moore and E. Thorndike also noted that fatigue had a significant negative impact on brain efficiency in the late 19th century (Rivers, 1896; Thorndike, 1899; Veauthier & Paul, 2014). Under this trend, fatigue has received more attention in the fields of psychology, behavioristics, sports science and transportation. The concept of fatigue has undergone a transformation from one-dimensional to multidimensional, and its definitions are diverse. Generally, fatigue refers to the state in which the efficiency of the body decreases gradually due to illness or excessive activity (Li, Yamamoto, & Zhang, 2018; Rajaratnam & Arendt, 2001). Therefore, fatigue can be divided into pathological fatigue (such as cancer-related fatigue) and nonpathological fatigue (such as driving fatigue, compassion fatigue, and work-related fatigue). Fatigue is manifested in physiological outcomes such as increased physical decline, muscle soreness and sleepiness and in psychological outcomes such as the weakening of motivation, excitement, alertness, attention, cognition and thinking (Lal & Craig, 2001). As shown in Table 1, due to differences in fatigue characteristics in different fields, every discipline has its own focus in

the definition of fatigue.

Compared with pathological fatigue, tourism fatigue is more similar to nonpathological fatigue. The essential cause of nonpathological fatigue is excessive activity such as long hours of work or driving or extensive training (Lal & Craig, 2002). The understanding of "degree" is also the key to defining tourism fatigue. There are many "degrees" in tourism activities such as travel time, weight bearing, travel intensity, driving distance, quantity and degree of homogenization of landscape, leisure space, recreational activities and tourism commodities, and travel times within a short time interval (Chronis, 2015; Jafari & Xiao, 2016). Therefore, all types of tourism activity with types of motivation (sightseeing, knowledge seeking, recreation, exploration, visiting family or vacation) may be excessive, which can lead to tourism fatigue. In addition, this "degree" and the process of being excessive vary with each tourist and each motivation. The comprehensiveness of tourism activities makes tourism fatigue more complex. High mobility leads to omni-directional physical fatigue as well as intensive brain activities, such as aesthetic appreciation, socializing, learning, novelty seeking, which lead to multidimensional mental fatigue (Jafari & Xiao, 2016; Lal & Craig, 2002). Therefore, referring to the definitions of fatigue in other fields, we define tourism fatigue in terms of tourists' physiological or psychological states of physical decline, weakening motivation, emotional decline and cognition impairment caused by excessive tourism activities. Tourism fatigue can be explained in four parts. First, tourism fatigue is a negative state. Second, tourism fatigue is the result of the excessive interaction between tourists and destinations. Third, the manifestations of tourism fatigue are diverse, including physiological and psychological aspects, while psychological fatigue is more complex, mainly referring to motivation, affection, emotion and cognition. Finally, there is a process of gradual accumulation in the generation of

Table 1
The definitions of fatigue in different fields.

Items	Fields	Definitions	References
Cancer-related fatigue	Medicine	An unusual, persistent, subjective sense of fatigue associated with cancer or cancer treatment.	Mock (2001)
Chronic Fatigue Syndrome	Psychology	A state characterized by fatigue lasting for at least six months, accompanied by limb weakness and other symptoms, cannot be explained from a pathological point of view.	Surawy et al. (1995)
Work-related fatigue	Behavioristics	A state of reduced efficiency and willingness to work.	Grandjean. (1979)
Work-related fatigue	Behavioristics	A state of diminished interest in continuing work.	Brown, Schell, and Pashniak (2017)
Compassion fatigue	Behavioristics	A decline in the ability or interest of nurses to sympathize or tolerate patients' pain.	Joinson (1992), Figley (2002)
Driving fatigue	Transportation	A state of impaired physical performance in cognitive and psychomotor activities, such as driving, that is a result of reduced brain alertness.	Williamson et al. (1996)
Athletic fatigue	Sport	A psycho-physiological state that follows from prolonged cognitive or physical activity and is characterized by feelings of low energy and a reduced willingness to invest effort.	Hockey (2013), Enoka & Duchateau (2016)

tourism fatigue. Therefore, tourism fatigue is more prominent in long-distance and longstanding travel such as long-distance self-driving travel and outbound travel.

The concept of tourism fatigue does not contradict the physical and mental recovery of tourism. Physical and mental recovery has been a popular issue in the tourism research in recent years. The rapid pace and intense competitive pressures of daily life have made various types of mental fatigue and mental illness common problems in today's society. Against this background, [Berg, Terry, and Henk \(2007\)](#), [G. Chen, Huang, and Zhang \(2017\)](#) and [Lehto \(2013\)](#) noted that a beautiful natural environment, especially a natural tourist destination, as a type of salutogenic resource, has a significant effect on relieving psychological pressure and improving mood, attention and mental health. Therefore, the physical and mental recovery aspects of tourism emphasize the potential of tourism activities for positive adjustment with regard to the negative state of daily life whereas tourism fatigue refers to the negative result of excessive tourism activities. The connotations of these terms are not contradictory; indeed, there is a potential relationship between them. Future studies should address whether tourism fatigue can influence the effects of the physical and mental recovery aspects of tourism and how to intervene in tourism fatigue to maximize those aspects.

2.2. Measurements of fatigue

There are two main methods of fatigue measurement: bioelectrical signal monitoring and questionnaire surveying, and the latter is more popular. Bioelectrical signal monitoring, including electroencephalogram, electro-oculogram, electrocardiogram, and electromyogram, is a mature method used in fields such as psychology and behavioristics ([Lal & Craig, 2001](#); [Wascher et al., 2014](#)). Compared with the questionnaire survey, this method is objective, accurate and dynamic; however, the instruments and equipment for bioelectrical signal monitoring are bulky, complex and expensive ([Lal & Craig, 2001](#)). In addition, its indication meaning is singular, which makes it difficult to represent the complex emotional and physiological state of tourists. Therefore, the questionnaire survey is a more effective means of tourism fatigue measurement.

There are many differences in fatigue characteristics among the different fields, regions and groups ([Hirai, Kanda, Takagai, & Hosokawa, 2015](#); [R. O. Phillips, 2015](#); [Winwood, Winefield, Dawson, & Lushington, 2005](#)), as shown in [Table 2](#). The fatigue-scale research has addressed processes from single disciplines to multiple disciplines, from one dimension to multiple dimensions, from general to specific. As a result, dozens of fatigue scales have been developed over the past half century. One of the earliest is the profile of mood states (POMS), which is used to measure the health status of patients and workers ([McNair & Lorr, 1964](#);

[Winwood et al., 2005](#)). However, in the POMS scale, fatigue is only a subscale that measures human physical function. Later, giving more attention to fatigue, many scholars proposed that it was necessary to develop a special fatigue scale. To facilitate this research, [Krupp L. B. et al. \(1989\)](#), focusing on fatigue in patients with chronic diseases, developed a one-dimensional fatigue severity scale (FSS). [Mendoza et al. \(1999\)](#) developed the brief fatigue inventory (BFI), which is shorter and easier to understand and translate. Subsequently, on the basis of several fatigue scales, [Michielsen H. J. et al. \(2003\)](#) developed the fatigue assessment scale (FAS), which can be applied widely and is short and easy to use.

However, the complexity of the concept and the range in manifestations of fatigue makes the limitations of one-dimensional scales more prominent, and multidimensional scales gradually became the focus of scholars' attention ([Chalder et al., 1993](#); [S. Phillips & Cullen, 1992](#); [Smets et al., 1995](#)). As shown in [Table 2](#), representative multidimensional fatigue scales include the FS, FIS, MFI, SOFI and CFS. The FS is suitable for patients and the general population and includes physical and mental dimensions ([Chalder et al., 1993](#)). The FIS is further divided into three dimensions, namely, physical, social and cognitive, in which the social dimension is comprised of social, emotional, and motivational aspects ([Fisk et al., 1994](#)). [Smets et al. \(1995\)](#) developed a more specific five-dimensional MFI to solve the problems for which the multidimensional scale was too long and that contained indirectly related items. Subsequently, aiming at workers' fatigue, [Åhsberg et al. \(1997\)](#) developed a five-dimensional SOFI through factor analysis. Similarly, the CFS is a three-dimensional fatigue scale (physical, affective, and cognitive subscales) for cancer patients in which the affective dimension contains three motivation-related items ([Okuyama et al., 2000](#)).

Overall, a one-dimensional scale focuses on the severity or effect of fatigue, which is short and easy to operate; however, its content and structure are singular. Multidimensional scales include physical, cognitive, affective, emotional, and motivational dimensions that are comprehensive and targeted but often have problems such as interminability and weak universality. Therefore, targeting, comprehensiveness, simplicity and ease of operation are important criteria for the development of a fatigue scale ([Whitehead, 2009](#)). Based on the above scales, great progress has been made in the measurement of fatigue around inheritance from and development in different fields and disciplines and verification and revision by different groups, regions and cultures ([Baussard, Carayol, Porro, Baguet, & Cousson-Gelie, 2018](#)). This progress provides an important reference for the measurement of tourism fatigue.

Tourism fatigue is the result of the excessive interaction between tourists and destinations. Tourism activities are comprehensive and mainly involve tourists' physical bodies, motivations/needs, affection/

Table 2
Characteristics of the main fatigue scales in different fields.

Name	Dimension	Number of Items	Subscales	Target Population	References
Profile of Mood States (POMS)	Single	7	1: Severity	Patients and workers	McNair & Lorr (1964) , Winwood et al. (2005)
Fatigue Severity Scale (FSS)	Single	10	1: Impact	Patients and general population	Krupp, Larocca, Muirash, & Steinberg (1989)
Brief Fatigue Inventory (BFI)	Single	9	1: Severity	General population and patients	Mendoza et al. (1999)
Fatigue Assessment Scale (FAS)	Single	10	1: Severity	General population and patients	Michielsen, Vries, & Heck (2003)
Fatigue Scale (FS)	Multiple	11	2: Physical, Mental	General population and patients	Chalder et al. (1993)
Fatigue Impact Scale (FIS)	Multiple	40	3: Physical, Social, Cognitive	General population and patients	Fisk, Pontefract, Ritvo, Archibald, & Murray (1994)
Multidimensional Fatigue Inventory (MFI)	Multiple	20	5: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and Reduced Activity	General population and patients	Smets, Garssen, Bonke, & De Haes (1995)
Swedish Occupational Fatigue Inventory (SOFI)	Multiple	25	5: Lack of energy, Physical exertion, Physical discomfort, Lack of motivation, Sleepiness	Workers	Åhsberg, Gamberale, and Kjellberg (1997)
Cancer Fatigue Scale (CFS)	Multiple	15	3: Physical, Affective, and Cognitive	Cancer patients	Okuyama et al. (2000)

emotion and cognitions (Kirillova, Fu, Lehto, & Cai, 2014; Kock, Josiassen, & Assaf, 2018; Alan & Bob, 2006; Mitas & Bastiaansen, 2018). Every aspect of excessive activity can lead to tourists' fatigue. Therefore, tourists' states of body, motivation/need, affection/emotion and cognition are the core dimensions of tourism fatigue measurement. Accordingly, this study constructs a conceptual model of tourism fatigue. As shown in Fig. 1, this is a dynamic, two-way enhanced system. Excessive interactions between tourists and destinations lead to their physical, motivational, emotional or cognitional fatigue. There is a potential relationship between tourist physiological fatigue and psychological fatigue. On the one hand, the consumption of a lot of energy will affect people's psychological state, and the aggravation of tourism physiological fatigue will lead to the deterioration of psychological fatigue (van Hoogmoed, Franssen, Bleijenberg, & van Riel, 2010; Williamson et al., 1996). On the other hand, the strength of external stimulation will promote the generation of body energy, and the reduction of psychological fatigue may also be conducive to the alleviation of physical fatigue, and vice versa (van Hoogmoed et al., 2010; Williamson et al., 1996). The potential interactions among the dimensions of tourism fatigue are an important issue to be addressed by future studies. These dimensions are explained as follows.

The first dimension is physical fatigue, which refers to the decline of tourists' physical function. There are many types of activities or elements related to the body in the tourism experience including walking, mountain climbing, cycling, boating, playing, riding various types of transportation, weight bearing, duration and intensity of participation in various activities, and transportation comfort (Chronis, 2015; Jafari & Xiao, 2016; Matteucci, 2014). Rich tourism activities are accompanied by a large amount of energy consumption and muscle activity. Hence, tourists' physical fatigue can easily occur, and it mainly manifests in mobility reduction, muscle soreness and physical weakening (Lal & Craig, 2001). At the same time, under new situations, such as the increase in tourist mobility in the modern transportation system, the popular postmodern trend of self-service, the acceleration of travel rhythm under the convergence of time and space, and the increase in taking care of the elderly and children during family travel (Gretzel & Jamal, 2010; Kelly, Lawlor, & Mulvey, 2017; Schänzel & Yeoman, 2015; M. Y.; Wu, Wall, Zu, & Ying, 2019), tourist physical fatigue will be more pronounced.

The second dimension is motivational/need fatigue, which means a reduction in tourist motivations/needs. Motivation/need is the driving force of tourism activities, which is reflected before, during and after a trip (Crompton, 1979). Furthermore, novelty, as the core element of all

types of tourism motivation (Cohen, 1972; Crompton, 1979; Mitas & Bastiaansen, 2018), is sensitive and changeable. The tourism experience is a process in which tourism motivation/need is gradually satisfied such as through an increase in the duration and frequency of escaping from the usual environment, participating in recreational activities, enjoying natural scenery, experiencing foreign cultures and visiting relatives and friends. When certain needs are met, the novelty of the destination decreases (Jang & Feng, 2007), which leads to tourist motivational fatigue. Motivational/need fatigue is mainly manifested in a decrease of willingness, interest and curiosity to travel or to continue to travel (Åhsberg et al., 1997).

The third dimension is affective/emotional fatigue, which refers to the decrease in tourist affection and emotion for various elements of tourism activities. Tourists have much affectional/emotional interaction and expression in the tourism experience, including their love for the vast wilderness, awe of the landscape, curiosity about exotic customs, and social interaction with other tourists and indigenous people (Faulant, Matzler, & Mooradian, 2011; Fennell, 2017; Norman, 2013; Zhang, Yang, Zheng, & Zhang, 2016). However, frequent interaction and expression will undoubtedly weaken the novelty of visitors to an unusual environment, resulting in affective/emotional fatigue, which is mainly manifested in a decline in liking, excitement and feelings of mystery and novelty (Lepp & Gibson, 2003; Li et al., 2018; Zheng et al., 2017). In addition, the repeated reception of identical or similar signals by the brain accelerates fatigue (Grandjean, 1979). Therefore, the spread of the homogenization of tourism products under the background of globalization will make tourist affective/emotional fatigue more significant.

The fourth dimension is cognitive fatigue, specifically, the impairment of tourist cognitive ability. Cognitive ability includes the ability of the brain to process, store and extract information (Kuhl, 2011). Visitors observe, notice, learn, memorize and analyze many novel things during their short vacation (Y. J. Lee, 2016) including arranging for accommodation and catering, road recognition, understanding and learning about different cultures, aesthetic appreciation, visiting historical sites, and guaranteeing security (Jafari & Xiao, 2016). When the intensity of brain operation exceeds a certain limit, tourist cognitive fatigue will occur, which is manifested by a decline in capabilities such as attention, thinking ability, reaction speed, and memory (Fisk et al., 1994; Kirillova et al., 2014; Pattyn, Neyt, Heridericlx, & Soetens, 2008).

3. Methods and results

The development and validation of a tourism fatigue scale requires the adoption of both quantitative and qualitative methods. In addition to the abovementioned construct definition, there are five steps: initial item production, scale purification, exploratory factor analysis, confirmatory factor analysis, and reliability and validity testing (G. Chen et al., 2014; G. A. Churchill, 1979; John R, 2002; Wong & Wan, 2013). Among them, construct definition is the determination of the research object according to the research purpose and scenario, i.e., the connotation definition of tourism fatigue. Initial item production is the obtaining of as many initial items of the scale as possible around the construct's scope. Initial item purification is the deletion or merging of similar, mutual contained and ambiguous items through content validity analysis and surface validity analysis and the modification of their literal expression. Exploratory factor analysis is the uncovering of the underlying structure of a relatively large set of variables, i.e., the initial items of tourism fatigue. Confirmatory factor analysis can assess whether another set of data collected conforms to the factor structure obtained from the exploratory factor analysis. Reliability testing can determine the consistency, stability and reliability of the above results including internal consistency and composite reliability. Validity testing can assess the extent to which a test measures what it claims to measure including content validity, criterion validity and construct validity (G. Chen et al., 2014; G. A. Churchill, 1979; John R, 2002; Wong & Wan, 2013).

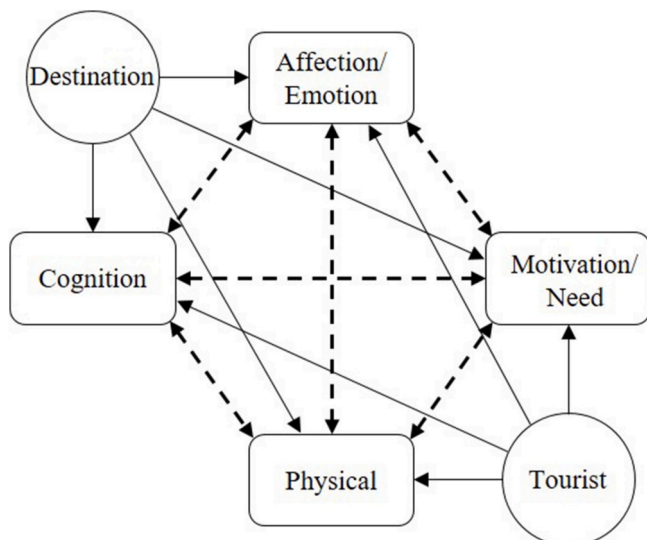


Fig. 1. The conceptual model of tourism fatigue.

3.1. Item generation

The production of initial items was mainly achieved through a literature review, in-depth interviews and a content analysis of online travel notes (G. Chen et al., 2014; Wong & Wan, 2013). First, the works of fatigue measurement in various fields provided the main framework for the development of the tourism fatigue scale. The literature review mainly involved two aspects: fatigue measurement and tourist perception and behavior. This study referred to mature scales, such as the FSS, FAS, BFI, FIS, MFI, SOFI, CFS and some improved scales, to extract potential items. For the aspect of tourist perception and behavior, this study mainly combed content for tourist motivation, affection, emotion, cognition and body, aiming to add and amend the related items.

Second, in-depth interviews were conducted to collect information for extracting and improving items and ensuring information saturation. Three types of respondents were selected: 2 professors in the field of tourist behavior, 9 graduate students majoring in tourism and 21 tourists. It should be noted that based on the practices of Yen, Tsauro, and Tsai (2018), Hung & Petrick (2010) and Chen, Huang, and Zhang (2017) in the development of a tourism scale, in-depth interviews were aimed at pursuing the information saturation of tourism fatigue through snowball sampling while there was no clear requirement for the quantity or type of interviewee. The length of the interviews ranged from 10 to 30 min. The interviewees first read the definitions of each dimension. Then, they were asked to answer a number of open questions, as follows, to extract their specific thoughts and experiences in terms of tourism fatigue.

- How do you understand tourism fatigue based on your travel experience?
- What do you think are the specific manifestations of physical fatigue, motivational/need fatigue, affective/emotional fatigue and cognitive fatigue?
- Please share your experience and thoughts on tourism fatigue, especially some things we have not yet mentioned.

Third, online travel notes can provide a more direct and real tourism experience for the generation of the initial items. Online travel notes are important resources for the study of tourist perception and behavior (G. Chen et al., 2014). More than 2000 online travel notes from two major tourism websites (<http://www.mafengwo.cn>; <https://www.ctrip.com>) in China were captured and analyzed to ensure information saturation regarding tourism fatigue. We mainly extracted the manifestation, degree and characteristics of tourism fatigue from the online travel notes. A content analysis method was adopted including repeated reading and summarizing. The results improved and supplemented the information obtained from the literature review and the in-depth interviews, such as the mystery and novelty of destinations, which are important factors in the tourism experience but not in other areas. A total of 28 questionnaire items were obtained through these steps.

3.2. Measurement refinement

3.2.1. Content validity

After the initial items of the scale were compiled, an expert panel was recruited to evaluate the scale's content validity. The panel consisted of two professors, two associate professors and five graduate students specializing in tourist behavior and perception (they were different from those who participated in the in-depth interviews mentioned above). The introduction of tourism fatigue and its dimensions were provided at the beginning of the expert evaluation sheet. The expert panel reviewed each item thoroughly and assessed the applicability and representativeness of the measurement items toward the associated construct by choosing an appropriate value on a scale of 1 (highly inapplicable) to 5 (completely applicable). The initial items were then modified based on the experts' constructive comments on the scale. Consequently, nine items were deleted, and 10 were further revised, and the number of

initial items was reduced from 28 to 19.

3.2.2. Pre-survey

The purpose of the small-scale pre-survey was to test the quality of the initial questionnaire, purify and modify the initial items, and obtain the scale for formal investigation. The pre-survey was carried out in Zhongshan Mountain, Nanjing, Jiangsu, China. A total of 50 questionnaires were distributed by convenience sampling, and 45 valid questionnaires were recovered. In the process of the pre-survey, the readability of the questionnaire was further tested and revised. A Cronbach's α and item-to-total correlations were computed to check the reliability of the whole scale and each item (G. A. Churchill, 1979; W. Kim, Jun, Walker, & Drane, 2015). As a result, 2 items were discarded (item-to-total correlation lower than 0.4). A total of 17 items remained.

3.3. Exploratory factor analyses (EFA)

After the above steps, the 17 initially generated items were incorporated into a formal survey questionnaire (see the Appendixes). A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to rate each item. The first round of data collection was conducted in Zhouzhuang, which is one of China's most famous ancient towns. A total of 436 (378 useable) responses were collected in the survey through convenience sampling, with an effective rate of 86.70%. The subject-to-item ratio was 22.24:1, which was higher than the limited value of 5:1 (Gorsuch, 1974). The demographic characteristics of the respondents are shown in Table 3. The profile of the sample was similar to those in Zhang, Li, Yang, and Zhang (2018) and Wang et al. (2018). As shown by the descriptive statistics of the scale items, the absolute values of univariate skewness did not exceed 2 while the absolute values of univariate kurtosis did not exceed 3. According to the (Kline, 2005) criteria, the data did not appear to deviate "extremely" from a normal distribution.

Utilizing the first data set, an EFA using the principal component method with oblique rotation was carried out to identify the dimensionality of the proposed tourism fatigue scale. We used oblique rotation

Table 3
Demographics of the respondents - sample 1 and sample 2.

Characteristics	Frequency(n)	Percentage (%)
Gender		
Male	172 (275)	45.50 (54.67)
Female	206 (228)	54.50 (45.33)
Age		
15–24	105 (130)	27.78 (25.85)
25–44	212 (301)	56.08 (59.84)
45–64	56 (67)	14.81 (13.32)
>65	5 (5)	1.32 (0.99)
Education background		
Junior high school and below	23 (39)	6.09 (7.76)
Senior high school	46 (73)	12.17 (14.51)
Junior college	133 (120)	32.28 (23.86)
Undergraduate	161 (222)	42.59 (44.14)
Graduate and above	26 (49)	6.88 (9.74)
Monthly personal income (RMB ¥)		
≤3000	78 (89)	20.63 (17.69)
3001–5000	90 (114)	23.81 (22.66)
5001–7000	94 (117)	24.87 (23.26)
7001–9000	80 (115)	21.16 (22.86)
>9000	36 (68)	9.52 (13.52)
Occupation		
Government/public institution staff	76 (72)	20.10 (14.32)
Enterprise staff	119 (265)	31.49 (52.69)
Private business owner	52 (50)	13.76 (9.94)
Student	76 (62)	20.11 (12.33)
None/retired	19 (15)	5.02 (2.99)
Others	36 (39)	9.53 (7.76)

Note: Sample 1 (n = 378), sample 2 (n = 503); Sample 2 is expressed in parentheses.

as we expected the factors to be correlated, as shown in Fig. 1. The criteria for filtering items, including communalities, were less than 0.50, and item loading was less than 0.50 on any factor, with 0.50 or higher loadings on multiple factors (G. Chen et al., 2014; Pan, Zhang, Gursoy, & Lu, 2017). In this round of EFA (Kaiser–Meyer–Olkin (KMO) = 0.826; Bartlett’s test of sphericity = 3797.959; df = 136; p < 0.001), one item (the communalities < 0.50) was removed. Consequently, another round of EFA using the principal component method with oblique rotation (Kaiser–Meyer–Olkin (KMO) = 0.820; Bartlett’s test of sphericity = 3600.529; df = 120; p < 0.001) was conducted with the 16 remaining items. Eventually, a four-factor latent structure emerged, with all the remaining 16 items included, and the four factors accounted for 70.634% of the total observed variances (see Table 4) (Kaiser, 1960). The Cronbach’s α scores for the four extracted factors were all higher than 0.80, demonstrating adequate reliabilities (Nunnally, 1994). The factor structure coincided with the theoretical analysis above, showed that the results have appropriate theoretical justification. These factors were physical fatigue (4 items), motivational fatigue (4 items), affective

Table 4
Results of EFA (Sample 1, n = 378).

Factor/item	Mean	FL	EV	VE(%)	CVE (%)	α
Factor 1: physical fatigue			5.691	35.572	35.572	0.862
My physical strength is declining	2.96	0.926				
My steps and movements slowed down	2.79	0.855				
I feel tired	3.08	0.908				
I want to sit down and have a rest	2.69	0.648				
Factor 2: motivational fatigue			2.515	15.717	51.289	0.853
My interest in the remaining attractions is declining	3.34	0.929				
My curiosity about the remaining attractions is declining	3.14	0.846				
My desire to continue visiting is diminishing	3.41	0.827				
I am inactive when I go to the rest of the attractions	2.95	0.696				
Factor 3: affective fatigue			1.890	11.813	63.102	0.855
The mystery of this destination for me is declining	3.32	0.900				
The freshness of this destination for me is declining	3.14	0.865				
My liking for this destination is declining	2.97	0.806				
My excitement is declining	3.38	0.757				
Factor 4: cognitive fatigue			1.205	7.533	70.634	0.837
I think slowly now	2.45	0.895				
My attention is dropping	2.57	0.857				
My reaction to the outside is becoming dull	2.33	0.797				
My brain is tired	2.76	0.726				

Note: FL = factor loading; EV = eigen-values; VE = variance explained; CVE = cumulative variance explained; α = Cronbach’s α .

fatigue (4 items) and cognitive fatigue (4 items).

3.4. Confirmatory factor analyses (CFA)

To further verify the latent structure identified from the EFA analysis, a confirmatory factor analysis (CFA) was performed using the covariance matrix. The second round of data collection was conducted in Huangshan, which is one of China’s most famous mountains. A total of 567 (503 useable) responses were collected in the survey through convenience sampling, with an effective rate of 88.71%. The subject-to-item ratio was 31.44:1, which is higher than the limited value of 5:1 (Gorsuch, 1974). The demographic characteristics of the respondents are shown in Table 3. The profile of the sample was similar to that in sample 1, Zhang, Li, Yang, and Zhang (2018) and Wang et al. (2018). As shown by the descriptive statistics of scale items, the data did not appear to deviate “extremely” from a normal distribution (Kline, 2005). The results of the CFA are shown in Table 5. The χ^2/df value was 3.751 ($1 < \chi^2/df < 5$), and other goodness-of-fit measures also indicated a good overall fit of the four-factor model to sample 2 (Bentler & Bonett, 1980; G.; Chen et al., 2014; L. T.; Hu & Bentler, 1999; Zhang, Zhang, Cheng, Lu, & Shi, 2012). The goodness-of-fit index (GFI = 0.910), comparative fit index (CFI = 0.962), and incremental fit indices (IFI = 0.962, NFI = 0.948, TLI = 0.954) were all larger than the 0.90 critical value; the parsimony comparative fit indices (PCFI = 0.801, PNFI = 0.790) were not lower than the 0.50 critical value; and the root mean square error of approximation (RMSEA) value (0.074) was less than the 0.08 critical value. Altogether, these values of fit indices suggested that the model fit the data adequately.

Subsequently, we assessed the reliability and validity of the identified scale. First, as shown in Table 5, the factor loadings for all 16 items were between 0.743 and 0.949, and the composite reliability was between 0.9022 and 0.9383 (larger than the 0.70 critical value), showing a

Table 5
Results of CFA (Sample 2, n = 503).

Factor/item	Mean	FL	C.R.	CR	AVE
Factor 1: physical fatigue				0.9022	0.6985
My physical strength is declining	3.55	0.882	25.399		
My steps and movements slowed down	3.62	0.844	23.808		
I feel tired	3.54	0.867	–		
I want to sit down and have a rest	3.66	0.743	19.513		
Factor 2: motivational fatigue				0.9278	0.7631
My interest in the remaining attractions is declining	2.57	0.906	24.108		
My curiosity about the remaining attractions is declining	2.60	0.905	24.101		
My desire to continue visiting is diminishing	2.68	0.800	–		
I am inactive when I go to the rest of the attractions	2.58	0.879	23.112		
Factor 3: affective fatigue				0.9383	0.7925
The mystery of this destination for me is declining	2.66	0.949	27.359		
The freshness of this destination for me is declining	2.62	0.933	26.695		
My liking for this destination is declining	2.51	0.858	23.351		
My excitement is declining	2.67	0.814	–		
Factor 4: cognitive fatigue				0.9298	0.7683
I think slowly now	2.54	0.895	26.695		
My attention is dropping	2.61	0.915	27.724		
My reaction to the outside is becoming dull	2.50	0.842	23.989		
My brain is tired	2.59	0.852	–		

Note: FL = factor loading; C.R. = critical ratio; – means no value; CR = composite reliability; AVE = average variance extracted; all items = p < 0.001.

satisfactory reliability of the scale (Bagozzi & Kimmel, 1995; G.; Chen et al., 2014; M. L.; Wu, 2009). Second, the values of average variance extracted (AVE) of the four factors were greater than 0.50 critical value, and all factor loadings were larger than 0.7 and significant ($p < 0.001$) (Anderson & Gerbing, 1988; Bailey & Ball, 2006). The results showed that there was a high correlation among different items in the same dimension, and the convergent validity of the scale was sufficient. Third, the discriminant validity of the scale was also examined. The correlation among physical fatigue, motivation fatigue, emotion fatigue and cognition fatigue ranged from 0.199 to 0.733, all below the 0.85 critical value and less than the square roots of the AVE of the corresponding factor (see Table 6) (G. Chen et al., 2014; Fornell & Larcker, 1981; Kline, 2005). These results indicated that the differences among these dimensions were significant; thus, the discriminant validity of the scale was acceptable. In summary, it can be concluded that the assessment of the measurement model supported the reliability and validity of the latent constructs.

3.5. Criterion-related validity

The present study further verified the criterion-related validity of the tourism fatigue scale. The criterion-related validity is used to examine the relationship between tourism fatigue and criteria, that is, the relationship between tourism fatigue and a related, mature and accepted construct (Colquitt, 2001). According to the above analysis, tourism fatigue is a significant negative state whose generation and development are accompanied by a decline in physical function, motivation, affection and cognition. This state may lead to a decline in the quality of destination perception, and, consequently, a decrease in tourist satisfaction (Fu, Yi, Okumus, & Jin, 2019; Park, Hahn, Lee, & Jun 2018). Hence, there is a high potential correlation between tourism fatigue and satisfaction. In addition, as one of the most classic topics in the tourism research, the construction of tourist satisfaction-related theories is quite mature. Accordingly, satisfaction meets the requirements of the criterion variable selection proposed by Colquitt J. A. (2001). The purpose of this part is to test whether an increase in tourism fatigue will lead to a decrease in satisfaction. This study adopted the revised tourist satisfaction scale of Yoon and Uysal (2005) and Albayrak and Caber (2018). In the second round of the data collection, the measurement items of tourist satisfaction were added. As a result (see Table 7), there was a significant negative correlation between satisfaction and tourist psychological fatigue but not physical fatigue. The relationship between physical fatigue and satisfaction is complex. Tourist motivation is one of the main influencing factors, such as hikers enjoying a physical workout (Svarstad, 2018) while sightseeing tourists tend to be comfortable. This result is basically consistent with the existing theoretical judgment and empirical cognition. Therefore, the criterion-related validity of the scale was supported.

Table 6
Construct inter correlations and squared roots of AVE (Sample 2, n = 503).

	Physical fatigue	Motivational fatigue	Affective fatigue	Cognitive fatigue
Physical fatigue	0.836			
Motivational fatigue	0.199	0.874		
Affective fatigue	0.218	0.733	0.890	
Cognitive fatigue	0.319	0.570	0.547	0.877

Notes: The diagonal elements are the squared root of the average variance extracted; the off-diagonal elements are the correlations among the constructs ($p < 0.001$).

Table 7
Criterion-related validity analysis (Sample 2, n = 503).

Tourism fatigue	Satisfaction
Physical fatigue	0.085
Motivational fatigue	-0.207***
Affective fatigue	-0.241***
Cognitive fatigue	-0.206***

Note: ***Correlation coefficients are significant at the 0.01 level.

4. Conclusion and discussion

Fatigue is a pervasive physiological and psychological phenomenon in the tourism experience but remains almost unexplored in the existing literature on tourist perception and behavior. Hence, the purpose of this study was twofold. First, the study aimed to conceptualize tourism fatigue and to identify its dimensions. Combining the connotation, performance, structure and measurement of fatigue in other fields, as well as tourist perception and behavior characteristics, this study defined tourism fatigue in terms of tourists' physiological or psychological states of physical decline, weakening motivation, affection decrease and cognition impairment caused by excessive tourism activities. Based on this definition, a conceptual model of tourism fatigue was built, and four potential dimensions were identified: physical fatigue, motivational/need fatigue, affective/emotional fatigue and cognitive fatigue.

The second purpose was to develop and validate the tourism fatigue scale. Following a rigorous procedure, this study first obtained an initial pool of 28 items through a literature review, in-depth interviews and a content analysis of online travel notes and followed by a reduction of the items to 17 through content validity checking and a pre-survey. After two rounds of data collection, 378 and 503 valid samples were collected, respectively. One item was removed through the EFA, and four factors were identified: physical fatigue, motivational fatigue, affective fatigue and cognitive fatigue. This factor structure was further validated through the CFA and showed satisfactory reliability and validity. Finally, this study obtained a four-factor tourism fatigue scale with 16 items. The exploration of the concept of tourism fatigue and its measurement scale has significant implications for tourist research and management.

4.1. Theoretical and practical implications

This study has several important theoretical implications. First, the existing knowledge of tourist perception and behavior is extended by proposing tourism fatigue as a multidimensional concept. This is the major theoretical contributions of this study. Tourist perception and behavior is one of the core parts of the tourism research, which involves positive, negative and neutral perception. However, the research value and significance of negative perception in the previous studies have not been given enough attention (Mitas & Bastiaansen, 2018; Yan, Zhou, & Wu, 2018). As a significant and universal negative state, fatigue has a great potential impact on tourist satisfaction and motivation. According to the results of criterion-related validity, motivational fatigue, affective fatigue and cognitive fatigue were negatively correlated with tourist satisfaction. Considering the close relationships among satisfaction, motivation, decision-making and revisit intention (Albayrak & Caber, 2018; Jang & Feng, 2007), the effect of tourism fatigue on tourist perception and behavior cannot be ignored. Hence, carrying out tourism fatigue research is significant for improving the current tourism knowledge.

Second, the development of the tourism fatigue scale provides a powerful tool for follow-up related research. This is one of the methodological contributions of this study. This study identifies the multidimensional structure of tourism fatigue by adopting qualitative and quantitative methods, expanding upon the single-dimensional study of

tourist aesthetic fatigue in Li, Cheng, and Xiao (2018) and Zheng, Liao, and Qin (2017). Aesthetic fatigue is a term often mentioned with regard to the tourism experience. However, the theoretical research has only focused on it in the past two years and has not paid enough attention to other manifestations of tourism fatigue. In addition to the influence of traditional research paradigms and ideas, another possible reason for the above-described research limitations is the vagueness of the tourism fatigue concept and the lack of tools for its measurement. The tourism fatigue scale can serve as a useful tool for future research and thus merits development.

However, in terms of practical value, the findings reported in this study have valuable implications for both destination managers and tourists. In line with the previous findings, the coping mechanism in terms of both the management and tourist sides included three parts: (1) reducing tourists' physiological and psychological loads, (2) maintaining tourists' physical and mental active states, (3) restoring tourists' physical and mental states (An et al., 2012; Lal & Craig, 2001, 2002; Li et al., 2018; Zheng et al., 2017). First, the findings can help managers better understand and intervene in tourist behavior. In view of the potential impact of tourism fatigue on the quality of the tourism experience, its position in tourist management is self-evident. Measures should be explored to prevent and alleviate tourism fatigue such as (1) providing convenient transportation, (2) ensuring adequate recreational facilities, (3) designing reasonable routes and (4) improving the uniqueness and innovation of tourist products. Second, for tourists, a better understanding of tourism fatigue can improve the quality of their tourism experience. Before and during a tour, tourists can minimize their occurrence of tourism fatigue through reasonable adjustments to the tourism plan, destination selection, travel time, tourism intensity, and accommodation arrangement. After a tour, tourism syndrome can also be alleviated by corresponding measures to accelerate physical and mental recovery.

4.2. Limitations and directions for future research

This study was based on a Chinese sample. Therefore, caution must be taken when the measurement is applied to other countries. Given the social, economic and cultural differences between the East and the West, the dimensions and items of tourism fatigue require further verification and improvement. In addition, it should be noted that the temporal dynamics of tourist fatigue on a trip are significant; that is, the degree of

tourist fatigue is different at different times. In fact, all types of tourists' body state, mood, emotion or other perceptions, such as satisfaction and sense of place, are dynamic and changeable over time (Coghlan & Pearce, 2010; Lin, Tsai, Lin, & Chen, 2014; Zhang, Zhang, Cheng, Lu, & Shi, 2012). The current research on these aspects has paid little attention to their temporal dynamics but has instead focused on the overall or homogeneous situations of a whole trip. Therefore, at present, our study addressed the overall or homogeneous situation of tourism fatigue. We will discuss the temporal dynamics of tourism fatigue in a follow-up study. Beyond the above-noted limitations, there is much room for further research, including the cross-regional and cross-cultural validation of the tourism fatigue scale, the simplification of the scale, the empirical measurement and evaluation of tourism fatigue, the influencing factors and intervention measures, and the effects of tourism fatigue.

Declaration of competing interest

None.

CRediT authorship contribution statement

Jinkun Sun: Conceptualization, Data curation, Investigation, Methodology, Software, Writing - original draft. **Jin-He Zhang:** Conceptualization, Project administration, Validation, Writing - review & editing. **Honglei Zhang:** Conceptualization, Methodology, Validation, Writing - original draft. **Chang Wang:** Data curation, Methodology, Writing - original draft. **Xiaofang Duan:** Conceptualization, Investigation, Methodology. **Min Chen:** Methodology, Project administration, Writing - original draft.

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Appendix A. Survey of Tourism Fatigue in Zhouzhuang

1. How much do you agree with the following statements regarding your actual situation.

1 = do not feel, 2 = feel slightly, 3 = feel moderately, 4 = feel strongly, 5 = feel very strongly.

Items	1	2	3	4	5
(1) My physical strength is declining.	1	2	3	4	5
(2) My steps and movements slowed down.	1	2	3	4	5
(3) I feel tired.	1	2	3	4	5
(4) I want to sit down and have a rest.	1	2	3	4	5
(5) My body began to ache.	1	2	3	4	5
(6) My interest in the remaining attractions is declining.	1	2	3	4	5
(7) My curiosity about the remaining attractions is declining.	1	2	3	4	5
(8) My desire to continue visiting is diminishing.	1	2	3	4	5
(9) I'm inactive when I go to the rest of the attractions.	1	2	3	4	5
(10) The mystery of this destination for me is declining.	1	2	3	4	5
(11) The freshness of this destination for me is declining.	1	2	3	4	5
(12) My liking for this destination is declining.	1	2	3	4	5
(13) My excitement is declining.	1	2	3	4	5
(14) I think slowly now.	1	2	3	4	5
(15) My attention is dropping.	1	2	3	4	5
(16) My reaction to the outside is becoming dull.	1	2	3	4	5
(17) My brain is tired.	1	2	3	4	5

2. This information is completely confidential.

Q1	Gender: (1) Male (2) Female
Q2	Age: (1) 15–24 (2) 25–44 (3) 45–64 (4) > 65
Q3	Education background: (1) Junior high school and below (2) Senior high school (3) Junior college (4) Undergraduate (5) Graduate and above
Q4	Monthly personal income (¥): (1) ≤3000 (2) 3001–5000 (3) 5001–7000 (4) 7001–9000 (5) > 9000
Q5	Occupation: (1) Government/public institution staff (2) Enterprise staff (3) Private business owner (4) Student (5) Waiters/salesmen (6) None/retired (7) Others

Appendix B. Survey of Tourism Fatigue in Huangshan

1. How much do you agree with the following statements regarding your actual situation.

1 = do not feel, 2 = feel slightly, 3 = feel moderately.
 4 = feel strongly, 5 = feel very strongly.

Items	1	2	3	4	5
(1) My physical strength is declining.	1	2	3	4	5
(2) My steps and movements slowed down.	1	2	3	4	5
(3) I feel tired.	1	2	3	4	5
(4) I want to sit down and have a rest.	1	2	3	4	5
(5) My body began to ache.	1	2	3	4	5
(6) My interest in the remaining attractions is declining.	1	2	3	4	5
(7) My curiosity about the remaining attractions is declining.	1	2	3	4	5
(8) My desire to continue visiting is diminishing.	1	2	3	4	5
(9) I'm inactive when I go to the rest of the attractions.	1	2	3	4	5
(10) The mystery of this destination for me is declining.	1	2	3	4	5
(11) The freshness of this destination for me is declining.	1	2	3	4	5
(12) My liking for this destination is declining.	1	2	3	4	5
(13) My excitement is declining.	1	2	3	4	5
(14) I think slowly now.	1	2	3	4	5
(15) My attention is dropping.	1	2	3	4	5
(16) My reaction to the outside is becoming dull.	1	2	3	4	5
(17) My brain is tired.	1	2	3	4	5
(18) The overall feeling of visiting Huangshan is similar to what you expected.	1	2	3	4	5
(19) Visiting to Huangshan is worthwhile compared with the time, energy and money spent.	1	2	3	4	5
(20) Huangshan is more interesting and beautiful than the mountain you have ever visited.	1	2	3	4	5

2. This information is completely confidential.

Q1	Gender: (1) Male (2) Female
Q2	Age: (1) 15–24 (2) 25–44 (3) 45–64 (4) > 65
Q3	Education background: (1) Junior high school and below (2) Senior high school (3) Junior college (4) Undergraduate (5) Graduate and above
Q4	Monthly personal income (¥): (1) ≤3000 (2) 3001–5000 (3) 5001–7000 (4) 7001–9000 (5) > 9000
Q5	Occupation: (1) Government/public institution staff (2) Enterprise staff (3) Private business owner (4) Student (5) Waiters/salesmen (6) None/retired (7) Others

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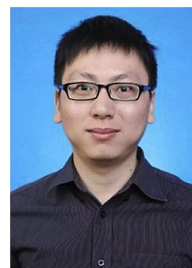
Jinkun Sun, PhD, School of Geography and Ocean Science at Nanjing University, Nanjing, and a lecture in the Department of Tourism Management, School of History, Culture and Tourism, Jiangsu Normal University, Xuzhou, Jiangsu, China (sunjinkun2008@126.com). His research interests include tourism geography, tourism fatigue and the relationships between environment and tourism.



Jin-he Zhang (corresponding author), PhD, is Professor and Director of the Department of Land Resources and Tourism Sciences at Nanjing University, China (zhangjinhe@nju.edu.cn). His research interest includes tourism geography, tourism environmental impact, and human geography.



Honglei Zhang, PhD, is an associate professor in the School of Geography and Ocean Science at Nanjing University, China (zhanghonglei@nju.edu.cn). He received Ph.D. in Tourism Geography and Tourism Planning from Nanjing University. His research interests include tourist behavior and tourism geography.





Chang Wang, PhD, is an assistant research fellow in the School of Geography and Ocean Science at Nanjing University, China (wangchang@nju.edu.cn). His research interests include tourism geography, tourism planning and tourists' environmental behaviours.



Min Chen is a doctoral candidate in the School of Geography and Ocean Science at Nanjing University, China (chenmoon1994@163.com). Her research interests include tourism geography and tourism community.



Xiaofang Duan is a doctoral candidate in the School of Geography and Ocean Science at Nanjing University, China (xiaofangduan@163.com). Her research focuses on telecoupling of tourism impacts on ecological environment.