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# What influences tourists' intention to participate in the Zero Litter Initiative in mountainous tourism areas: A case study of Huangshan National Park, China

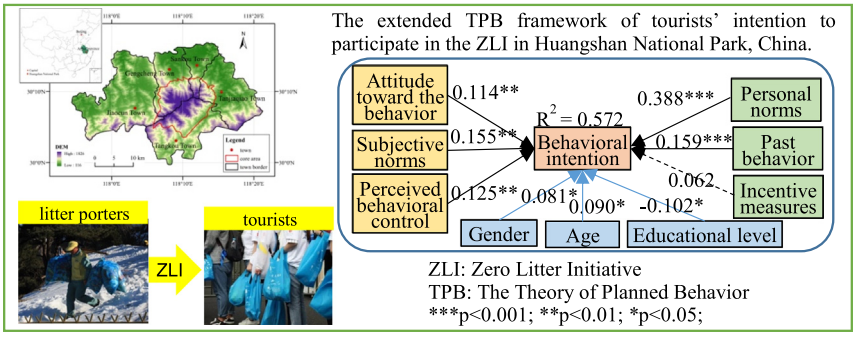
Huan Hu, Jinhe Zhang *, Chang Wang, Peng Yu, Guang Chu

*School of Geography and Ocean Science, Nanjing University, Nanjing, PR China*

## HIGHLIGHTS

- The Zero Litter Initiative is a new tourism litter management strategy in China.
- Hierarchical regression analysis was applied to test the proposed model.
- The extended TPB had stronger predictive power than original TPB.
- Tourists had strong intentions to participate in the Zero Litter Initiative.
- Personal norms had the greatest effect on tourists' intention.

## GRAPHICAL ABSTRACT

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## ABSTRACT

The Zero Litter Initiative (ZLI) of bringing self-generated litter down the mountain is a new attempt to reduce tourism litter generation on climbing trails in China. The extended theory of planned behavior (TPB) was used to analyze the influencing factors of tourists' environmentally responsible behavioral intention to participate in the ZLI, including three additional explaining variables of personal norms (moral obligation to do ZLI), past behavior, and incentive measures, as well as three control variables of gender, age, and educational level. A total of 372 valid questionnaires were collected from tourists in Huangshan National Park. The results of the hierarchical regression analysis showed that: (1) the extended TPB model had stronger predictive power than the original TPB model; (2) tourists' intention to participate in the ZLI was significantly and positively influenced by their attitude toward the behavior (positive or negative opinions), subjective norms (perceived social pressures from referents), perceived behavioral control (perceived ease or difficulty), past behavior, and the strongest predictor of personal norms; (3) incentive measures mainly referred to economic incentives (e.g., lower ticket prices) and non-economic incentives (e.g., a gift and honorary title), which had no significant influences on tourists' intention, and there may be a "crowding-out effect" on intrinsic motivations for collective action in public space; (4) gender had significant influences on tourists' intention, which showed females had stronger participation intention than males. Age had significant and positive influences on tourists' intention, which indicated older tourists were more willing to participate in the ZLI than younger tourists. However, the educational level had significant and negative influences on tourists' intention. Lastly, the study presented practical suggestions for enhancing tourism litter management and achieving sustainable development in mountainous tourism areas.

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* Corresponding author.
*E-mail address:* zhangjinhe@nju.edu.cn (J. Zhang).

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## 1. Introduction

With the rapid development of tourism over the last several decades, the ecological and environmental impact of tourism litter has been an important international issue around the world (Zhang et al., 2011). Particularly in nature-based areas, such as mountains, lakes, seas, and forests, the environment is sensitive, and the ecology is frangible. Some countries have tried to explore effective tourism litter disposal and management strategies (Ezeah et al., 2015; Rodríguez-Rodríguez, 2012). China is an emerging and vast tourism destination, which is also facing various environmental issues arising from tourism litter (Hu et al., 2018). Especially worthy of attention is that China is a mountainous country, and mountainous regions account for two-thirds of China's land area (Chen et al., 2006). Thus, there are many popular mountainous tourism destinations in China, such as Huangshan Mountain, Taishan Mountain, Wuyi Mountain, and the Great Wall. Because of the complicated terrain conditions in mountainous areas, the collection, transportation, and treatment of tourism litter have become an urgent issue in China.

Tourists' behavior has brought many environmental problems in tourism areas. Tourism litter is mainly produced by tourists (Kuniyal et al., 2003). Therefore, the effective solution is to change tourists' environmental behavior to reduce litter generation at the "upstream" level, rather than litter disposal through recycling and reuse at the "downstream" level. On the other hand, minimizing the generation of tourism litter is an effective way to simplify and facilitate litter collection and transportation in Chinese mountainous areas (Kaseva and Moirana, 2010). Thus, it is essential to explore the possible influencing factors of tourists' responsible environmental behavioral intention to minimize litter generation at the "upstream" level. The Zero Litter Initiative (ZLI) of bringing self-generated litter down the mountain was a new attempt to reduce tourism litter generation on climbing trails in China. This initiative was firstly proposed by Huangshan National Park (HNP) in 2013, which was aim to minimize tourism activities' impacts on the environmental system by reducing litter generation on climbing trails. HNP is the best and loveliest mountainous landscape in China, which attracts more than three million visitors each year, facing the test of litter disposal. Therefore, this initiative can help the park save time and money on litter disposal. Subsequently, other mountainous tourism destinations also proposed this initiative in China. With the promotion of the action, more and more tourists have developed responsible litter management behavior during the mountain climbing process. For example, during the 2015 National Day Golden Week holiday in China, there were over 180,000 visitors came to HNP, and more than half of them participated in this initiative (AnhuiDaily, 2015).

Most of previous tourism litter studies focused on environmental impacts. The most direct effect of tourism litter is visual pollution, which affects the satisfaction of tourists (Ojedokun, 2011). Also, tourism litter can also lead to varied ecological damage and environmental pollution, such as pollution of soil and water, the spread of infectious diseases, emission of greenhouse gases, the death of wild animals and endangerment of human health (Campbell et al., 2016; Cingolani et al., 2016). However, few studies focused on tourist litter management behavior and responsible litter management projects. A large number of tourists are important stakeholders because they are the primary producers of tourism litter. The success of the ZLI largely depends on the enthusiasm and willingness of tourists to join in the initiative. Thus, to better understand what motivates tourists to participate in the ZLI has become an urgent problem.

Several theoretical models have been used to understand a series of individual responsible environmental behaviors. For example, the theory of reasoned action (TRA) for predicting students' paper recycling behavior in school (Goldenhar and Connell, 1993), the value-belief-norm theory for predicting individual intention to improve energy efficiency in household (Fornara et al., 2016), and the theory of planned behavior (TPB) for farmers' ecological conservation behavior (Deng et al., 2016). For tourists' environmentally responsible intention and behavior, the TPB has more extensive application than other theories (Han et al., 2010; Verma and Chandra, 2018; C. Wang et al., 2018a). Although the TPB is widely used, its predictive power and adequacy are repeatedly questioned. Therefore, with the purpose of solving this problem, scholars have explored to increase the explanatory power of the model by adding other variables in various contexts (Chan and Bishop, 2013; Y. Wang et al., 2018; Yazdanpanah and Forouzani, 2015). Many studies in the past have focused on adding internal factors. For example, several studies found that personal norms significantly affected individual intention (Han et al., 2017). Moreover, past behavior was also focused on as an important factor in the research of individual environmental behaviors. Song et al. (2012) indicated that past behavior significantly affected festival visitors' intention. In the present study, therefore, the TPB was improved by adding two internal variables of personal norms and past behavior with the ZLI. However, the external factors (e.g., incentives, age, and gender) can also affect individual decisions. Several studies found that incentive measures (e.g., rewards, pricing schemes, gifts, and discounts), as a situational factor, positively affected individual behavioral intention (Thøgersen, 2003; Yue et al., 2013). HNP also proposed some incentives to encourage tourists to participate in the ZLI, such as bottled water, postcard, and other souvenirs. Moreover, because the samples of this study were not homogeneous, they had different demographic characteristics. Therefore, in the context of tourists' litter management, three demographic variables (gender, age, and educational level) as control variables were considered in the extended TPB.

To fill these research gaps, the extended TPB model was used to study the influencing factors of tourists to participate in the ZLI. The study used HNP as a case study, which was the first national park to propose the ZLI in Chinese mountainous tourism areas. The main aims and objectives of the study were the following: (1) What factors have significant impacts on tourists' intention to participate in the ZLI in mountainous tourism areas? (2) How much do they predict tourists' intention to participate in the ZLI? (3) How does the proposed model improve the predictive power of the original TPB model for tourists' intention to participate in the ZLI? The study attempted to propose an effective theoretical framework to explain the factors affecting tourists' intention to participate in the responsible litter management initiative and propose useful litter management suggestions to achieve environmentally friendly development in mountainous tourism areas.

## 2. Materials and methods

### 2.1. Theoretical foundation and hypotheses

#### 2.1.1. Theoretical foundation

The TPB developed from the TRA by adding a non-volitional predictive variable of perceived behavioral control (Ajzen and Fishbein, 1977). Based on the TPB, the behavioral intention was influenced two volitional variables of attitude toward the behavior (ATT) and subjective norms (SN), and a non-volitional variable of perceived behavioral control (PBC) (Ajzen, 1991). Specifically, the meaning of ATT is the positive or negative opinions on the behavior, SN is the perceived social pressure from referents (e.g., friends, leaders, peers, and family) to do or not do the action, PBC is the perceived ease or difficulty to do the action (Ajzen, 1991).

Previous studies of waste management have shown that ATT, SN, and PBC positively affected the behavioral intention in different contexts, including waste separation behavior (Zhang et al., 2015), waste recycling behavior (Botetzagias et al., 2015; Saphores et al., 2012), waste reduction (Li et al., 2018) and so on. Given existing research, these hypotheses were proposed:

**H1.** ATT significantly positive affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

**H2.** SN significantly positive affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

**H3.** PBC significantly positive affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

*2.1.2. Additional variables*

(1) personal norms and behavioral intention to participate in the ZLI

The meaning of personal norms is the moral obligation to do or not to do the specific behavior (Schwartz and Howard, 1981). Researchers also used moral norm, responsibility feeling, perception responsibility, and responsibility to refer to it. If an individual behavior is consistent with personal norms, there will be a sense of pride. If there is an inconsistency in behavior, the individual will have a sense of guilt (Onwezen et al., 2013). Personal norms refer to internal pressure; however, subjective norms refer to external pressure.

Previous studies have confirmed that personal norms positively affected the environmentally responsible behavioral intention (Harland et al., 1999; Li et al., 2018). Bortoleto et al. (2012) found that personal norms were the primary predictor and positively affected household waste prevention behavior. Chen and Tung (2014) found personal norms significantly changed the consumer intention to visit green hotels. These studies demonstrated that the environmentally responsible behavioral intention was driven not only by external norms (subjective norms) but also by internal norms (personal norms). Thus, this hypothesis was proposed:

**H4.** Personal norms significantly positive affect tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

(2) past behavior and behavioral intention to participate in the ZLI

Past behavior has been widely discussed in studies of individuals' decision-formation. Numerous studies have shown that past behavior was a good predictor for behavioral intention (Ajzen, 2011; Han et al., 2017; Ouellette and Wood, 1998). Knussen et al. (2004) indicated that past behavior positively affected the willingness to recycle household waste. Han et al. (2017) also showed tourists' past behavior is a significant positive factor in the willingness to participate in bicycle tourism. Extensive studies confirmed that past behavior played a key role in improving the predictive power of the original TPB by a meta-analysis (Ouellette and Wood, 1998). Based on these pieces of evidence, the study proposed the following hypothesis:

**H5.** Past behavior significantly positive affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

(3) incentive measures and behavioral intention to participate in the ZLI

The ZLI can be regarded as a collective action in public space, and as its long-term and collective interests may not offset individual costs, it is easy to produce the free-rider problem and the tragedy of the commons. Thus, tourists may tend to hitch a ride and refuse to take part in it. Based on the rational choice theory (Ostrom, 1998), the problem can be solved through several external behavioral interventions, such as incentive measures, which can increase personal objective rewards or motivations, thereby promoting altruistic behaviors (Ostrom, 2000).

In the face of new policies and initiatives, economic incentives (e.g., discounts and coupons) are crucial in influencing individuals to change their original behavioral intention (Thøgersen, 2003). Xu et al. (2018) found that economic incentives positively affected household waste separation intention. Besides, several studies also showed that non-economic incentives (e.g., a gift and honorary title) also had positive impacts when individuals faced new choices (Stern, 1999). Therefore, this study intended to add incentive measures as an independent variable to explain tourists' behavioral intention to participate in the ZLI, including economic incentives (e.g., lower ticket prices) and non-economic incentives (e.g., a gift and honorary title). Based on these findings, the study proposed the following hypothesis:

**H6.** Incentive measures significantly positive affect tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

(4) demographic variables and behavioral intention to participate in the ZLI

In previous studies, gender, age, and education were the most commonly considered demographic variables for individuals' behavioral intention. Several studies showed that even if demographic variables were statistically significant, their predictive power was usually relatively small (Hornik et al., 1995). However, several studies showed that demographic variables markedly improved the predictive power of the research model (Pakpour et al., 2014). Due to the lack of relatively published studies focusing on tourists' litter management behavior, so we reviewed papers examining individuals' household waste management behaviors to select them as control variables.

First, several studies suggest that women were more willing to recycle (Saphores et al., 2012), but Bortoleto et al. (2012) showed that men were more involved in family re-utilization activities, while other researchers found no relationship between gender and waste recycling (Do Valle et al., 2004). Second, several studies suggest that age had a positive correlation to household waste behaviors, with older persons being more willing to reduce waste (Pakpour et al., 2014; Scott, 1999), while others found insignificant relationship between age and household waste prevention behavior (Bortoleto et al., 2012; Werner and Makela, 1998). Third, the level of education also had an ambiguous relationship to household waste behaviors. Several studies suggested that educational level had a positive impact on household waste management (Bortoleto et al., 2012; Owens et al., 2000), but others found opposite results (Saphores et al., 2012; Werner and Makela, 1998).

Other demographic variables, such as income level, marital status, and profession, have also received attention. It is worth noting that these findings appear to be inconsistent in the different context of predicting intention or behavior (Do Valle et al., 2004; Hansmann et al., 2006). Therefore, to establish different policies with different groups, it is necessary to study the impact of demographic variables on tourists' intention to participate in the ZLI. Therefore, these hypotheses were proposed:

**H7.** Gender significantly affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

**H8.** Age significantly positive affects tourists' behavioral intention to participate in the ZLI in mountainous tourism areas.

**H9.** Educational level significantly positive affects tourists' behavioral intention to participate in the ZLI of in mountainous tourism areas.

*2.1.3. The proposed conceptual model*

Based on these reviews and hypotheses, the study extended the original TPB, including three independent variables of personal norms (PN), past behavior (PB), and incentive measures (IM), three demographic variables (gender, age, and educational level) as control

variables, and a dependent variable of behavioral intention (BI) to build a framework to explore factors influencing tourists' intention to participate in the ZLI (Fig. 1).

### 2.2. Methods

#### 2.2.1. Background of the research case

HNP is located in Huangshan City, southeastern China, which has 88 peaks with a height of >1000 m, and the three main peaks of "Lotus", "Guangmingding" and "Tiandu" are all over 1800 m above sea level, covering 160.6 $km^2$ in core areas (Fig. 2). The length of climbing trails is more than exceeding 50,000 m, and the width is about 1.8 m in HNP. The dustbins are set approximately every 100 m along climbing trails. Tourists produce an average of 15,000 kg of garbage per day along climbing trails, and reaches a peak of 30,000 kg per day during the peak period of tourism, mainly including paper, plastic, metal, glass, wood, organic waste. However, the particularity of natural mountain conditions makes managers face enormous litter disposal difficulties. The collection and transportation of tourism litter are artificial by sanitation workers along climbing trails. The cleaning area of sanitation workers is >90,000 $m^2$. For the authorities concerned, to protect the park's ecological environment, HNP invests a lot of workforce, material resources, and financial resources to deal with tourism litter every year.

In China, no matter in any place, tourists develop the habit of throwing litter into the trash can. Tourists considered that the litter collection and treatment process in the later period has nothing to do with them. Therefore, in mountainous tourism areas, the vast majority of tourists still maintain this habit. As a result, a large amount of litter is left in the trash can along the climbing trails, which brings enormous litter management pressure to the manager. The worse problem is that a small number of tourists cannot comply with the rules of civilized tourism, littering anywhere, and even throwing litter into the valley. However, it is worth noting that when litter is thrown into a valley or a cliff, sanitation workers need to risk their lives to clean up litter. Moreover, these evil and uncivilized events happen every day in HNP and other similar areas (Fig. 3).

To resolve the issue, HNP firstly proposed the Zero Litter Initiative (ZLI) in 2013. The purpose of the initiative is to reduce litter generation along the climbing trails and create a litter-free national park. The initiative has caused widespread concern in all walks of life. In China, several mountain-type tourist destinations have also launched this initiative. To better popularize this initiative, the study intended to analyze the factors influencing tourists' intention to participate in the ZLI in mountainous tourism areas.

#### 2.2.2. Measurement instruments

In this study, two parts comprised the questionnaire. The first part was the introduction to the research background and basic information of demographics. The second part was measurement items of seven constructs (Table 1). The measurement items in present study were mainly from previous environmental behavior studies, including ATT (Ajzen, 1991), SN (Ajzen, 1991; Han et al., 2017), PBC (Ajzen, 1991; López-Mosquera and Sánchez, 2012; Vagias et al., 2014), PN (Onwezen et al., 2013; Van Riper and Kyle, 2014), PB (Perugini and Bagozzi, 2001), IM (Lindenberg and Steg, 2007; Stern, 1999; Thøgersen, 2003), and BI (Ajzen, 1991; Vagias et al., 2014). The questionnaire used a five-point Likert scale to measure all items.

#### 2.2.3. Data collection

A pilot survey was conducted online for 50 interviewers traveled to HNP in recent years, and 35 samples were valid. Based on the results of the pilot survey, some ambiguous items and unreasonable wording were revised. Then, a formal questionnaire was formed. The formal questionnaire was distributed by six investigators, who were trained and informed about the background and goal of the survey. Convenience sampling technique has been adopted in HNP during 4th and 5th August 2017. The study issued 500 questionnaires, including 372 valid ones. The effective rate of questionnaires was 74.4%.

#### 2.2.4. Data analysis

In this study, the proposed hypothesized model was based on the TPB and previous studies. Therefore, the confirmatory factor analysis (CFA) was used to test the applicability of the data to the hypothesized measurement model by AMOS 21.0. Then, the hierarchical multiple regression was used to investigate the factors influencing tourists' intention to participate in the ZLI on climbing trails, and to test whether the proposed model improves the predictive power of the original TPB model in the context of tourists' responsible litter management behavior. In Model 1, as control variables, demographic variables were first entered, including gender (male = 0, female = 1), age (<14 = 1, 15–24 = 2, 25–44 = 3, 45–65 = 4), and educational level (Primary school = 1, Junior high school = 2, Senior high school = 3, technical school = 4, undergraduate degree = 5, postgraduate degree = 6). In Model 2, ATT, SN, and PBC were included. In Model 3, PN, PB, and IM were added.

## 3. Results

### 3.1. Sample demographics

The sample demographics were provided in Table 2. The gender ratio was almost the same. Respondents were relatively young and had a high level of education. More than half of the respondents had a relatively high monthly income level, and their monthly income exceeded 3500 RMB (50.3%). 59.1% of respondents traveled with family members, and others traveled with their friends, colleagues, classmates or alone.

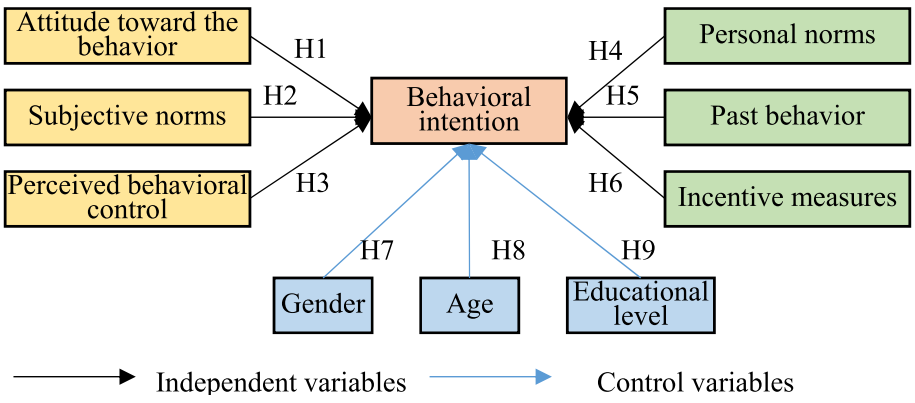


**Fig. 1.** Proposed conceptual model.

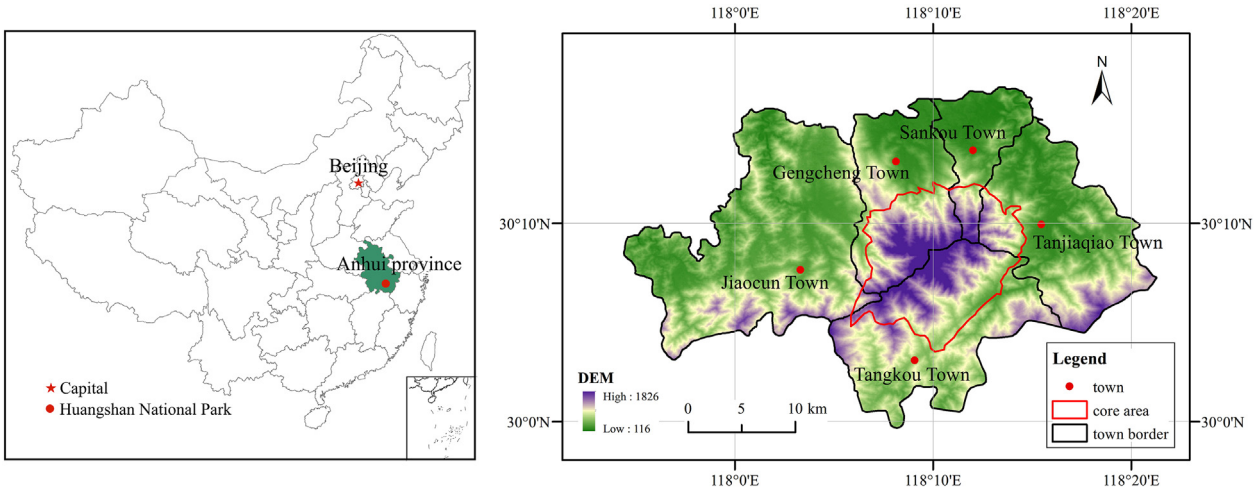


**Fig. 2.** Map of the study areas. Note 1: the figure on the left shows the location of HNP in China and the right one is the administrative map which shows the location of the core area. Note 2: the administrative map was obtained from National Geomatics center of China (http://www.ngcc.cn/), and the DEM was from ASTER GDEM V2 dataset with a resolution of 30 m (https://ssl.jspacesystems.or.jp/ersdac/GDEM/E/1.html).

### 3.2. Descriptive statistical analysis

The general characteristics of the sample data are as follows (Table 3). The mean score (4.15) of the behavioral intention (BI) was high, which showed that tourists had a strong intention to participate in the ZLI. Therefore, the action would be a viable option for trail litter management. The mean score (4.46) of ATT showed tourists had a positive attitude toward the ZLI. The mean score (4.08) of SN showed social pressure might help to participate in the ZLI. The mean score of PBC was 3.96, indicating that the action is not a difficult task in itself, but there are still some external obstacles, such as lack of litter bags, lack of time and improper routes. Therefore, PBC must be strengthened to reduce behavioral obstacles.

The mean score (4.38) of PN showed that tourists had a strong sense of obligation to take action for the ZLI. The mean score (3.16) of PB was low, which meant respondents rarely participated in the ZLI-related

**Fig. 3.** Artificial collection and transportation of litter in HNP. Note 1: the resource of pictures that the website of the picture ① is https://mp.weixin.qq.com/s/a2CTRlj9Jjo7FbI4r80EMA, the picture ② is http://k.sina.com.cn/article_6439976759_17fda3f3700100au7o.html, the picture ③ is http://www.sohu.com/a/257461438_743608, and the picture ④ is https://a.xcar.com.cn/bbs/thread-13986850-0-15.html. Note 2: pictures ① and ② showed a sanitation worker was collecting litter on a rock wall and the climbing trails. Pictures ③ and ④ showed the porters transported litter to the foot of Huangshan mountain.

**Table 1**
Measurement items.

| Constructs | Items and sources |
|---|---|
| ATT | Attitude toward the behavior (Ajzen, 1991)<br>For me, bringing self-generated litter down the mountain is |
| ATT1 | Very unbeneficial (1) - very beneficial (5). |
| ATT2 | Very foolish (1) - very wise (5). |
| ATT3 | Very meaningless (1) - very meaningful (5). |
| SN | Subjective norms (Ajzen, 1991; Han et al., 2017) |
| SN1 | People who are important to me think I should bring self-generated litter down the mountain. |
| SN2 | People who are important to me would want me to bring self-generated litter down the mountain. |
| SN3 | People whose opinions I value would wish me to bring self-generated litter down the mountain. |
| PBC | Perceived behavioral control (Ajzen, 1991; López-Mosquera and Sánchez, 2012; Vagias et al., 2014) |
| PBC1 | I have enough physical strength to carry all my litter when I travel up and down the mountain. |
| PBC2 | I have bags for taking self-generated litter. |
| PBC3 | My tour route and time would be convenient to bring self-generated litter down the mountain. |
| PBC4 | If I want to, I could easily engage in bringing self-generated litter down the mountain. |
| PN | Personal norms (Onwezen et al., 2013; Van Riper and Kyle, 2014) |
| PN1 | The behavior made me think of myself as an environmentally responsible tourist. |
| PN2 | If I bring self-generated litter down the mountain, I will feel that I am contributing to the environmental protection of the national park. |
| PN3 | If I bring self-generated litter down the mountain, I will be proud of it. |
| PB | Past behavior (Perugini and Bagozzi, 2001) |
| PB1 | In the past two years, did you bring a garbage bag when traveling? |
| PB2 | In the past two years, did you participate in the zero litter initiative related activities? |
| PB3 | In the past two years, did you consciously take litter out of the tourism area? |
| IM | Incentive measures (Lindenberg and Steg, 2007; Stern, 1999; Thøgersen, 2003) |
| IM1 | If the ticket price is lower as a reward, I will engage in bringing self-generated litter down the mountain. |
| IM2 | If I receive some small gifts (e.g., bottled water, postcard, and souvenir) as incentives, I will engage in bringing self-generated litter down the mountain. |
| IM3 | If I receive an environmentally friendly tourist medal, I will engage in bringing self-generated litter down the mountain. |
| BI | Behavioral intention (Ajzen, 1991; Vagias et al., 2014) |
| BI1 | I am planning to engage in bringing self-generated litter down the mountain in the near future. |
| BI2 | I am willing to engage in bringing self-generated litter down the mountain in the near future. |
| BI3 | I will make an effort to engage in bringing self-generated litter down the mountain in the near future. |

Note 1: ATT = attitude toward the behavior, SN = subjective norms, PBC = perceived behavioral control, PN = personal norms, PB = past behavior, IM = incentive measures, BI = behavioral intention.
Note 2: SB, PBC, PN, IM, and BI were measured from strongly disagree (1) - strongly agree (5); PB was measured from never (1) to always (5).

**Table 2**
Demographics of respondents and control variables (n = 372).

| Variable | N | % |
|---|---|---|
| Gender | | |
| Male = 0 | 188 | 50.5 |
| Female = 1 | 184 | 49.5 |
| Educational level | | |
| Primary school = 1 | 23 | 6.2 |
| Junior high school = 2 | 48 | 12.9 |
| Senior high school = 3 | 62 | 16.7 |
| Technical school = 4 | 48 | 12.9 |
| Undergraduate degree = 5 | 166 | 44.6 |
| Postgraduate degree = 6 | 25 | 6.7 |
| Travel companions | | |
| Family members | 220 | 59.1 |
| Friends/colleagues/classmates | 131 | 35.3 |
| Alone | 21 | 5.6 |
| Age (M = 27.11) | | |
| <14 = 1 | 48 | 12.9 |
| 15–24 = 2 | 124 | 33.3 |
| 25–44 = 3 | 176 | 47.3 |
| 45–65 = 4 | 24 | 6.5 |
| Monthly income (RMB) | | |
| Under 3000 | 181 | 48.7 |
| 3501–5000 | 93 | 25.0 |
| 5001–8000 | 51 | 13.7 |
| 8001–12,500 | 25 | 6.7 |
| Over 12,500 | 22 | 6.0 |

activities. Among situational factors, IM was useful for stimulating litter management behavior. The mean score of IM1 (lower ticket price) was relatively higher than IM2 (small gifts: bottled water, postcard, or souvenir) and IM3 (an environmentally friendly tourist medal), which meant respondents preferred economic incentives, rather than physical (IM2) and spiritual (IM3) ones.

The reliability the validity tests of this questionnaire (Table 3) by the SPSS 21.0 showed that the Cronbach's alpha coefficients were between 0.794 and 0.914 (a value over 0.7 was generally required), which indicated that the scales were highly reliable. In addition, through the KMO measure (a value over 0.6 is typically required), the chi-square values of Bartlett's test of sphericity, and the significance testing, the results showed that the data were suitable to factor analysis (KMO = 0.899, Bartlett's test of sphericity = 5305.710, $P < 0.001$). Furthermore, Multivariate linear tests were conducted by examining the variance inflation factor (VIF) scores of the linear regression of independent variables. The value of VIF (<10) indicates that there was no multicollinearity.

### 3.3. Confirmatory factor analysis

The result of the CFA with a maximum likelihood showed that the measurement model had a good fit (Chi/df = 2.171, RMSEA = 0.056, GFI = 0.910, CFI = 0.961, IFI = 0.962, TLI = 0.952, NFI = 0.931). In general, the criteria of reference were that the Chi/df was under 3, RMSEA was under 0.08, GFI, CFI, IFI, TLI, and NFI were above 0.09 (Hu and Bentler, 1999). All composite reliability (CR) values were from 0.797 to 0.916 and above the limitation of 0.6, indicating that the internal consistency of all variables was good (Bagozzi and Yi, 1988). Besides, the convergent validity was evaluated via the standardized factor loadings and the average variance extracted (AVE). The AVE values were from 0.567 to 0.784 and above the limitation of 0.5. The standardized factor loadings were from 0.678 to 0.976 and above the limitation of 0.6 (Chin et al., 2008; Fornell and Larcker, 1981). The findings indicated that the convergent validity was adequate (see Table 3). Furthermore, the discriminant validity was evaluated by AVE and correlation coefficients. Based on the research of Fornell and Larcker (1981), if the correlation coefficients were less than the square root of AVE of the latent, the discriminant validity was adequate. The findings showed that the correlation coefficients were less than the square root of AVE (see Table 4), which represent that the discriminant validity was good.

So overall, the reliability, convergent validity, and discriminant validity of the measurement model were acceptable, and the collected data was applicable to the measurement model.

### 3.4. Hierarchical regression analysis of variables

The study used the hierarchical regression to assess the predictive power of the extended TPB. The results were shown in Table 5. In Model 1, the three control variables (gender, age, and educational level) were collectively able to explain 2.1% of the variance in BI ($R^2$ = 0.021, $F(3, 368) = 2.658$, $P < 0.05$). The result confirmed a previous study showing that demographic variables had significant influences on tourists' intention, but their explanatory power was small (Hornik et al., 1995). The influence of gender was significant, and the β value was 0.143 ($P < 0.01$), indicating that females had a stronger intention

**Table 3**
Means, standard deviations, reliability, and convergent validity of items.

| Variable | Items | Mean | S.D. | Standardized loading | T-value | Cronbach's alpha | C.R. | AVE |
|---|---|---|---|---|---|---|---|---|
| ATT | ATT1 | 4.53 | 0.607 | 0.723 | | 0.854 | 0.856 | 0.665 |
| | ATT2 | 4.38 | 0.680 | 0.835 | 14.975 | | | |
| | ATT3 | 4.47 | 0.645 | 0.881 | 15.428 | | | |
| SN | SN1 | 4.11 | 0.954 | 0.847 | | 0.914 | 0.915 | 0.782 |
| | SN2 | 4.04 | 0.965 | 0.908 | 22.688 | | | |
| | SN3 | 4.10 | 0.928 | 0.898 | 22.343 | | | |
| PBC | PBC1 | 4.06 | 1.034 | 0.824 | | 0.861 | 0.865 | 0.616 |
| | PBC2 | 3.86 | 1.147 | 0.822 | 17.626 | | | |
| | PBC3 | 3.75 | 1.146 | 0.806 | 17.216 | | | |
| | PBC4 | 4.16 | 0.994 | 0.678 | 13.803 | | | |
| PN | PN1 | 4.41 | 0.791 | 0.867 | | 0.892 | 0.899 | 0.748 |
| | PN2 | 4.42 | 0.792 | 0.902 | 23.164 | | | |
| | PN3 | 4.32 | 0935 | 0.824 | 19.996 | | | |
| PB | PB1 | 3.33 | 1.116 | 0.725 | | 0.794 | 0.797 | 0.567 |
| | PB2 | 2.77 | 1.244 | 0.732 | 11.963 | | | |
| | PB3 | 3.39 | 1.155 | 0.800 | 12.394 | | | |
| IM | IM1 | 4.22 | 1.027 | 0.844 | | 0.890 | 0.898 | 0.747 |
| | IM2 | 4.06 | 1.055 | 0.976 | 22.562 | | | |
| | IM3 | 3.95 | 1.198 | 0.759 | 17.617 | | | |
| BI | BI1 | 4.15 | 0.877 | 0.831 | | 0.913 | 0.916 | 0.784 |
| | BI2 | 4.19 | 0.837 | 0.936 | 23.094 | | | |
| | BI3 | 4.12 | 0.883 | 0.886 | 21.470 | | | |

Note 1: ATT = attitude toward the behavior, SN = subjective norms, PBC = perceived behavioral control, PN = personal norms, PB = past behavior, IM = incentive measures, BI = behavioral intention.

than males. However, age and the educational level were not significant at the significance level of 0.05.

In Model 2, the three independent variables of ATT, SN, and PBC were added. The explanatory power was reached at 46.2% ($R^2$ = 0.462, F (3, 365) = 52.199, P < 0.001). The explained increment of Model 2 was significant ($\Delta R^2$ = 0.441, ΔF (3, 365) = 99.604, ΔP < 0.001). In other words, in the case of controlling demographic variables, the independent variables of ATT, SN, and PBC significantly increased the variance of BI explained by 44.1%. The largest contribution was PBC (β = 0.296, P < 0.001). The influence of ATT and SN were also significant, and the β values were 0.261 (P < 0.001) and 0.262 (P < 0.001), indicating that their impact on the dependent variable BI was positive. It is worth noting that the control variables of gender and age were also significant in Model 2 (see Fig. 4). However, the explanatory power of gender has decreased from 0.143 to 0.124 (P < 0.001), and the explanatory power of age has increased from 0.024 (P > 0.05) to 0.105 (P < 0.05), reaching a significance level of 0.05. The β value of age was greater than zero, indicating that its impact on BI was positive.

In Model 3 (see Fig. 5), the independent variables of PN, PB and IM were added, which explained an additional 11.0% of the variance in BI. The explained increment of Model 3 was significant ($\Delta R^2$ = 0.110, ΔF (3, 362) = 31.102, ΔP < 0.001). In total, the extended TPB in Model 3 was able to explain 57.2% of the variance in BI ($R^2$ = 0.572, F (9, 362) = 53.766, P < 0.001). In other words, in the case of controlling demographic variables, the influences of ATT, SN, PBC, PN, and PB were all significant, and the β values were 0.114 (P < 0.01), 0.155 (P < 0.001), 0.125 (P < 0.01), 0.388 (P < 0.001), and 0.159 (P < 0.001). The largest contribution is PN in Model 3. The β values were all greater than zero, indicating that their impact on BI was positive. However, the independent variable of IM was not significant (β = 0.062, P > 0.05). Thus, H1, H2, H3, H4, and H5 were all supported. However, H6 was rejected.

The control variables of gender, age, and educational level were also significant in Model 3 (see Fig. 5). The β values were 0.081, 0.090, −0.102 and reached a significance level of 0.05. Thus, H7 and H8 were both supported, and H9 was partly supported. The explanatory power of gender further decreased from 0.124 to 0.081 (P < 0.05), and the explanatory power of age also decreased from 0.105 to 0.090 (P < 0.05). The β values of gender and age were greater than zero, indicating that their impact on BI was positive, while the explanatory power of educational level has increased from −0.052 (P > 0.05) to −0.102 (P < 0.05), reaching a significance level of 0.05. The β value of educational level was lower than zero, indicating that its impact on BI was negative. Moreover, gender was a significant predictor of BI in all models that females had stronger intention than males. Age was a significant and positive predictor of BI in Model 2 and Model 3, while the educational level was only significant in Model 3, and the impact was negative.

**Table 4**
The discriminant validity of latent variables.

| Variable | ATT | SN | PBC | PN | PB | IM | BI |
|---|---|---|---|---|---|---|---|
| ATT | 0.815 | | | | | | |
| SN | 0.536 | 0.884 | | | | | |
| PBC | 0.446 | 0.697 | 0.784 | | | | |
| PN | 0.651 | 0.603 | 0.629 | 0.865 | | | |
| PB | 0.322 | 0.411 | 0.463 | 0.355 | 0.752 | | |
| IM | 0.248 | 0.183 | 0.219 | 0.427 | 0.140 | 0.864 | |
| BI | 0.553 | 0.607 | 0.608 | 0.745 | 0.476 | 0.346 | 0.885 |

Note 1: ATT = attitude toward the behavior, SN = subjective norms, PBC = perceived behavioral control, PN = personal norms, PB = past behavior, IM = incentive measures, BI = behavioral intention.
Note 2: diagonal values indicated the square root of AVE of each latent variable.
Note 3: underneath of diagonal indicated the correlation matrix of latent variables.

## 4. Discussion

### 4.1. Factors influencing tourists' intention to participate in the ZLI

#### 4.1.1. Influence of ATT, SN, and PBC on tourists' behavioral intention

Tourists' ATT, SN and PBC positively affected their behavioral intention to participate in the ZLI in the Model 2 and Model 3. Similar to previous research results, tourists' environmentally responsible intention was significantly and positively influenced by ATT, SN, and PBC (Verma and Chandra, 2018; C. Wang et al., 2018a). The effect of ATT on tourists' intention showed that tourists' positive opinions on the ZLI affected their intention. Therefore, tourists' managers should pay more attention to making tourists feel positive impacts of bringing their litter down the mountain, such as reducing water and soil pollution, reducing infectious disease spread via insects, and improving the cleanliness of the trails. In addition, the influence of SN on tourists' intention showed the pressure from salient referents (e.g., family, classmates, friends, and colleagues) can increase the tourists' behavioral intention to participate in the ZLI. Thus, it is necessary to promote relevant policies for the public that can to raise their environmental

**Table 5**
Hierarchical regression analysis of tourists' intention to participate in the ZLI.

| Variables | Model 1 | | Model 2 | | Model 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | β | t-Value | β | t-Value | β | t-Value | Collinearity statistics | |
| | | | | | | | Tolerance | VIF |
| Gender | 0.143** | 2.764 | 0.124*** | 3.207 | 0.081* | 2.338 | 0.977 | 1.023 |
| Age | 0.024 | 0.399 | 0.105* | 2.303 | 0.090* | 2.188 | 0.702 | 1.424 |
| Education | 0.017 | 0.275 | −0.052 | −1.152 | −0.102* | −2.474 | 0.696 | 1.436 |
| ATT | | | 0.261*** | 5.847 | 0.114** | 2.662 | 0.641 | 1.560 |
| SN | | | 0.262*** | 5.056 | 0.155*** | 3.223 | 0.514 | 1.944 |
| PBC | | | 0.296*** | 5.992 | 0.125** | 2.613 | 0.515 | 1.941 |
| PN | | | | | 0.388*** | 7.644 | 0.459 | 2.180 |
| PB | | | | | 0.159*** | 4.155 | 0.809 | 1.237 |
| IM | | | | | 0.062 | 1.603 | 0.799 | 1.252 |
| Model summary | | | | | | | | |
| F | 2.658* | | 52.199*** | | 53.766*** | | | |
| $R^2$ | 0.021 | | 0.462 | | 0.572 | | | |
| ΔF | 2.658* | | 99.604*** | | 31.102*** | | | |
| $\Delta R^2$ | 0.021 | | 0.441 | | 0.110 | | | |

Note 1: ATT = attitude toward the behavior, SN = subjective norms, PBC = perceived behavioral control, PN = personal norms, PB = past behavior, IM = incentive measures, BI = behavioral intention.
* Significance at P < 0.05.
** Significance at P < 0.01.
*** Significance at P < 0.001.

awareness and create an atmosphere of responsible travel. Furthermore, tourists' PBC positively influenced their intention, indicating that tourists' perception of easy to participate in the responsible tourism litter management was effective to increase their behavioral intention.

*4.1.2. Influence of PN, PB, and IM on tourists' behavioral intention*

In the present study, tourists' PN was the strongest factor of their intention to participate in the ZLI. In model 3, the result revealed that tourists' moral obligation and perception responsibility for reducing tourism litter generation was the most important determinant. In line with past studies, PN was the main predictor and positively affected household waste prevention behavioral intention (Bortoleto et al., 2012; Pakpour et al., 2014). Therefore, for managers, environmentally responsible education activities in the future should pay more attention to tourist's personal perceived responsibility of tourism litter management. If tourists form a sense of responsibility, it will help attract more tourists to participate in responsible tourism litter management projects. The result also demonstrated that environmentally responsible behavioral intention was driven not only by external norms (SN) but also by internal norms (PN) (Chen and Tung, 2014).

Besides, tourists' PB was the second strongest predictor for their intention, the frequency and habits of past behaviors help improve tourists' intention to participate in the ZLI. Similarly, several previous studies also confirmed that PB played a key role in individual environmentally responsible behavioral intention (Knussen et al., 2004). This result indicated that visitors' past environmentally responsible behavioral experiences would help to increase their willingness to participate in new environmentally responsible behaviors. This is a positive cycle process. Relevant management departments advocate more environmentally responsible tourism activities. Then, tourist will have more opportunities to participate in these activities. Thus, for tourists, the more past experiences would bring the more willingness to participate in new activities. Finally, tourism will achieve the environmentally friendly development.

In contrast to prior studies (Thøgersen, 2003; Xu et al., 2018), the study found that the impact of incentive measures on tourists' intention to participate in the ZLI was not significant. This result may be because incentive measures are used in the public space, and so participants may fear that others will mistake their altruistic motives as resulting from incentive measures. However, if incentive measures are used in private space (e.g., household), participants may not fear such a misunderstanding. This phenomenon is called the "crowding-out effect" of incentive measures (Ariely et al., 2009). Hence, unlike private space, incentive measures were not a significant influencing factor for tourists' intention to participate in the ZLI in public space.

*4.1.3. Influence of gender, age, and educational level on tourists' behavioral intention*

As for demographic variables, the results of Model 3 indicated that tourists' gender, age, and educational level had significant impacts on their intention to participate in the ZLI. The results can help different publicity and education efforts for different groups of tourists.

First of all, females had stronger participation intention than males. The result was similar to Yue et al. (2013), women were more willing to participate in responsible environmental behavior. The reason for this result may be that women have taken on more household waste disposal work in their daily family life, so they still have a stronger environmental awareness during the travel process. Thus, managers should

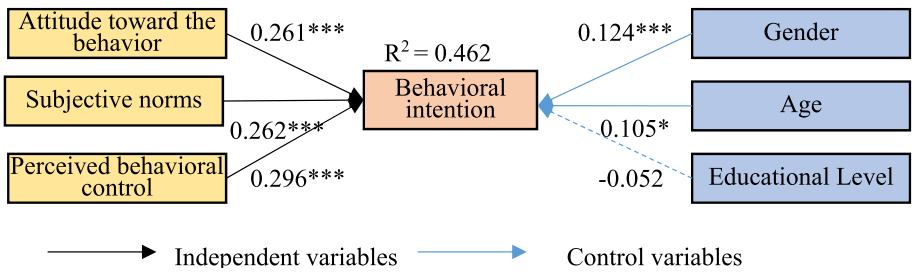


**Fig. 4.** Results of the proposed model 2. Note1: *** significance at P < 0.001, ** significance at P < 0.01; *significance at P < 0.05; the solid line is the significant path, but the dotted line is not.

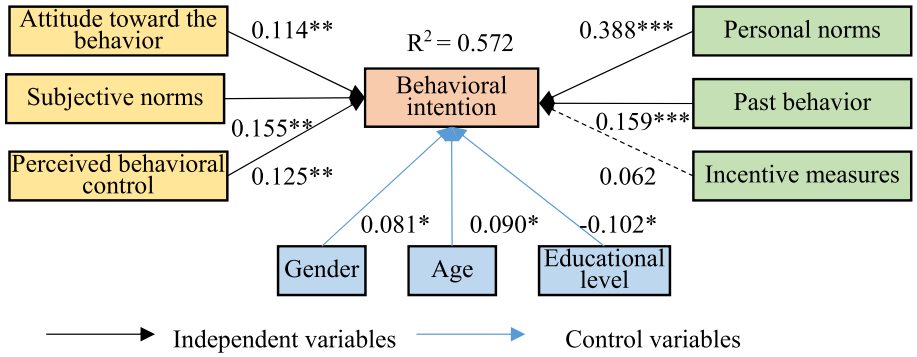


**Fig. 5.** Results of the proposed model 3. Note1: *** significance at P < 0.001, ** significance at P < 0.01; *significance at P < 0.05; the solid line is the significant path, but the dotted line is not.

preferably develop educational materials for males and encourage them to participate in the ZLI. In addition, age had a significantly positive impact on tourists' intention to participate in the ZLI. This result may be since that older people have a greater sense of urgency and hope to leave better resources for future generations and achieve sustainable development across generations. However, in the long run, the willingness of young people to participate in the ZLI is more important, and they are key groups in the widespread promotion of the initiative. Thus, for managers, the younger tourists are the focus of the environmental publicity and education about encouraging them to participate in the ZLI. Furthermore, in contrast to general cognition, educational level exhibited a negative relationship with tourists' intention to participate in the ZLI. However, at this stage of China, older people have a relatively lower level of education than younger people. Thus, the result was reasonable in China. Environmental organizations, schools, and other related departments should continue to educate people about the public health and environmental impacts of tourism litter.

### 4.2. Implications

From a theoretical standpoint, to fill the gap of previous research on the tourists' environmentally responsible behavior in tourism litter management, this study used the original and extended TPB model to analyze tourists' intention to participate in the ZLI. For the original TPB, all variables (ATT, SN, and PBC) exerted significant and positive influences on tourists' intention to participate in the ZLI. However, the original TPB ignores some necessary factors for the explication of tourist's decision-making process (e.g., PN, PB, and IM), and its predictive power and adequacy are repeatedly questioned. Therefore, this study proposed the extended TPB model to improve the predictive power for tourists' decision formation. In contrast to the original TPB model, three independent variables (PN, PB, and IM) and three demographic variables (gender, age, and educational level) as control variables were added into the extended TPB. Indeed, in the context of tourists' responsible litter management behavior, our proposed model improved the predictive power of the original TPB model for tourists' behavioral intention, and the explained variance increases from 46.2% to 57.2%. The explained increment of the extended TPB model was significant ($\Delta R^2 = 0.110$, $\Delta F\,(3, 362) = 31.102$, $\Delta P < 0.001$). The increased ability of the extended TPB model confirmed the need and applicability of adding other variables besides ATT, SN, and PBC. Especially, tourists' PN and PB were the two factors that had the greatest influences on the behavioral intention to participate in responsible litter management. Compared with the original TPB model, the results showed that the extended TPB was suitable for analyzing the tourists' environmentally responsible behavioral intention to participate in the ZLI. The findings also implied that the theoretical mechanism was more complicated than the interpretation of the original TPB model in explaining tourists' environmentally responsible behavioral intention. Thus, our study provides a new and more complete theoretical basis for the study of tourist litter management behavior.

From a practical standpoint, the study paid attention to the emerging concept called ZLI in China, which was a new tourism litter management method to reduce litter generation along climbing trails in mountainous tourism areas. At the same time, the results provided a lot of valuable practical experience for solving tourism litter issues in other similar mountainous tourism areas of other countries and regions. First of all, according to the finding that PN was the most important factor in the context of tourists' responsible litter management. Thus, the awareness of tourists' environmental responsibility is crucial to reduce tourism litter generation. In addition, males and younger tourists tended to have lower intention to participate in tourism litter management. Therefore, for males and younger tourists, it is necessary to provide more information about the negative ecological impact of tourism litter and the positive impact of responsible tourism litter management behavior. The aim is to change their attitudes and raise awareness of responsibility through environmental education activities. Furthermore, more convenient facilities, such as adding more garbage bag supply stations, should be provided for tourists that will make them perceive the ease to join in the environmentally responsible behavior and facilitate the performance of the behavior.

### 4.3. Limitations and future research directions

There are several research limitations and opportunities for future improvement in this study. First of all, under the premise of controlling the gender, age, and education level variables, the overall variance of the final model interpretation ranged from 46.2% to 57.2%, which indicated that the extended TPB could explain determinants of tourists' litter management intention in mountainous tourism areas. Despite the explanatory power of the final model was not bad, the 42.8% variance was still not explained. Future studies may consider improving and increasing the indicator variables to improve the explained variance. Besides, tourists' intention to participate in the responsible tourism litter management project was just a hypothesis which was not demonstrated in the real field. Although the actual behavior of an individual is mainly determined by the intention to act, there will be inconsistent in many cases (Ajzen, 1991). Therefore, for tourists' responsible litter management behavior, a detailed study will be necessary for future studies to verify the consistency between tourists' intention and their actual behavior.

Furthermore, the study comprehensively examined the influence of the three types of incentive measures, including economic and non-economic incentives, and found that the effect of incentive measures on the behavioral intention was not significant. Future research can focus on the differences in the impact of different incentive measures on behavioral intention and verify whether there is a crowding-out effect for collective action in public space. That would also be interesting

in the future to check whether the punishment could be an equal/superior/inferior predictor of intention as compared to incentives.

## 5. Conclusions

This study used the extended TPB to analyze factors influencing tourists' intention to participate in the ZLI in mountainous tourism areas. The model proposed in this study successfully improved the predictive power of the original TPB model. The relationships were assessed through hypotheses testing by employing the hierarchical regression analysis. First, tourists had a strong intention to participate in the responsible tourism litter management project. Tourists' ATT, SN, PBC, PN, and PB had significant influences on tourists' intention to participate in the ZLI, and tourists' PN was the strongest predictor. Second, the impact of IM on the behavioral intention was not significant. There may be a "crowding-out effect" on intrinsic motivations for collective action in public space. Third, the demographic variables (gender, age, and educational level) had significant influences on tourists' intention. Tourist of females, older, and lower educational level were more willing to participate in the ZLI.

As an environmentally responsible litter management project, the ZLI is a new attempt to reduce litter generation on climbing trails in China. This study introduced the pro-environmental concept of tourism litter management to other similar tourism sites. At the same time, the results provided the scientific basis and useful litter management suggestions to other countries for solving tourism litter issues to achieve environmentally friendly development in mountainous tourism areas.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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## References

Ajzen, I., 1991. The theory of planned behavior. Organ. Behav. Hum. Decis. Process. 50 (2), 179–211.
Ajzen, I., 2011. The theory of planned behaviour: reactions and reflections. Psychol. Health 26 (9), 1113–1127.
Ajzen, I., Fishbein, M., 1977. Attitude-behavior relations: a theoretical analysis and review of empirical research. Psychol. Bull. 84 (5), 888–918.
AnhuiDaily, 2015. 100,000 Tourists Bringing Self-generated Litter Down the Mountain in Huangshan National Park (Accessed 29 June 2018).
Ariely, D., Bracha, A., Meier, S., 2009. Doing good or doing well? Image motivation and monetary incentives in behaving prosocially. Am. Econ. Rev. 99 (1), 544–555.
Bagozzi, R.P., Yi, Y., 1988. On the evaluation of structural equation models. J. Acad. Mark. Sci. 16 (1), 74–94.
Bortoleto, A.P., Kurisu, K.H., Hanaki, K., 2012. Model development for household waste prevention behaviour. Waste Manag. 32 (12), 2195–2207.
Botetzagias, I., Dima, A.-F., Malesios, C., 2015. Extending the theory of planned behavior in the context of recycling: the role of moral norms and of demographic predictors. Resour. Conserv. Recycl. 95, 58–67.
Campbell, M.L., Slavin, C., Grage, A., Kinslow, A., 2016. Human health impacts from litter on beaches and associated perceptions: a case study of 'clean' Tasmanian beaches. Ocean Coast. Manag. 126, 22–30.
Chan, L., Bishop, B., 2013. A moral basis for recycling: extending the theory of planned behaviour. J. Environ. Psychol. 36, 96–102.
Chen, M.-F., Tung, P.-J., 2014. Developing an extended theory of planned behavior model to predict consumers' intention to visit green hotels. Int. J. Hosp. Manag. 36, 221–230.
Chen, G., Jiang, M., Chen, B., Yang, Z., Lin, C., 2006. Emergy analysis of Chinese agriculture. Agric. Ecosyst. Environ. 115 (1–4), 161–173.
Chin, W.W., Peterson, R.A., Brown, S.P., 2008. Structural equation modeling in marketing: some practical reminders. J. Market. Theory. Prac. 16 (4), 287–298.
Cingolani, A.M., Barberá, I., Renison, D., Barri, F.R., 2016. Can persuasive and demonstrative messages to visitors reduce littering in river beaches? Waste Manag. 58, 34–40.
Deng, J., Sun, P., Zhao, F., Han, X., Yang, G., Feng, Y., 2016. Analysis of the ecological conservation behavior of farmers in payment for ecosystem service programs in eco-environmentally fragile areas using social psychology models. Sci. Total Environ. 550, 382–390.
Do Valle, P.O., Reis, E., Menezes, J., Rebelo, E., 2004. Behavioral determinants of household recycling participation: the Portuguese case. Environ. Behav. 36 (4), 505–540.
Ezeah, C., Fazakerley, J., Byrne, T., 2015. Tourism waste management in the European Union: lessons learned from four popular EU tourist destinations. Amer. J. Clim. Chang. 4 (05), 431–445.
Fornara, F., Pattitoni, P., Mura, M., Strazzera, E., 2016. Predicting intention to improve household energy efficiency: the role of value-belief-norm theory, normative and informational influence, and specific attitude. J. Environ. Psychol. 45, 1–10.
Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Mar. Res. 39–50.
Goldenhar, L.M., Connell, C.M., 1993. Understanding and predicting recycling behavior: an application of the theory of reasoned action. J. Environ. Syst. 22 (91-91.
Han, H., Hsu, L.-T.J., Sheu, C., 2010. Application of the theory of planned behavior to green hotel choice: testing the effect of environmental friendly activities. Tour. Manag. 31 (3), 325–334.
Han, H., Meng, B., Kim, W., 2017. Emerging bicycle tourism and the theory of planned behavior. J. Sustain. Tour. 25 (2), 292–309.
Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P., Scholz, R.W., 2006. Justifications and self-organization as determinants of recycling behavior: the case of used batteries. Resour. Conserv. Recycl. 47 (2), 133–159.
Harland, P., Staats, H., Wilke, H.A., 1999. Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. J. Appl. Soc. Psychol. 29 (12), 2505–2528.
Hornik, J., Cherian, J., Madansky, M., 1995. Determinants of recycling behavior: a synthesis of research results. J. Socio-Econ. 24 (1), 105–127.
Hu, L.t., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Model. 6 (1), 1–55.
Hu, H., Zhang, J., Chu, G., Yang, J., Yu, P., 2018. Factors influencing tourists' litter management behavior in mountainous tourism areas in China. Waste Manag. 79, 273–286.
Kaseva, M.E., Moirana, J.L., 2010. Problems of solid waste management on Mount Kilimanjaro: a challenge to tourism. Waste Manag. Res. 28 (8), 695–704.
Knussen, C., Yule, F., MacKenzie, J., Wells, M., 2004. An analysis of intentions to recycle household waste: the roles of past behaviour, perceived habit, and perceived lack of facilities. J. Environ. Psychol. 24 (2), 237–246.
Kuniyal, J.C., Jain, A.P., Shannigrahi, A.S., 2003. Solid waste management in Indian Himalayan tourists' treks: a case study in and around the Valley of Flowers and Hemkund Sahib. Waste Manag. 23 (9), 807–816.
Li, J., Zuo, J., Cai, H., Zillante, G., 2018. Construction waste reduction behavior of contractor employees: an extended theory of planned behavior model approach. J. Clean. Prod. 172, 1399–1408.
Lindenberg, S., Steg, L., 2007. Normative, gain and hedonic goal frames guiding environmental behavior. J. Soc. Issues 63 (1), 117–137.
López-Mosquera, N., Sánchez, M., 2012. Theory of Planned Behavior and the Value-Belief-Norm Theory explaining willingness to pay for a suburban park. J. Environ. Manag. 113, 251–262.
Ojedokun, O., 2011. Attitude towards littering as a mediator of the relationship between personality attributes and responsible environmental behavior. Waste Manag. 31 (12), 2601–2611.
Onwezen, M.C., Antonides, G., Bartels, J., 2013. The norm activation model: an exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. J. Econ. Psychol. 39, 141–153.
Ostrom, E., 1998. A behavioral approach to the rational choice theory of collective action: presidential address, American Political Science Association, 1997. Am. Polit. Sci. Rev. 92 (1), 1–22.
Ostrom, E., 2000. Collective action and the evolution of social norms. J. Econ. Perspect. 14 (3), 137–158.
Ouellette, J.A., Wood, W., 1998. Habit and intention in everyday life: the multiple processes by which past behavior predicts future behavior. Psychol. Bull. 124 (1), 54.
Owens, J., Dickerson, S., Macintosh, D.L., 2000. Demographic covariates of residential recycling efficiency. Environ. Behav. 32 (5), 637–650.
Pakpour, A.H., Zeidi, I.M., Emamjomeh, M.M., Asefzadeh, S., Pearson, H., 2014. Household waste behaviours among a community sample in Iran: an application of the theory of planned behaviour. Waste Manag. 34 (6), 980–986.
Perugini, M., Bagozzi, R.P., 2001. The role of desires and anticipated emotions in goal-directed behaviours: broadening and deepening the theory of planned behaviour. Brit. J. Soc. Psychol. 40 (1), 79–98.
Rodríguez-Rodríguez, D., 2012. Littering in protected areas: a conservation and management challenge–a case study from the Autonomous Region of Madrid, Spain. J. Sustain. Tour. 20 (7), 1011–1024.
Saphores, J.-D.M., Ogunseitan, O.A., Shapiro, A.A., 2012. Willingness to engage in a pro-environmental behavior: an analysis of e-waste recycling based on a national survey of US households. Resour. Conserv. Recycl. 60, 49–63.
Schwartz, S.H., Howard, J.A., 1981. A normative decision-making model of altruism. Altruism and Helping Behavior: Social, Personality and Developmental Perspectives, pp. 189–211.
Scott, D., 1999. Equal opportunity, unequal results: determinants of household recycling intensity. Environ. Behav. 31 (2), 267–290.
Song, H.J., Lee, C.-K., Kang, S.K., Boo, S.-j., 2012. The effect of environmentally friendly perceptions on festival visitors' decision-making process using an extended model of goal-directed behavior. Tour. Manag. 33 (6), 1417–1428.
Stern, P.C., 1999. Information, incentives, and proenvironmental consumer behavior. J. Consum. Policy 22 (4), 461–478.

Thøgersen, J., 2003. Monetary incentives and recycling: behavioural and psychological reactions to a performance-dependent garbage fee. J. Consum. Policy 26 (2), 197–228.
Vagias, W.M., Powell, R.B., Moore, D.D., Wright, B.A., 2014. Predicting behavioral intentions to comply with recommended leave no trace practices. Leis. Sci. 36 (5), 439–457.
Van Riper, C.J., Kyle, G.T., 2014. Understanding the internal processes of behavioral engagement in a national park: a latent variable path analysis of the value-belief-norm theory. J. Environ. Psychol. 38, 288–297.
Verma, V.K., Chandra, B., 2018. An application of theory of planned behavior to predict young Indian consumers' green hotel visit intention. J. Clean. Prod. 172, 1152–1162.
Wang, C., Zhang, J., Yu, P., Hu, H., 2018a. The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: the moderating role of environmental interpretations. J. Clean. Prod. 194, 425–434.
Wang, Y., Yang, J., Liang, J., Qiang, Y., Fang, S., Gao, M., Fan, X., Yang, G., Zhang, B., Feng, Y., 2018b. Analysis of the environmental behavior of farmers for non-point source pollution control and management in a water source protection area in China. Sci. Total Environ. 633, 1126–1135.
Werner, C.M., Makela, E., 1998. Motivations and behaviors that support recycling. J. Environ. Psychol. 18 (4), 373–386.
Xu, L., Ling, M., Wu, Y., 2018. Economic incentive and social influence to overcome household waste separation dilemma: a field intervention study. Waste Manag. 77, 522–531.
Yazdanpanah, M., Forouzani, M., 2015. Application of the Theory of Planned Behaviour to predict Iranian students' intention to purchase organic food. J. Clean. Prod. 107, 342–352.
Yue, T., Long, R., Chen, H., 2013. Factors influencing energy-saving behavior of urban households in Jiangsu Province. Energ Policy 62, 665–675.
Zhang, J., Zhang, H., Zhang, J., Liu, F., 2011. Review of studies on environmental impacts of tourism waste. Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC), 2011 2nd International Conference on. IEEE, pp. 6369–6372.
Zhang, D., Huang, G., Yin, X., Gong, Q., 2015. Residents' waste separation behaviors at the source: using SEM with the theory of planned behavior in Guangzhou, China. Int. J. Environ. Res. Public Health 12 (8), 9475–9491.

**Huan Hu** is a doctoral candidate of the School of Geography and Ocean Science at Nanjing University, China (hu66huan@163.com & huhuannju@smail.nju.edu.cn). Her research focuses on tourism geography, tourism environmental impact, and tourism ecological compensation.

**Jinhe Zhang**, PHD (corresponding author), is professor of the School of Geography and Ocean Science at Nanjing University, China (zhangjihe@nju.edu.cn). His research interest includes tourism geography, tourism environmental impact, and human geography.

**Chang Wang** is a doctoral candidate in the School of Geography and Ocean Science at Nanjing University, China (sonofwind1989@163.com). His research interests include tourism geography, tourism planning and the relationships between environments and tourists' behaviors.

**Peng Yu** is a doctoral candidate of the School of Geography and Ocean Science at Nanjing University, China (pengyuyp@163.com). His research interests include consumer behaviour in tourism, community tourism, parks and protected areas management.

**Guang Chu** is a doctoral candidate of the School of Geography and Ocean Science at Nanjing University, China (532672578@qq.com). His research focuses on rural-tourism development, and rural-tourism community.