



Research article

Tourist engagement and behavioral intentions in rural tourism: Mediator of memorable tourism experience

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ABSTRACT

The relationship between tourist engagement, experiences, and behaviors has not been extensively studied in rural tourism. Specifically, the impact of tourist engagement, which encompasses various dimensions, on rural tourism sustainable development has not been well-established. The objective of this study was to examine the relationship between tourist engagement and behavioral intentions in rural tourism, with memorable tourism experiences (MTEs) acting as the mediator. A quantitative cross-sectional questionnaire-based survey was undertaken in Henan, China. In total, 500 valid participants answered a face-to-face questionnaire. The results obtained from the partial least squares structural equation modeling indicate that among the five dimensions of tourist engagement, the variable of attention does not have a significant impact on MTEs. Only the qualities of enthusiasm and attention have notable impacts on behavioral intention. MTEs play a crucial role in mediating the relationship between the five characteristics of tourist engagement and behavioral intention. This project is an innovative endeavor in the realm of rural tourism that aims to investigate the processes and relationships that connect tourist engagement, MTEs, and behavioral intents to address development challenges and promote the sustainability of rural tourism. The findings provide valuable theoretical insights and practical contributions to further the research and industry of rural tourism.

1. Introduction

Rural tourism is centered around visiting and immersing oneself in rural or countryside locations, rather than metropolitan or conventional tourist sites [1,2]. It has become a significant tourism component and a driving factor in rural development, which has been the subject of scholarly inquiry for over 30 years. The notion of rural tourism has grown from its essential parts and definition, including the different components. It then broadened its scope to include components on holidays, recreational activities, social governance, and cultural dimensions [2–4]. Its role in rural development is apparent in the economy, society, the environment, cultural preservation, and education [5,6]. Rural experiential tourism involves travelers actively connecting with the local culture, customs, and natural environment to have authentic and immersive experiences. It is a growing segment within the broader tourism industry, attracting travelers interested in authentic, less mainstream experiences [7,8]. It is crucial to diversify livelihood possibilities in rural regions to achieve a balanced population distribution and promote sustainable rural development [9].

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Due to the rapid development of the rural tourism sector, tourists increasingly prefer immersive experiences in rural areas. Rural tourism development marketing is currently faced with competition in several dimensions, necessitating rural destinations to emphasize the quality of the rural tourism experience and continually innovate in line with evolving visitor preferences. Tourism experiences can be associated with various factors and outcomes, including sensory impressions [10], service quality [11], different types of tourist behavioral intentions, and activities such as camping [12], green consumption [9]. Fang et al. [13] mentioned that the strategic sensory inputs may provide an immersive night tourism experience, coinciding with the rising interest in immersive tourism. Zheng et al. [14] established that service quality, as a crucial aspect of the tourism experience, has a substantial correlation with tourists' tourist revisit intention.

The tourist experience is a core indicator of destination management for the comprehensive evaluation of destination value [15], while the young generations are increasingly opting for tourism modes that provide 'highly valued' and distinctive experiences [16]. The transformative tourism experiences possess significant personal and social ramifications owing to their life-altering potential when individuals fully engage with their experience, and the competitiveness and allure of tourist sites may be enhanced by offering exceptional tourism experiences from novel viewpoints [17,18].

However, typical rural tourism locations are encountering challenges in distinguishing themselves, leading to a lack of unique characteristics that may attract a broader range of travelers. Most of the rural tourism is still primarily focused on conventional tourist programs and typical rural activities, which lead to the lack of appeal and limited competitiveness, coupled with a low level of innovation, pose significant challenges for typical rural tourist locations [19], particularly for villages or towns that aim to promote the rural tourism business as a means of alleviating poverty and encouraging community growth [20]. Moreover, the standardization of rural tourism experiences hinders creativity, restricts the ability to generate income, and weakens the genuine local culture and environment [21,22], ultimately posing a challenge to the marketing of rural tourism destinations [10]. Additionally, the rural tourist business is confronted with challenges such as limited brand recognition, reduced appeal, an urgent need for innovation, and insufficient sustainability for future growth. These problems are frequently seen in typical rural areas, resulting in a rapid increase in population in well-known places while neglecting lesser-known but equally important rural sites. This situation is harmful to the sustainable development of the latter. The imperative of bolstering the competitiveness, notoriety, and allure of rural tourist regions has arisen as a pivotal problem for these locales.

Previous research has acknowledged that tourist engagement is a significant and interesting area for further investigation [23], and the concept of tourist engagement towards a tourism destination has been considered as a key influential element in relation to tourist behavioral intentions [24]. Furthermore, there exists a strong correlation between some general engagement behaviors and both behavioral and psychological engagement [25]. For instance, Yen et al. [26] indicated a positive correlation between tourist engagement and the formation of memorable tourism experiences, as well as tourists' subjective well-being in film tourism. Lyon et al. [27] showed that an animal care discussion or participation in a staff-led demonstration would augment visitor experience and promote learning outcomes in zoo displays. While such studies highlight the significant role of tourist engagement in formatting memorable tourism experience, studies in the field of rural tourism have not given much attention to tourist engagement. Previous research has mainly considered tourist engagement as one of the factors that influence tourism, the effects of tourist engagement dimensions on behavioral intentions of rural tourism have not adequately been addressed as well.

Memorable tourism experiences (MTEs) has been considered to be the important mediating factors that bridge tourists and destinations by explaining why and how tourism experiences affect their behavioral intentions. For example, memorable tourism experiences encompass distinctive, influential, and enduring moments or interactions has effects on tourists' behavioral intentions [28, 29]. Past experiences profoundly influence the future decisions of travelers, underscoring the importance of memorable tourism experiences [30–32]. When selecting a trip or vacation destination, travelers often emphasize recalling these significant locations and experiences [33]. Furthermore, previous research has demonstrated that memorable tourism experiences mediate the relationship between sensory experience and behavioral intention in rural tourism [34]. Consequently, numerous scholars contend that memorable tourism experiences serve as the most reliable predictors of behavioral intention, offering critical insights vital for the management of tourism destinations and environmental conservation [28,33]. A growing corpus of research examines the influence of memorable travel experiences on visitors' behavioral intentions across many tourism settings. Assessing the value of rural tourism is essential since it serves additional functions in modern society, including fostering social contact and providing opportunities for varied experiences. Nonetheless, more investigation is necessary. The ramifications of the mediating function of MTEs in the rural tourist sector remain less explored. Particularly in Henan, China. As a result, there is a paucity of research regarding the significance of tourist engagement in rural tourism, addressing and exploring the interrelations among tourist engagement, memorable tourism experiences, behavioral intentions, and the fundamental mechanisms that affect one another within the realm of rural tourism.

Self-determination theory (SDT) is crucial for comprehending visitors' motivation [35,36] focusing on human motivation and personality while investigating the degree of individual self-determination via empirical approaches. Self-determination theory posits that individuals possess an inherent propensity for psychological development and integration [37,38]. Individuals may actively participate, gain information, accept behavioral norms, integrate into social groups, and increase their skills. Even though scholars have noted the significance of SDT applications in tourism studies, for example the SDT model has been employed to identify the motivations for tourist engagement among individuals with disabilities [37], validating the positive effect of attitude and perceived tourists' willingness to engage in tourism activities, shaped by individuals' inherent cognitive beliefs [39], the implementation of the self-determination theory in the tourism industry, particularly within rural tourism sectors, has been significantly neglected.

This research seeks to examine the relevance between tourist engagement and behavioral intention through the mediator influence memorable tourism experiences based on self-determination theory in rural tourism. The empirical investigation was performed in Henan, a province where the rural populace constitutes 44.57% of the total population (approximately 50 million individuals) living in

roughly 45,000 administrative villages across diverse terrains, including mountains, plains, basins, hills, and loess plateaus, in central China. The results are expected to substantially enhance rural tourism development by offering innovative theoretical frameworks and practical insights into comprehending tourists' needs and intentions in rural tourism, as well as delivering more effective metrics to address issues of growth based on local attributes.

2. Literature review and hypothesis development

2.1. Theoretical foundation

The self-determination theory (SDT) was initially proposed by American psychologists Edward L. Deci and Richard M. Ryan during the 1980s [40]. SDT is founded on the belief that individuals are proactive participants in their own lives. It suggests that people have an inherent desire for self-integration, growth, and learning, which is fostered by the assistance they get from their social and external surroundings [41,42]. This theory focuses heavily on human motivation and personality, analyzing the degree to which humans are self-determined using empirical techniques. The Self-Determination Theory includes components such as external regulation, intrinsic regulation, introjected regulation, and identified regulation [38]. It posits that individuals possess an intrinsic inclination towards self-integration, personal development, and knowledge acquisition, which is enhanced by the support derived from their social and external environments [41,42]. With its use in marketing, the application of SDT in the tourism and leisure industry with the increasing experiential economic development. For instance, Soltani Nejad et al. [43] suggested that the characteristics of mobile applications in E-leisure promote tourist engagement, along with its antecedents and repercussions. Moura et al. [37] examined the travel motivations of individuals with disabilities, observing that they are driven to engage in tourist activities mostly due to the anticipated advantages from these experiences.

Tourist engagement is considered as an interaction between tourist and destination, it significantly impacts tourist loyalty, contentment, and behavioral intention [44]. Prior studies have shown that tourist engagement mainly refers to the level of a tourist's active participation and dedication to a tourism experience [45,46]. Tourist engagement encompasses the extensive involvement and dynamic participation of tourists in their travel experiences, and is highly relevant to individuals' behavioral intentions and destination development, for instance, Seyfi et al. [46] investigated the effects of tourist engagement on revisit and word-of-mouth intentions of heritage tourism. Sawu & Ridla [47], involved tourists as co-creators while analyzing regenerative tourism components products, tourists' perceptions, tourists' experiences, and regenerative tourism development policies. Therefore, destination management organizations must provide resources for the preservation, enhancement, and marketing of tourist assets [48]. The assessment of the genuineness and distinctiveness of the attraction had a crucial role in shaping the level of involvement and psychological connection of tourists [27]. Consequently, increased tourist interaction can have a beneficial impact on memorable tourism experiences [24]. Xiong et al. [49] mentioned that tourist engagement and MTEs significantly mediate the relationship between smart tourism technologies and tourists' revisit intention.

Memorable tourism experiences are characterized by unique, impactful, and long-lasting events or interactions that travelers cherish and remember even after their trip has ended [29]. It is the reflection of external regulation within tourists. These noteworthy interactions, derived from tourism experiences, have significant practical implications for destination management, enhancing competitiveness, and fostering sustainable development. The memories of past interactions have a substantial influence on the future decisions made by tourists, underscoring the importance of memorable tourism experiences [30–32]. When selecting a trip or vacation destination, travelers usually give importance to remembering these remarkable locations and experiences [33]. Consequently, several academics contend that memorable tourist experiences are the most reliable predictors of behavior intentions, offering significant insights that are crucial for effectively managing tourism destinations [33]. Atasoy and Eren [44] present supplementary evidence to bolster the notion that a memorable tourism experience holds greater significance than a normal tourism experiences.

2.2. Tourist engagement influences behavioral intention

Previous research has used two different measuring scales to study tourist participation in empirical investigations. Babak Taheri [50] developed a measurement tool consisting of two components, each including eight items, to evaluate the levels of engagement among tourists. Other dimensions have proven to be highly useful in marketing and tourism settings, as well as in service organizations. These dimensions define engagement as the degree to which a customer is actively and fully involved in their relationship with a business, encompassing physical, cognitive, and emotional aspects [24,50]. The five key components that contribute to this engagement are enthusiasm, attention, absorption, interaction, and identification [51]. Enthusiasm is defined as a person's high degree of enthusiasm and interest in the subject they are engaged [52]. It denotes a significant level of enthusiasm and intense attention focused on involving folks, which improves the entire tourism experience. Attention pertains to the degree of concentration that a visitor exhibits, whether consciously or unconsciously, towards a specific brand or place [53]. It is portrayed as an abstract asset that people may distribute across different channels, and it is widely acknowledged as a crucial element of involvement. The absorption dimension refers to the condition in which a tourist is fully engrossed in their destination experience [24], it represents the level of focus that visitors have on their locations, as well as the people and media associated with them [23]. The concept of identification refers to the level of commitment and emotional attachment that exists between a tourist and a location. On the other hand, the interaction component relates to the perceived sense of unity or belongingness that an individual feels towards a certain place [24]. Prior study indicates these five dimensions have direct and indirect effects on behavioral intentions. For instance, in vegan restaurants, dimensions of enthusiasm, attention, absorption, and interaction have a positive impact on vegan restaurant approach intentions,

except identification. It is necessary to emphasize customer psychological resilience, enthusiasm, attention, absorption, and interaction when eliciting customer engagement to increase approach intentions [54]. Also, in the context of Macao's casino integrated resorts, scholars found that customer engagement has effects on consumer behavioral intention [55]. In hotel marketing the five dimensions have direct impact on brand trust and indirect influence on customers' word of mouth intention and customers' reuse intention [56].

However, most prior studies have treated tourist engagement as a comprehensive factor in tourism research and have proven a strong connection between tourist engagement and behavioral intention, since tourist engagement is a complex notion that includes cognitive, emotional, and behavioral components, encompassing both psychological and behavioral aspects [24]. For example, studies in heritage tourism with PLS-SEM showed the significant effect of the absorption dimension on revisit intention, and identification of WOM intention [24]. N. Kumar et al. [57] indicated that prioritizing customer engagement scale items with dimensions (enthusiasm, attention, absorption, interaction, identification) may assist destination managers in strategy formulation to ensure tourists' high-level transcending purchase. Okeke [58] investigated the antecedents and consequences of customer engagement behavior in the hospitality sector and found that, customer involvement, enthusiasm, attention, and absorption as the antecedents, electronic word of mouth and behavioral intentions to loyalty as the consequences or outcomes, while customer engagement behavior and customer relationship management were used as mediating and moderating variables, respectively. However, there is a lack of research specifically examining each facet of tourist engagement, particularly in the context of rural tourism. An urgent investigation of the links between each measure of tourist engagement and behavioral intention is needed. The proposed hypotheses are:

- H1.** Enthusiasm has a positive effect on behavioral intention
- H2.** Attention has a positive effect on behavioral intention
- H3.** Absorption has a positive effect on behavioral intention
- H4.** Interaction has a positive effect on behavioral intention
- H5.** Identification has a positive effect on behavioral intention

2.3. *The relationship between tourist engagement and memorable tourism experiences*

Prior research has demonstrated that tourist engagement has a significant role in shaping both behavioral intention and the creation of memorable tourism experiences [47,59]. It occasionally serves as the precursor to noteworthy tourist engagement that influence persons' behavioral intentions [25]. Researchers examine how tourist engagement, authenticity, and the image of a destination influence people's intention to behave in a certain way. They found that memorable tourism experiences have a close relationship with tourist engagement, tourist engagement was identified as a significant factor that influences memorable tourism experiences, which in turn have both direct and indirect effects on people's intention to behave. Yen et al. [26] research found that, when it comes to Korean film tourism, tourist engagement is positively correlated with both the development of MTEs and the subjective well-being of tourists. Tsaur et al. [60] discovered that in the Taiwan area, memorable customer experiences were favorably impacted by customer engagement in the hotel industry. Additionally, tourist engagement with heritage tourism positively affects memorable tourism experiences, which in turn forms an intention to return [45]. For instance, study of heritage tourism research in Paris shows that respondents mentions items such as absorption, enthusiasm, and passion of visiting different cultural attractions [61]. The antecedent role of tourist engagement for memorable tourism experience also has been confirmed by Seyfi et al. [59] have validated the antecedent role of tourist engagement for memorable tourism experiences, highlighting the impacts of tourist engagement, authenticity, and destination image on many aspects of MTEs. Therefore, meaningful travel and hospitality experiences would depend on how tourists engage with a range of kinds.

Tourist engagement has been regarded as a precursor to experiences and has been explored in tourism and hospitality research [58]. However, most studies have analyzed tourist engagement as a singular construct encompassing five dimensions, neglecting the relationships between these dimensions and memorable tourism experiences, despite the potential for each dimension to yield distinct effects across various tourism and hospitality contexts. Therefore, the hypotheses are as follows:

- H6.** Enthusiasm has a positive effect on memorable tourism experiences
- H7.** Attention has a positive effect on memorable tourism experiences
- H8.** Absorption has a positive effect on memorable tourism experiences
- H9.** Interaction has a positive effect on memorable tourism experiences
- H10.** Identification has a positive effect on memorable tourism experiences

2.4. *The mediating role of memorable tourism experiences*

Research on the influence of memorable tourism experiences on tourists' behavioral intentions in different tourism contexts is increasing due to its additional functions in the modern tourism business. Prior studies indicated that, there is highly relevance between memorable tourism experiences and behavioral intentions, for instance, Keskin et al. [55] found that memorable tourism experiences mediate the effect between nostalgic bonds and behavioral intentions in cultural tourism experience. Zhenbin et al. [34]

confirmed that memorable tourism experiences significantly affect tourists' behavioral intention as the mediator between sensory experience and behavioral intention. When tourists making decision, they usually tend to review their prior tourism experiences, especially the unforgettable ones [28,62]. Therefore, memorable tourism experiences have effects on behavioral intention.

Previous studies show that memorable tourism experiences play an important mediating role in a variety of studies. For instance, Yen et al. [26] investigated the association between tourist engagement and subjective well-being as mediated by memorable tourism experiences in film tourism and confirmed the mediation role of MTEs and the relevance between tourist engagement and MTEs. Afzal et al. [63] mentioned that memorable tourism experiences presented a significant mediation effect between smart tourism technologies and tourists' engagement with the use of technology-enhanced experiences. Setiawan et al. [64] indicated that city image nostalgic emotion plays an essential role in influencing tourist engagement through memorable tourism experiences as mediation for visiting tourist destinations. In addition, tourist engagement is considered as a involvement and interaction with destinations which highly relevant to tourists' experiences, five dimensions of absorption, attention, interaction, enthusiasm, and identification are the significant indicators that predicted the involvement and commitment to tourist experience [61]. Thus, tourist engagement has a close relationship with behavioral intention through MTEs which act as a mediator between tourist engagement and behavioral intention. However, there is limited research on the connection between tourist engagement and behavioral intention in the context of memorable tourism experiences, particularly in rural tourism. Additionally, there is a lack of research on the relationships between the five dimensions of tourist engagement and behavioral intention, with memorable tourism experiences acting as a mediator between them. Thus, the hypotheses are supposed to be:

- H11.** MTEs have a positive effect on behavioral intention
- H12.** MTEs play a mediating role between enthusiasm and behavioral intention
- H13.** MTEs play a mediating role between attention and behavioral intention
- H14.** MTEs play a mediating role between absorption and behavioral intention
- H15.** MTEs play a mediating role between interaction and behavioral intention
- H16.** MTEs play a mediating role between identification and behavioral intention

3. Method

3.1. Measurement instrument

The proposed framework was assessed using a quantitative cross-sectional questionnaire-based survey design. A structured questionnaire was developed with two sections: demographic information and multi-item measurement scales adapted from previous studies. All construct items were measured on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The questionnaire was prepared in English, translated into Chinese for field administration, and checked through translation and back-translation by bilingual tourism and English-language experts. Items were adapted to the rural tourism context by replacing general brand or destination wording with rural-destination wording and by asking respondents to answer according to their recent rural tourism experience in Henan. Tourist engagement was measured with 15 items across five reflective first-order dimensions: enthusiasm (3 items), attention (3 items), absorption (3 items), identification (3 items), and interaction (3 items) [24]. Example items include respondents' enthusiasm for rural tourism, attention paid to the rural destination, absorption in the rural tourism experience, identification with the destination, and interaction with the destination setting. Memorable tourism experiences were measured with 24 items across seven reflective first-order dimensions: hedonism (4 items), refreshment (4 items), local culture (3 items), meaningfulness (3 items), knowledge (3 items), involvement (3 items), and novelty (4 items) [65]. Behavioral intention was measured with three items covering intention to revisit, word of mouth, and recommendation [66]. The full measurement instrument has been provided as a supplementary questionnaire file.

3.2. Study setting and sample

A case study was conducted in Henan, a province in the central region of China. Henan has a rural population that makes up 44.57% of its total population, which is approximately 50 million people. These rural residents live in around 45,000 administrative villages, situated in diverse landscapes including mountains, plains, basins, hills, and loess plateaus. Four rural tourist attractions in Luanchuan, Linzhou, Gongyi, and Qixian in Henan, China, were chosen for their importance in showcasing rural tourism growth at both national and provincial levels. Luanchuan is ranked as one of the top 100 tourist counties in China, while Linzhou and Gongyi are identified as promising counties in the national county tourism development plan. Finally, Qixian is included in the initial group of provincial-level tourist demonstration zones in Henan Province. These areas are prominent examples that have played a crucial role in fostering the growth of local rural tourism, attracting attention, and inspiring other regions to build their rural tourist industries.

The study focused on rural tourists in the four areas as the target group. The minimum sample size for the rural tourism data was checked using G*Power, the Raosoft Sample Size Calculator, and Krejcie and Morgan's table [67]. For G*Power, the calculation used a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, statistical power = 0.95, and six predictors for the most complex endogenous construct, yielding a minimum required sample larger than the commonly recommended threshold for PLS-SEM. The Raosoft calculation used a 95% confidence level, a 5% margin of error, and a 50% response distribution, producing a recommended minimum sample of

approximately 384 for a large population. Krejcie and Morgan's table also recommends 384 cases for populations above 100,000.

3.3. Data collection and analysis

Using purposive sampling, the developed questionnaire survey was administered to eligible respondents who met the following selection criteria: 1) rural tourists; 2) over the age of 18; 3) visiting for leisure and tourism; 4) have rural tourism experience in Henan in the last six months. For the reliability and validity of constructs and items, once the scale was adapted, pre-testing with six experts in tourism study and English education, and 45 tourists in Chongdugou were invited to participate in the pilot-testing. Based on their response, some questions were refined, several items were removed, and the final questionnaire items were used to measure each construct. Data collection took place face-to-face from January 2023 to March 2023 in the main commercial streets and tourist entrances of Chongdugou (Luanchuan), Shibanya (Linzhou), Zhulin (Gongyi), and Zhaozhuang (Qixian). A total of 575 questionnaires were distributed using mobile-phone-based electronic questionnaires. After excluding incomplete and invalid responses, 500 valid questionnaires were retained for the final analysis, representing a valid response rate of 86.96%.

The data used in this study were collected as part of a broader survey project on rural tourism experiences in Henan Province, China. A related publication based on the same survey examined sensory experience as an antecedent of memorable tourism experiences and behavioral intention [34]. The present study differs by focusing on tourist engagement as a multidimensional construct and examining the distinct effects of its five dimensions on memorable tourism experiences and behavioral intention. The related publication is disclosed here for transparency.

The Windows software SPSS 26.0 was utilized for data cleaning and descriptive analysis. The platform provides a user-friendly interface for doing statistical analysis in the fields of social science and behavioral research [68]. PLS-SEM conducts analyses on latent constructs (unobserved) as well as manifest variables (observed) within the framework of structural equation modeling [69–71].

Table 1
Assessment of measurement model.

Variable	Outloading	Cronbach's alpha	CR	AVE
BI1	0.893	0.868	0.869	0.791
BI2	0.887			
BI3	0.889			
MH1	0.847	0.873	0.873	0.724
MH2	0.848			
MH3	0.852			
MH4	0.857	0.871	0.872	0.795
MI1	0.882			
MI2	0.897			
MI3	0.895	0.866	0.867	0.789
MK1	0.869			
MK2	0.884			
MK3	0.912	0.879	0.879	0.805
ML1	0.911			
ML2	0.877			
ML3	0.902	0.853	0.854	0.772
MM1	0.894			
MM2	0.873			
MM3	0.869	0.895	0.896	0.760
MN1	0.840			
MN2	0.877			
MN3	0.899	0.855	0.860	0.698
MN4	0.870			
MR1	0.864			
MR2	0.755	0.875	0.876	0.800
MR3	0.850			
MR4	0.867			
VAB1	0.892	0.856	0.856	0.776
VAB2	0.882			
VAB3	0.909			
VAT1	0.905	0.886	0.888	0.815
VAT2	0.880			
VAT3	0.857			
VEN1	0.865	0.872	0.872	0.796
VEN2	0.926			
VEN3	0.916			
VID1	0.819	0.840	0.854	0.757
VID2	0.890			
VID3	0.900			
VIN1	0.879	0.889	0.889	0.889
VIN2	0.889			
VIN3	0.909			

This approach is particularly valuable when dealing with relatively small sample sizes, non-normal data distributions, or measurement instruments characterized by low reliability. Via SmartPLS 4.1, partial least squares structural equation modeling (PLS-SEM) was employed to test the research model, as it enables the analysis of both latent constructs (unobserved) and manifest variables (observed) within the framework [71].

The study employed the two-stage approach for the reflective-formative higher-order constructs. In the first stage, all lower-order dimensions were modeled reflectively and their latent variable scores were estimated. In the second stage, these latent variable scores were used as formative indicators of the higher-order constructs of tourist engagement and memorable tourism experiences. The repeated-indicator technique was not used in the final higher-order construct estimation. A formative specification was adopted at the second-order level because the lower-order dimensions represent conceptually distinct facets that are not interchangeable; for example, enthusiasm, attention, absorption, identification, and interaction reflect different ways in which tourists engage with a rural destination. Multicollinearity among formative indicators was assessed using VIF values, and outer weights and outer loadings were evaluated to assess the contribution of each lower-order dimension. PLSpredict was used to evaluate the predictive capabilities of the PLS path model.

4. Result

4.1. Demographic statistic

The sample was composed of 58.2% female and 41.8% male participants. The age distribution skewed toward a younger cohort, with 50.6% aged 18–27 and 23.8% aged 28–37. In terms of socioeconomic status, 69.2% of respondents reported a monthly income below 5000 CNY. Educational attainment was relatively high, with nearly half the sample (48.4%) holding a bachelor's degree. Occupationally, students represented the largest segment at approximately 40.0%, while the remaining 60.0% were distributed across various professional sectors.

4.2. The measurement model

The reliability and validity of the data set were assessed before the establishment of the measurement model. The KMO value was 0.971. Harman's single-factor technique was utilized to analyze data through principal component factor analysis, which indicated that the first factor accounted for 28.163% of the variance, falling below the standard threshold of 50 percent.

In the first stage of PLS-SEM analysis, the repeated indicator technique approach was employed to assess the measurement model. The validation and reliability of the measurement model included assessing the validity and reliability of model fit and all latent variables (Table 1). The model is evaluated using the Standardized Root Mean Square Residual (SRMR), which has a value of 0.040, below both 0.1 and 0.08. Additionally, the d_{ULS} value is 0.520, below 0.95, and the d_G value is 0.451, also below 0.95. The first-order latent variables were established by checking the indicator loadings and cross-loadings. All remaining indicator loadings exceeded the recommended threshold. The Variance Inflation Factor (VIF) values for indicators in the first-order constructs were below 5.0, ranging from 1.579 to 3.864 (see Table 2).

Cronbach's alpha values ranged from 0.840 to 0.895, exceeding the recommended minimum level of 0.70, indicating satisfactory internal consistency reliability. Composite reliability values (CR) ranged from 0.854 to 0.896, also above the recommended limit of 0.70. The Average Variance Extracted (AVE) values ranged from 0.698 to 0.815, exceeding the threshold of 0.50 and supporting convergent validity. Discriminant validity of the first-order reflective constructs was assessed using both the Heterotrait-Monotrait (HTMT) ratio and Fornell-Larcker's criterion. Several HTMT values were high, including AB-AT = 0.930, EN-AT = 0.923, INV-MF = 0.930, RE-BI = 0.931, RE-INV = 0.955, KN-INV = 0.965, NV-HE = 0.950, and KN-RE = 0.923. These results indicate that some lower-order dimensions are empirically close and should be interpreted cautiously. However, the dimensions were retained because

Table 2
Discriminant validity- HTMT Matrix (first order).

	AB	AT	BI	EN	HE	IDN	INT	INV	LC	MF	RE	KN	NV
AB													
AT	0.93												
BI	0.676	0.732											
EN	0.821	0.923	0.717										
HE	0.766	0.752	0.72	0.741									
IDN	0.776	0.768	0.593	0.724	0.709								
INT	0.696	0.681	0.589	0.610	0.645	0.724							
INV	0.721	0.742	0.769	0.705	0.852	0.691	0.689						
LC	0.686	0.682	0.707	0.627	0.799	0.647	0.624	0.823					
MF	0.737	0.674	0.675	0.633	0.789	0.691	0.678	0.930	0.818				
RE	0.728	0.750	0.931	0.726	0.868	0.654	0.669	0.955	0.926	0.889			
KN	0.723	0.715	0.791	0.667	0.853	0.636	0.615	0.965	0.823	0.865	0.923		
NV	0.768	0.746	0.715	0.709	0.950	0.675	0.662	0.903	0.856	0.872	0.896	0.899	

Note: AB(Absorption), AT (Attention), BI (Behavioral intention), EN(Enthusiasm), HE(Hedonism), IDN (Identification), INT(Interaction), INV (Involvement), LC(Local culture), MF(Meaningfulness), RE(Refreshment), KN(Knowledge), NV(Novelty).

they are theoretically distinct facets of tourist engagement and memorable tourism experiences, and the bootstrapped 95% confidence intervals did not include 1.00. Thus, discriminant validity was considered acceptable with caution, and the high correlations are acknowledged as a methodological limitation.

Validation of the second-order constructs was based on the data derived from the first-order latent scores. Cronbach's alpha values ranged from 0.840 to 0.952, while CR values were all above 0.7, both exceeding the recommended limits. AVE values ranged from 0.757 to 0.815, all above the 0.5 threshold. Thus, reliability and convergent validity were achieved. Discriminant validity has been effectively demonstrated, as indicated by the majority of HTMT values below 0.85, except for two values that were slightly above 0.9 (Table 3). The majority of VIF values are below 3.3, except for novelty (4.664), refreshment (4.230), and involvement (4.358), which are over 3.3 but below 5. In addition, the empirical 95% confidence interval created through bootstrapping in Smart PLS does not contain the value of 1. This indicates that there is sufficiently discriminant validity.

4.3. The structural model

The results indicate that dimensions of enthusiasm, attention, and MTEs have positive effects on behavioral intention (Table 4), $H1$ ($\beta = 0.193, p < 0.001$), $H2$ ($\beta = 0.153, p < 0.030$), $H11$ ($\beta = 0.513, p < 0.000$) are supported, while $H3$ ($\beta = -0.035, p < 0.602$), $H4$ ($\beta = -0.042, p < 0.460$), $H5$ ($\beta = 0.044, p < 0.368$) are rejected, indicates that absorption, interaction, and identification have non-significant effects on behavioral intention. The dimensions of enthusiasm, absorption, and identification have positive effects on MTEs, except attention has a non-significant influence on MTEs. Hence, $H6$ ($\beta = 0.179, p < 0.001$), $H8$ ($\beta = 0.266, p < 0.000$), $H9$ ($\beta = 0.142, p < 0.003$), $H10$ ($\beta = 0.217, p < 0.009$) are supported, $H7$ ($\beta = 0.110, p < 0.124$) is rejected. $H12$ ($\beta = 0.092, p < 0.004$), $H14$ ($\beta = 0.136, p < 0.001$), $H15$ ($\beta = 0.073, p < 0.006$), $H16$ ($\beta = 0.112, p < 0.000$) are supported, $H13$ ($\beta = 0.056, p < 0.119$) is rejected, indicating MTEs has mediating effects between enthusiasm, absorption, identification, interaction and behavioral intention, and show nonmediation effect between attention and behavioral intention. The holistic results are shown in Fig. 2.

The R^2 values indicated the strong explanatory power of the structural model, whereby memorable tourism experiences accounted for 56.8% of the variance in behavioral intention and the five dimensions of tourist engagement accounted for 61.1% of the variance in memorable tourism experiences. Further, the large effect size, f^2 , of 0.236 shows that memorable tourism experiences exhibited the most substantial influence on behavioral intention. In terms of the impact on memorable tourism experiences, attention only had a small effect ($f^2 = 0.007$).

PLSpredict was conducted in SmartPLS using cross-validated prediction with 10 folds and 10 repetitions (Table 5). The evaluation considered Q^2 predict values and compared PLS-SEM prediction errors with the linear model (LM) benchmark using RMSE and MAE. The Q^2 predict values were greater than zero, ranging from 0.341 to 0.530, indicating predictive relevance. PLS-SEM produced lower RMSE values than the LM benchmark for most indicators, while the MAE comparison was mixed for some indicators. Therefore, the model demonstrates acceptable to moderate predictive relevance rather than uniformly high predictive power. The mediation results also require differentiated interpretation: enthusiasm shows partial mediation because both the direct and indirect effects are significant; absorption, interaction, and identification show indirect-only mediation because their direct effects on behavioral intention are not significant while their indirect effects through MTEs are significant; attention shows no significant mediation.

5. Discussion and conclusions

5.1. Conclusions

This study explores the correlation between five aspects of tourist engagement, memorable tourism experiences, and behavioral intention in the context of rural tourism. A quantitative methodology was employed to ensure accuracy and comprehensiveness. The study has obtained extensive results with strong empirical evidence by including relevant factors in the research framework, gathering survey data from a representative sample, and using PLS-SEM to examine the structural connections among the variables. The findings demonstrate that four out of five dimensions—enthusiasm, absorption, interaction, and identification—exert strong direct impacts on memorable tourism experiences, whereas two out of five dimensions—enthusiasm and attention—positively influence behavioral intention. MTEs directly influence behavioral intention and serve as a mediator among four of the five dimensions: enthusiasm, absorption, interaction, and identification, about behavioral intention. The findings provide useful insights into the theoretical and

Table 3
Discriminant validity- HTMT Matrix (second order).

	BI	EN	INT	MTEs	AB	AT	IDN
BI							
EN	0.717						
INT	0.593	0.724					
MTEs	0.794	0.723	0.707				
AB	0.676	0.821	0.776	0.777			
AT	0.732	0.923	0.768	0.761	0.930		
IDN	0.589	0.610	0.724	0.691	0.696	0.681	

Note: AB(Absorption), AT(Attention), BI(Behavioral intention), EN(Enthusiasm), HE(Hedonism), IDN (Identification), INT(Interaction), MTEs (Memorable tourism experiences) (see Fig. 1).

Table 4
Results of the structural model.

Path	β	(STDEV)	T statistics	0.25%	97.50%	P values	Result
H1.EN - > BI	0.192	0.057	3.370	0.081	0.304	0.001**	Support
H2.AT - > BI	0.153	0.070	2.197	0.021	0.296	0.028*	Support
H3.AB - > BI	-0.035	0.067	0.517	-0.169	0.094	0.605	Reject
H4.INT - > BI	-0.041	0.056	0.734	-0.150	0.069	0.463	Reject
H5.IDN - > BI	0.044	0.048	0.904	-0.050	0.139	0.366	Reject
H6.EN - > MTEs	0.179	0.054	3.325	0.074	0.284	0.001**	Support
H7.AT - > MTEs	0.110	0.071	1.539	-0.025	0.248	0.124	Reject
H8.AB - > MTEs	0.266	0.064	4.152	0.137	0.389	0.000***	Support
H9.INT - > MTEs	0.143	0.049	2.954	0.050	0.242	0.003**	Support
H10.IDN - > MTEs	0.217	0.047	4.656	0.127	0.311	0.000***	Support
H11.MTEs - > BI	0.513	0.069	7.463	0.374	0.644	0.000***	Support
H12.EN - > MTEs - > BI	0.092	0.032	2.872	0.034	0.159	0.004**	Support
H13.AT - > MTEs - > BI	0.056	0.036	1.563	-0.013	0.128	0.118	Reject
H14.AB - > MTEs - > BI	0.136	0.041	3.344	0.063	0.221	0.001**	Support
H15.INT - > MTEs - > BI	0.073	0.026	2.772	0.025	0.130	0.006**	Support
H16.IDN - > MTEs - > BI	0.111	0.028	3.924	0.060	0.173	0.000***	Support

Note: Note: * means $\text{sig} < 0.05$, ** means $\text{sig} < 0.01$, *** means $\text{sig} < 0.001$.

AB(Absorption), AT(Attention), BI(Behavioral intention), EN(Enthusiasm), HE(Hedonism), IDN (Identification), INT(Interaction), MTEs(Memorable tourism experiences).

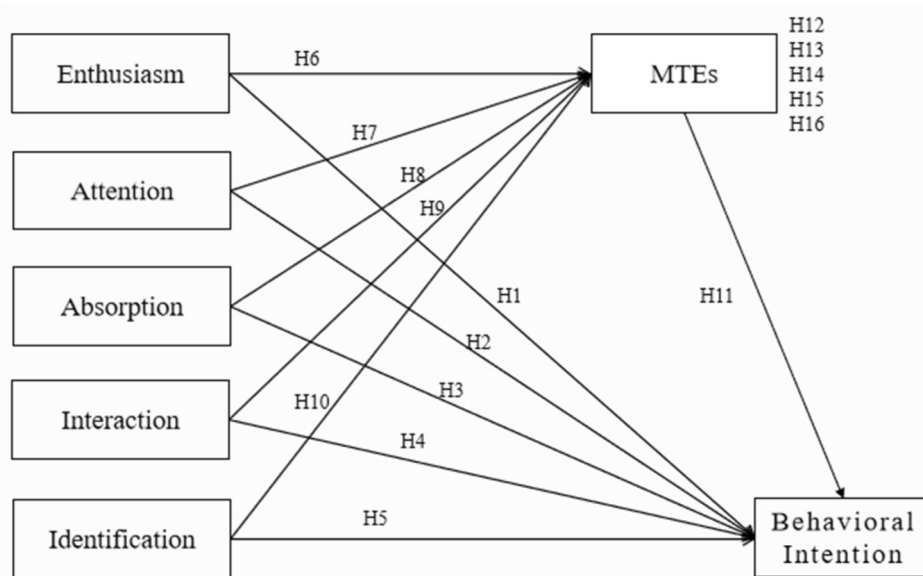


Fig. 1. The proposed research model.

practical knowledge in the sector, providing a comprehensive understanding of the link between tourist engagement, memorable tourism experiences, and behavioral intention in rural tourism.

The first objective of the study is to examine the immediate impacts of five aspects of enthusiasm, attention, absorption, identification, and interaction on memorable tourism experiences and behavioral intentions. The results indicate that four out of five dimensions, namely enthusiasm, absorption, identification, and interaction, have substantial direct impacts on the creation of a memorable tourism experience. Attention has a negligible impact on memorable tourism experiences. The lack of impact of attention on memorable tourism experiences may be attributed to attention's ability to enable tourists to immediately acquire information through their sensory organs. Tourists may quickly perceive and react to external stimuli using their sensory organs. However, these stimuli often have only temporary impacts on tourists' memories and are swiftly replaced by other stimuli. Therefore, unless the stimulus is unique and unforgettable for visitors, it might result in long-lasting memory retention. Given the absence of comprehensive studies examining the direct correlations between the five characteristics of tourist engagement and behavioral intention, these findings can be valuable for future studies in rural tourism and as a benchmark for studies in other areas of tourism research.

While comparing two enthusiasm and attention out of the five dimensions has a favorable impact on behavioral intention, the three dimensions of absorption, identification, and interaction do not have a significant influence on behavioral intention. These findings partially corroborate previous research. The study conducted by Seyfi et al. [72] found that dimension absorption had a substantial

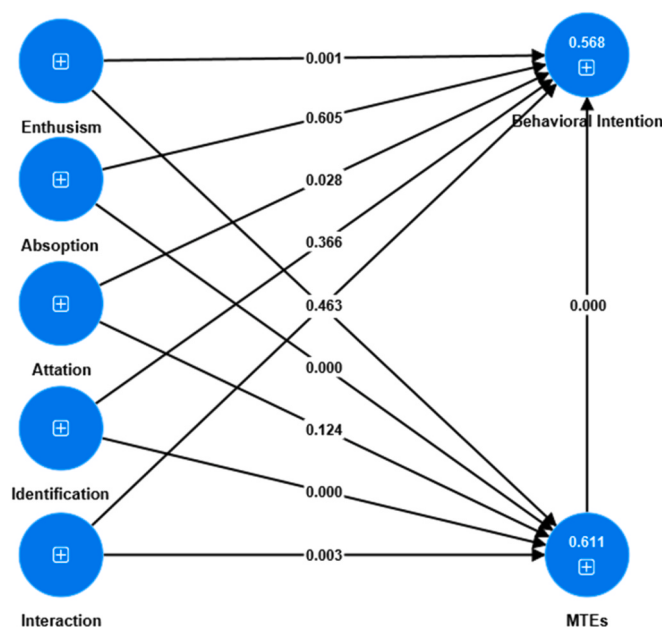


Fig. 2. Results of structural equation modeling (PLS-SEM).

Table 5

PLSpredict assessment of manifest variables.

	Q ² predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
BI1	0.359	0.656	0.500	0.673	0.502
BI2	0.342	0.642	0.490	0.656	0.494
BI3	0.365	0.608	0.476	0.603	0.465
HE	0.530	0.687	0.532	0.691	0.524
INV	0.511	0.700	0.519	0.705	0.523
LC	0.437	0.752	0.569	0.760	0.574
MF	0.395	0.779	0.575	0.786	0.581
RE	0.433	0.754	0.562	0.761	0.571
KN	0.406	0.772	0.587	0.790	0.598
NV	0.523	0.692	0.511	0.702	0.509

Note: BI(Behavioral intention), EN(Enthusiasm), HE(Hedonism), IDN(Identification), INT(Interaction), INV(Involvement), LC(Local culture), MF (Meaningfulness), RE(Refreshment), KN(Knowledge), NV(Novelty).

impact on the return intention of domestic cultural tourism in Kashan, but the other dimensions did not. Nevertheless, it has been shown that two out of the five dimensions of interaction and identification significantly influence word-of-mouth (WOM) [24]. The inability of absorption, identification, and interaction to directly impact tourists' behavioral intentions may be attributed to many variables. One pertains to the assignment of dimensions, prior studies indicate that absorption refers to a tourist's complete immersion in their destination experience; identification represents the level of commitment and emotional connection between a tourist and a location; the interaction component relates to the perceived sense of unity or belonging that an individual feels towards a specific place [24]. All these elements are very relevant to tourists' perception, assessment, and justification for choosing places. These characteristics may impact actions and behavioral intentions alone via certain types of conditioning that include appropriate evaluation, justification, and cognition. The disparities between the rural tourism destination supply system and tourist requirements, the underdevelopment of rural tourism, or the lack of appealing rural tourism products, activities, or programs may exacerbate the gap between expected and actual rural experiences. By creating memorable tourism experiences, tourists may develop a comprehensive understanding of rural tourism, which subsequently influences their behavioral intentions.

The results indicate that the factors of enthusiasm, absorption, identification, and interaction have a significant impact on behavioral intention utilizing creating memorable tourism experiences. There is no notable influence of memorable tourism experiences on the relationship between attention and behavioral intention. These findings exhibit a partial resemblance to previous research. For example, memorable tourism experiences act as intermediaries between tourist engagement and behavioral intention. Previous research has shown that tourist engagement has both direct and indirect effects on behavioral intention through memorable tourism experiences in heritage tourism and cultural tourism [73,74]. The absence of a mediating effect between attention and behavioral intention may be attributed to the fact that attention, related to short-term memory, is predominantly established in the

present during standard tourism programs, in contrast to other dimensions that necessitate processes of evaluation, justification, and identification. A short attention span hinders the formation of substantial memories. Attention may be provided as the first rationale and subsequently influence behavioral intention succinctly. Another explanation may be attributed to the absence of appealing motivation, which might sustain an individual's attention for an extended period and facilitate a thorough justification and identification process. Without significant stimuli, it is difficult to develop long-term memories. Consequently, it is essential to consider the interconnections among all aspects of tourist engagement and memorable tourism experiences. Creating and delivering rural tourist offerings, initiatives, and events that include compelling elements influencing individual participation via attractive rationale, assessment, understanding, and recognition, thus fostering memorable tourism experiences. For example, skillfully depicting local narratives on the wall, showcasing traditional farming practices, and presenting an engaging exhibition about daily rural life actively stimulates visitors' motives and interests, rather than passively awaiting their attention. Memorable tourism experiences need to serve as an effective conduit between tourist engagement and behavioral intention in the development and promotion of high-quality rural tourism.

Furthermore, this study provides a theoretical framework for examining rural tourism via the lens of self-determining theory. This allows researchers to get a comprehensive understanding of the significance and underlying processes of tourist engagement in rural tourism. Previous studies often focus on tourist engagement, despite using different dimensions in their surveys. However, few of these studies have examined the connections between each dimension. Additionally, research specifically exploring each dimension of tourist engagement in the context of tourism is limited. Thus, this study has initiated a novel inquiry using the self-determination theory, which will contribute to a deeper comprehension of tourist engagement and its impact on MTEs and behavioral interactions in the tourism sector.

5.2. Theoretical contribution

This study highlights the significance of taking a comprehensive approach based on self-determining theory when examining the connection between visitors' engagement, memorable tourism experiences, and behavioral intention. This study examines the impacts of sub-dimensions of tourist engagement, which allows for a better understanding of the effects of each dimension and the relationship between factors. Unlike previous studies that treated tourist engagement as a single holistic variable, this study takes a more detailed approach. Moreover, this study offers a theoretical perspective on rural tourism with the self-determining theory which allows scholars to well understand the importance and the mechanisms of tourist engagement in rural tourism. For example, previous studies tend to employ tourist engagement even though they designed and processed surveys with different dimensions, however, few of these studies explored the linkages with each dimension, and research on each dimension of tourist engagement in tourism is scarce. Therefore, this study has established a fresh investigation with the self-determining theory which would lead to a further understanding of tourist engagement and its influence on MTEs and behavioral interactions in the tourism industry.

Furthermore, this research contributes to existing theory by constructing and examining a comprehensive theoretical framework that encompasses variables related to dimensions of tourist engagement, memorable tourism experiences, and behavioral intentions. By presenting an empirically validated integrated framework, this study sheds light on the impact of tourist engagement in rural tourism, thereby enhancing the understanding of the complex relationships between tourist engagement, memorable tourism experiences, and behavioral intentions. Additionally, by highlighting the mediating role played by memorable tourism experiences within the rural tourism context, this study adds another layer of theoretical significance to the literature, deepening the comprehension of how different dimensions influence memorable tourism experiences and, consequently, behavioral intentions.

5.3. Practical contributions

This study provides valuable insights and practical recommendations for managers, practitioners, and policymakers in rural tourism locations, particularly those that are not well-known. By understanding individuals' behavioral goals, these stakeholders may enhance sustainable development.

The research demonstrates that tourist engagement is a comprehensive experience that positively affects behavioral intentions through memorable tourism experiences, which are directly connected to behavioral intention. This statement highlights the importance of recognizing that tourists' perceptions of engagement greatly influence the construction of their memorable experiences, which in turn impact their judgments and behavior. Therefore, practitioners must focus on establishing meaningful interactions for tourists that enable them to engage in immersive experiences from various perspectives. This can be achieved by providing unique tourism programs and activities that possess significant attributes such as identification, interaction, and absorption. By doing so, practitioners can address the problems of homogenization, low attractiveness, and reduced competitiveness. Managers might view tourist engagement as a pivotal factor in driving management innovation. Rural tourism programs aim to foster creativity by offering engaging experiences through well-designed architecture, vibrant performances, meaningful activities, and lasting memories.

This study provides policymakers with an alternate viewpoint on the development of sustainable rural tourism in lesser-known areas that are experiencing homogeneity and a lack of competitiveness and appeal. The current study primarily examines tourists' level of involvement and the creation of lasting impressions throughout their tourism experiences, rather than focusing on environmental conditions or transportation infrastructure. By prioritizing the aspects of tourist engagement, tourism goods, and supply chains may be enhanced to offer exceptional tourism and leisure experiences that are characterized by deep and meaningful interaction. Officials may establish communal spaces in rural tourism sites to cater to both inhabitants and tourists while maintaining a harmonious equilibrium between progress, novelty, amusement, and the enhancement of competitiveness.

5.4. Limitations and future research

While this study offers valuable insights, it is crucial to acknowledge its distinct limitations that can guide future research endeavors. The primary methodology employed for data collection was a quantitative approach, including self-administered questionnaires. To enhance understanding, future research should explore qualitative and mixed-method approaches, to obtain more holistic research. The sample size and sample area should be expanded to enhance the generalizability of results since this research primarily examines four rural tourist locations in contrast to over 1737 villages that engage in leisure agriculture and rural tourism in Henan. By employing a range of tools for data collection and using diversified methods, there is a possibility of achieving a more complex understanding of tourist engagement and creating memorable tourism experiences in rural tourism.

Further research should explore additional areas, such as the influence of tourist engagement on both positive and negative recollection, the development of memorable tourism experiences linked to tourist engagement, and the establishment of comprehensive tourist engagement in situations where certain senses are absent during specific trips or activities. Moreover, future research must ascertain efficient strategies for leveraging tourist engagement to amplify the unique charm of rural tourism destinations. Given the budgetary constraints in rural areas, introducing novel strategies focused on involving tourists might create new prospects for the development of tourism.

Furthermore, it is important to prioritize additional studies to acquire a deeper understanding of every facet of tourist engagement. Exploring the reasons why certain aspects of tourist engagement have positive effects on memorable tourism experiences and behavioral intentions, while others do not, is a valuable endeavor. In addition, carrying out longitudinal research would provide valuable insights into the long-lasting impacts of tourist engagement on the efficiency and sustainability of rural tourism growth. Similarly, doing comparison studies across different regions or periods might offer valuable insights into the effectiveness of tourist engagement in diverse situations. By addressing these subjects, we may enhance our understanding of tourist engagement with tourism and develop a more comprehensive and comparative comprehension, which will enable us to construct more effective plans for the expansion of rural tourism.

CRediT authorship contribution statement

Zhenbin Wang: Writing – original draft, Visualization, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sridar Ramachandran:** Writing – review & editing, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Suiying Cheng:** Writing – review & editing, Validation, Supervision, Project administration, Investigation, Funding acquisition, Conceptualization.

Ethics statement

The Ethics Committee for Research Involving Human Subjects of University Putra Malaysia(JKEUPM) approved the research. The approval number is JKEUPM-2023-289. This ethical approval ensures that the research adheres to established ethical standards and guidelines, protecting the rights and well-being of participants involved in the study. The participants were informed of their rights with a consent form in writing.

Data availability statement

Data will be made available at a reasonable request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2026.e45181>.

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