Journal of Destination Marketing & Management 22 (2021) 100656

Contents lists available at ScienceDirect

Journal of Destination Marketing & Management

journal homepage: www.elsevier.com/locate/jdmm

Interpreting disaster: How interpretation types predict tourist satisfaction and loyalty to dark tourism sites

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ARTICLE INFO

Keywords:
Dark tourism
Interpretation
Heritage value
Tourist satisfaction
Tourist loyalty

ABSTRACT

Tourism interpretation is crucial in delivering heritage value and managing tourism sites; however, existing literature neglects interpretation in the dark tourism context from tourists' perspectives. Thus, in this study, a conceptual model was established to predict tourist satisfaction and loyalty to disaster memorials according to interpretation type (i.e., personal and non-personal). Visitors to the Tangshan Earthquake memorials in China were surveyed. Multi-group difference analysis estimated the biased effects of interpretation types, and the proposed model's applicability was verified. Results showed that tourists who utilize non-personal interpretation services perceived lower interpretation quality, interpretation satisfaction, and overall tourist satisfaction. However, the impact of interpretation quality on interpretation satisfaction was significantly higher for this tourist group than those who use personal interpretation services, whereas the impact of tourist satisfaction on loyalty was considerably higher for tourists who utilize personal interpretation than their counterparts. Findings contribute a dynamic mechanism for dark tourism researchers and provide practical implications for destination managers.

1. Introduction

Dark tourism in which tourists specifically target destinations highlighting death, suffering, or atrocities is an emerging niche within special interest tourism (Buda & Shim, 2017). For instance, since opening in May 2014, the 9/11 Memorial Museum has attracted more than 10 million visitors until 2017, averaging approximately 9000 daily (9/11 Memorial Staff, 2017). Furthermore, experiences in dark tourism sites could help tourists understand the relationship between life and death (Golańska, 2015), cultivate historical consciousness and a sense of national identity, and strengthen their awareness of disaster preparation and prevention (Gotham, 2017). Because dark tourism sites are always involved with cultural, natural, and historical introspection, interpretation has become an essential way for tourists to learn more about man-made or natural disasters.

Interpretation generally implies the use of certain media and/or ways of expression to allow specific information to spread and reach the information recipients. It can be classified as personal (i.e., with a tour guide) or non-personal (i.e., without a tour guide) (Munro, Morrison-Saunders, & Hughes, 2008). With the benefits in service and education for visitors, it is evident that interpretation can enhance tourists' positive attitudes toward nature and foster an environmentally friendly behavior (Moscardo, 1998; Weng, Liang, & Bao, 2020). Hence, interpretation serves as a bridge between tourism sites and tourists. However, less attention has been paid to interpretation in the context of dark tourism sites. Previous studies mainly focused on historical information mining and meaning construction of a site from the supply perspective, often overlooking tourists' evaluation from the demand perspective (Lennon & Tiberghien, 2020). Thus, more research should answer these questions:

(1) How do tourists assess the interpretation of dark tourism sites?
(2) How does it emit the effects on tourist satisfaction and loyalty to the dark tourism sites?
(3) What are the roles of distinct interpretation types in the influencing process?

To answer these questions, this study aims (1) to investigate the

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https://doi.org/10.1016/j.jdmm.2021.100656
Received 10 April 2021; Received in revised form 5 July 2021; Accepted 11 August 2021
Available online 25 August 2021

influencing relationship between tourists' perceived interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction, and destination loyalty and (2) to assess the moderating role of interpretation type (i.e., non-personal and interpersonal interpretation) on these influencing paths. Further, it attempts to provide practical implications for dark tourism site managers from the orientation of interpretation quality and interpretation type with tourists' perspective. This study was conducted at the memorials built to commemorate the 1976 Great Tangshan Earthquake, one of China's most famous dark tourism sites.

2. Literature review

2.1. Dark tourism

Dark tourism is described as "phenomena which encompass the presentation and consumption (by visitors) of real and commodified death and disaster sites" (Foley & Lennon, 1996, p. 198). Therefore, it can effectively excavate spirit power (e.g., earthquake relief spirit, collectivism spirit), improve preservation of traditional culture, and promote cultural identity of residents and tourists. In the domain of dark tourism, dark heritage is recognized as possessing high value, increasing attention towards its preservation. Scholars have identified that dark heritage sites contain value beyond death and tragedy, such as for education, reflection, and potential contribution to the state's soft power (Clarke, Cento, & Deganutti, 2017; Hryhorczuk, 2014).

Currently, burgeoning research has focused on visitor experiences and perceptions in dark tourism (Magee & Gilmore, 2015; Sigala & Steriopoulos, 2021). Scholars found that visitors could not only gain knowledge through dark tourism sites but also improve their emotional and spiritual well-being (Magee & Gilmore, 2015; Oren, Shani, & Poria, 2021). Specifically, dark tourists could obtain both educational and social benefits (Cohen, 2011; Jamin, Zain, Sakarji, Ahmad, & Beta, 2020). Among them, educational benefits are considered the most significant and can be classified into various categories, such as life/death education, historical education, patriotism education, disaster prevention, and relief education (Cohen, 2011; Kang, Scott, Lee, & Ballantyne, 2012; Tang, 2014). Winter (2015) posited that dark tourism is an important historical education process, which provides facilitating conditions for sustaining and transmitting social memory through ritual or commemorative activities. Further, psychological research has noted that visiting dark tourism sites can strengthen family bonding and connection, promote positive moral values (e.g., understanding, empathy, sincerity), and provide unusual adventurous experiences (Jamin, Zain, Sakarji, Ahmad, & Beta, 2020). Oren et al. (2021) demonstrated that visitors' perceived benefits gained in dark tourism sites can be categorized into heritage-related, moral-related, and cognitive benefits.

It can be concluded that benefits gained in the dark tourism context combinate both cognitive (i.e., understanding the natural environment, basic conditions, tourist activities, etc.) and affective elements (i.e., obtaining the patriotism education and being more patriotic, obtaining life education to contemplate and better cherish life, etc.). These benefits have been regarded as crucial for improving tourist satisfaction and post-visit behavioral intention. For instance, Tang (2014) reported that the "gratification, appreciation, and satisfaction" of dark tourism experiences are positively correlated with tourists' gained benefits. However, conventional research typically concerns the development of dark destinations from the supply perspective, more studies focusing on tourists' experiences and perceptions have been appealed in academics (Israfilova & Khoo-Lattimore, 2019; Wu & Cheng, 2018).

2.2. Interpretation and dark tourism

Tilden (1957) defined interpretation as "an educational activity which aims to reveal meanings and relationships to people about the places they visit and the things they see through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate factual information" (p. 7). Therefore, as a means of presenting, representing, or explaining heritage, the essence of interpretation is to encourage visitors' connections and responses to the heritage (Sharpley & Stone, 2009). Such connections could be built through telling stories about a site's significance and context, such as the physical, natural, social, aesthetic, or spiritual spectrum (Cave & Jolliffe, 2012). Interpretation is also designed to stimulate interest, promote learning and understanding, and improve enjoyment and satisfaction. Further, scholars have found that interpretation is useful for resource protection and visitor management by guiding appropriate behavior and encouraging visitors to be receptive to a management policy or sustainability message (Cheng, Cao, & Wang, 2017; Moscardo & Ballantyne, 2008).

Interpretation can affect tourist experience quality and satisfaction (Huang, Afsharifar, & van der Veen, 2016; Kuo, Chang, Cheng, & Lin, 2016; Lee, Jeon, & Kim, 2011). Prior literature has broadly demonstrated that interpretation exerts a positive influence on overall tourist satisfaction (Ham & Weiler, 2007; Huang, Weiler, & Assaker, 2015; Lee, 2009; Mancini, 2001; Pearce & Moscardo, 1998). Additionally, extant work has proven that tourists' evaluation of interpretation may exert an impact on their behavioral intention. For instance, Huang et al. (2015) revealed that cognitive interpretation outcome has a significantly positive impact on tourist behavioral loyalty and word-of-mouth intention, while affective interpretation outcome does not.

In dark tourism sites, interpretation can connect tourists' memories, knowledge, and interests with the history and heritage on display, which could bring them with emotional, educational and/or entertaining experiences (Kavanagh, 1996; Wyatt, Leask, & Barron, 2020). However, research has paid little attention to interpretation in dark tourism, and the studies that exist mainly focus on the perspective of memorial management. Moreover, conserving the site's authenticity through the interpretation has suffered difficult challenges (Magee & Gilmore, 2015). Evidence has showed that multi-hued forms of interpretation at dark tourism sites (e.g., Alcatraz Island and Robben Island) are produced not only through shifting priorities of memory managers but also by tourists' expectations and external interest group agendas (Strange & Kempa, 2003). Scholars further posited that the interpretation at some dark destinations has deliberately decorated or modified the site's original history to meet political or other agendas, creating a selective history (Lennon & Tiberghien, 2020; Wight & Lennon, 2007). By analyzing the permanent exhibition, Lennon and Foley (1999) found that, while the US Holocaust Memorial Museum succeeds in providing an extensive historical narrative of the Holocaust and offering a cogent memorial to the victims, the interpretation services confuse history and use narrative techniques meant to maintain interest, which may remove reality much farther from the simulation. Therefore, obtaining more insights in what and how interpretations can be qualified as authentic from tourist perspective is necessary.

Regarding interpretive media type, personal interpretive media utilizes people to provide visitors with information, while non-personal interpretive media is printed media or electronic media that provides information at a tourism site without requiring in-person assistance (Pendit & Zaibon, 2013), such as brochures, exhibits, and self-guided walks. Previous studies showed the advantages of both interpretation types. For personal interpretation, a tour guide can actively deliver site values; interact with tourists; provide immediate feedback; satisfy visitors' emotional needs; provide an experience which appeals to emotion, imagination, and intellect; and inspire people to return or visit a similar attraction (Beeho & Prentice, 1995; Reisinger & Steiner, 2006). However, non-personal interpretation without a guide or interpreter may have a more positive effect on enhancing tourists' understanding (Wright & Sharpley, 2018), given that non-personal interpretation services, such as printed materials, are often free, while guided tours can be expensive (Weng et al., 2020). Moreover, the role of interpretation type

on impacting tourists' satisfaction has been raising interests from academics. Reino, Mitsche, and Frew (2007) found that visitors utilizing technology-supported interpretation were more satisfied than those using face-to-face interpretation. Beattie and Schneider (2018) confirmed that visitor satisfaction differed among guided, audio-guided, and self-guided interpretation satisfaction. Despite these, the efficacy of distinct interpretation types in changing tourists' attitude and behavior is not fully understood.

3. Hypothesis development

3.1. Interpretation quality, benefits gained, and interpretation satisfaction

Scholars have attached importance to interpretation outcomes, such as the impact on visitor benefits (e.g., knowledge) and satisfaction (Cheng et al., 2017). Nowacki (2009) found a positive relationship between provider performance quality and visitors' gained benefits. Rojas and Camarero (2008) demonstrated a positive relationship between the quality visitors perceive, and the emotional intensity, which could be summarized as emotional benefits gained by visiting a site. In the tourism interpretation context, Kuo, Cheng, Chang, and Hu (2018) noted the perceived service quality of a physical interpretation environment service has a direct positive correlation with visitor experience. Accordingly, combined with the conclusion drawn by Nowacki (2009), while the significant positive influence of interpretation quality on benefits gained cannot be directly affirmed, it can be preliminarily inferred. Thus, we propose the following hypothesis:

H1. Interpretation quality will positively affect benefits gained.

Product quality and customer satisfaction are the primary outcomes of marketing research (Sureshchandar, Rajendran, & Anantharaman, 2002). Prior studies have demonstrated a linear relationship between perceived quality and customer satisfaction, as the latter results from customer assessments of perceived quality (Loureiro & González, 2008; Rojas & Camarero, 2008). In the context of content-driven websites, positive evaluations of e-service quality influence positive levels of consumer satisfaction (Carlson & O'Cass, 2010). In tourism context, scholars have found that perceived quality is an antecedent of tourist satisfaction (Heung & Cheng, 2000). Trinh and Ryan (2013) posited that tourism interpretation services and exhibit displays are core elements affecting museum visitor satisfaction. However, whether the same influencing path (i.e., interpretation quality positively affects interpretation satisfaction) exists in the dark tourism context remains unclear. Reduplicating pervious findings, we propose the following hypothesis:

H2. Interpretation quality will positively affect interpretation satisfaction.

Interpretation quality is an important factor in determining tourists' experiences (Bjerregaard, 2014; Rojas & Camarero, 2008). Hwang, Lee, and Chen (2005) measured tourists' perceived interpretation satisfaction in the natural tourism context, finding that tourists' involvement is significantly positively correlated with interpretation satisfaction, and plays a mediating role between place attachment and interpretation satisfaction. This indicates that tourists' involvement and place attachment affect interpretation satisfaction to some degree, both of which can be attributed to tourists' perceived benefits gained by interpretation from a wider perspective. Gan and Lu (2012) identified a significant positive correlation between tourists' knowledge acquisition, interpretation system evaluation, and tourist satisfaction with interpretation. Thus, in the dark tourism context, we follow the prior findings in other domains and hypothesize the following:

H3. Benefits gained will positively affect interpretation satisfaction.

3.2. Roles of interpretation satisfaction and tourist satisfaction

Satisfaction refers to an emotional state of mind after exposure to an opportunity, which can reflect an experience's benefits or outcome (Baker & Crompton, 2000), along with other influences, such as process service quality (Howat, Crilley, & Mcgrath, 2008). Moscardo (1996) noted that a state of mindfulness and knowledge acquired during a visit were key to visitor satisfaction. Nowacki (2009) found that benefits gained from the provider performance quality increase tourist satisfaction towards visitor attractions. Considering the rare research on the interpretation in the dark tourism context, a positive association is hypothesized as follows:

H4. Benefits gained will positively influence tourist satisfaction.

Interpretation satisfaction has been considered a vitally important element of overall tourism experience (Ham & Weiler, 2007; Rojas & Camarero, 2008). Extant literature has confirmed that effective interpretation exerts a positive influence on overall tourist satisfaction and destination loyalty (Chang, 2014; Huang et al., 2015; Lee et al., 2011). Huang, Hsu, and Chan (2010) found that tour guide performance could significantly positively affect tourist satisfaction with guiding services and indirectly influence satisfaction with tour services and experiences. In the dark tourism context, Kuo et al. (2016) used a case study of tourists visiting the Kinmen battlefields in Taiwan to verify the positive impact of tour guide interpretation on tourist satisfaction, which further increases tourists' destination loyalty.

Additionally, the construct "tourist satisfaction" in this paper mainly refers to tourists' overall evaluation of the entire tourism experience. It not only involves the evaluation of interpretation service (conceptualized as "interpretation satisfaction" herein) but also entails the evaluation of infrastructure, facilities, activities, and services at tourist sites. To emphasize the importance of interpretation satisfaction and clearly define the influencing relationship between them, this study specifically proposes the following hypothesis:

H5. Interpretation satisfaction will positively affect tourist satisfaction.

Consumer loyalty and satisfaction are inextricably intertwined (Lee et al., 2011). Tourist loyalty has been treated as an extension of customer loyalty in tourism settings (Zhang, Fu, Cai, & Lu, 2014). From an attitudinal perspective, tourist loyalty can be generally defined as tourists' psychological expression, such as intention to revisit a destination or recommend to other potential tourists (Oppermann, 2000; Zhang et al., 2014). Prior knowledge has extensively manifested that tourist satisfaction has a positive impact on loyalty (Chiu, Zeng, & Cheng, 2016; Kozak & Rimmington, 2000; Mao & Zhang, 2014). Therefore, based on the combination of the previous evidence in this section, the following hypotheses are proposed:

H6. Interpretation satisfaction will positively affect loyalty.

H7. Tourist satisfaction will positively affect loyalty.

3.3. Effects of interpretation type

Interpretation is an important element in heritage tourism, influenced by personal and non-personal interpretive media (Pendit & Zaibon, 2013). Grinder and McCoy (1985) found that interpreters play an important role in museums, as they should display accurate content and messages and help visitors feel comfortable in an unfamiliar environment. However, as Kuo et al. (2018) stated, visitors are more likely to guide themselves around the exhibits by using signs or materials rather than selecting an in-person tour guide because most museums have limited guide resources. Moreover, many reasons may cause tourists to select non-personal interpretive media (e.g., not interested in taking up the service of an interpreter/tour guide even if they were available), being time-poor, and technical aspects (such as language not offered; Tsang, Yeung, & Cheung, 2011). Therefore, personal and non-personal interpretation each has its advantages and a special role in tourism experience.

The underlying differences for tourists utilizing different types of interpretation on their travel experience were investigated extensively by academics. Weng et al. (2020) used comparative analysis to examine the effectiveness of tour guide and non-tour guide interpretation on different value types, and they found that, compared to natural heritage

value, cultural heritage value is more effectively interpreted by a tour guide and more difficult to perceive without guided interpretation. Roberts and Edwards (2014) confirmed that guided interpretation was more effective in terms of visitor satisfaction, while guided and non-guided interpretation had only marginal differences in terms of effectiveness regarding knowledge gain and attitude change. Moreover, Morgan and Dong (2008) explored visitor satisfaction with both a guided and non-guided experience, and they found higher levels of satisfaction among the group that received guided interpretation than that which did not.

Thus, the quality, benefits gained, and satisfaction visitors perceived from personal and non-personal interpretation services may have different attributes and display dynamic patterns in affecting tourists' overall satisfaction and post-tour behavior. Further empirical research is required to determine the more effective interpretation type. Therefore, we combine the common findings of interpretation type in the cultural heritage domain and propose hypothesis 8 and the following research question:

H8. Visitors using personal interpretation services perceive higher interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction and loyalty than those who used non-personal interpretation.

RQ. How do personal and non-personal interpretations bias the relationships between interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction, and loyalty?

Based on the previous literature review, a hypothesized model of the interpretation experience process was constructed in Fig. 1. It is also assumed to vary across different interpretation types: personal and non-personal interpretation.

4. Methodology

4.1. Research site

Tangshan Earthquake memorials were selected as the study site (Fig. 2). On July 28, 1976, the Great Tangshan Earthquake (*Ms*7.8) occurred in Hebei Province, China. Its epicenter, Tangshan, experienced extreme devastation from this catastrophe, with a death toll of 242,769, and most buildings within 47 km^2 from the epicenter were destroyed (Liu, Wang, Chen, Li, & Guo, 2007). After the earthquake, the local government made great efforts to conserve the relics and constructed The Great Tangshan Earthquake memorial sites. The memorial sites include Tangshan Earthquake Ruins Memorial Park and Tangshan Earthquake Resistant Memorial Hall, etc (Fig. 3). The former opened in July 2008 and covers a total area of 400,000 m^2. It was the first park built on the ruins to serve as a memorial to an earthquake in China. The latter, opened in July 1986, provides Tangshan Earthquake history and patriotism education and serves as a cultural activity center. These two memorials have become landmarks in the city and are "must-see" sites for tourists (Chen & Xu, 2018).

Multiple forms of interpretation services are offered in the memorial sites. Among them, personal interpretation services are mainly delivered by local tour guides, which effectively facilitate inter-personal interaction and visitors' understanding of the memorial sites. However, an appointment should be made in advance for such service, and the number of full-time tour guides is limited, approximately ten. Non-personal interpretation mainly covers various forms of interpretative media, including exhibits, guide boards, signs, pamphlets, LED electronic displays, and portable wireless commentators. Both personal and non-personal interpretation not only provide important access for visitors to comprehend the entire site but also offer convenience for tourism activities, serving as a mediator between visitors and memorial sites.

4.2. Questionnaire design

The questionnaire was created with five sections using the current literature and suggestions from experts, including two managers from the research site and five tourism professors. The first section focuses on interpretation types. The respondents were asked the types of interpretation service (i.e., personal or non-personal interpretation) they used when visiting the Tangshan Earthquake memorials. The second section focuses on tourists' evaluation of interpretation quality. Nine measuring items were borrowed from previous studies (Gan & Lu, 2012; Hwang et al., 2005; Kuo et al., 2016; Moscardo, 1996) and were modified to fit the study setting. The third section focuses on benefits gained. According to previous studies (Cohen, 2011; Kang et al., 2012; Kuo et al., 2016), benefits gained contain both cognitive and affective elements, and 18 items were developed. The fourth section focuses on satisfaction and loyalty. Tourists' overall satisfaction with interpretation services and dark tourism sites were introduced based on studies by Gan and Lu (2012), Kuo et al. (2016), and Chen and Tsai (2007). Accordingly, two single-item questions "Are you satisfied with the interpretation after visiting?" and "Are you satisfied with your trip to the earthquake heritage site?" were formulated to measure "interpretation satisfaction" and "tourist satisfaction" respectively. Moreover, two items concerning loyalty were adapted from the work by Nowacki (2009). The last section focuses on the respondents' demographic information, including age, gender, education level, occupation, and residence. In Section 2-4, all the measuring items were set on a five-point Likert scale, ranging from completely disagree (1) to completely agree (5) (Table 1).

4.3. Data collection

In June 2016, a pilot survey was conducted at the Great Tangshan Earthquake memorial sites. Through on-site investigation and in-depth contact with the managers, the general situation and the setup of the interpretation system in the memorial sites were roughly grasped. By observing the visitors' activities, the suitable survey locations and the

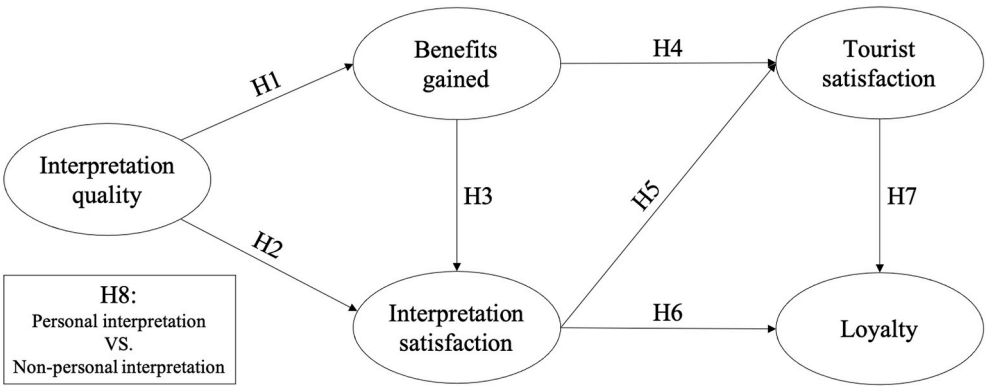

Fig. 1. Research model.

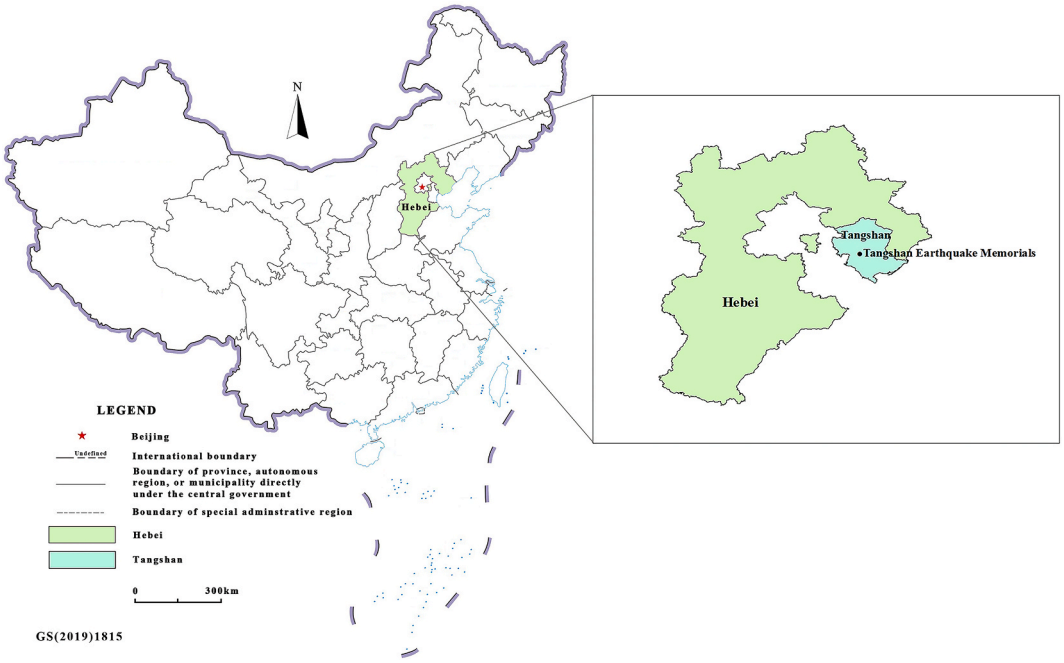

Fig. 2. Location of the Tangshan Earthquake memorials in Hebei province, China.

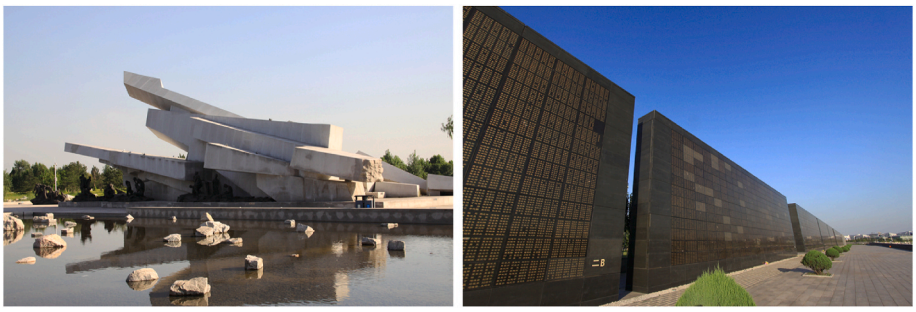

Fig. 3. Landscape of the Tangshan Earthquake memorials.

appropriate way of distributing questionnaires were determined. Then, a preliminary questionnaire survey using convenience sampling was implemented on site. According to the respondents' feedback and expert opinions, appropriate adjustments were made to create a formal questionnaire. In July 2016, researchers went to The Great Tangshan Earthquake memorial sites again and distributed questionnaires on-site. Data were collected via convenience sampling. A total of 450 questionnaires were distributed to visitors, among which 429 were effectively received (recovery rate: 95.33 %). After excluding invalid questionnaires (e.g., with incomplete answers or the same answer for all questions), 336 valid questionnaires were retained (effective rate: 85.31 %).

Demographic characteristics are shown in Table 2. Among the respondents, 52.7 % were male and 47.3 % were female. In terms of age, the largest group was aged between 20 and 29 years (33 %), followed by $\leq$ 19 (22.3 %) and 30–39 (21.7 %). Specifically, 27.1 % of respondents received undergraduate education, followed by junior school and below (22.3 %) and senior high school (19.9 %). The greatest proportion of respondents was students (35.4 %). In particular, 62.2 % of the respondents were from Hebei Province, China, while their counterparts only accounted for 37.8 %. In terms of interpretation type, 23.5 % and 76.5 % of the respondents ($n_1 = 79$, $n_2 = 257$) reported using personal and non-personal interpretation respectively.

4.4. Data analysis

Given the limited theoretical approaches and empirical studies in dark tourism research from the consumer-oriented perspective (Biran, Poria, & Oren, 2011; Kang et al., 2012), data analysis in this study followed a rigorous four-step procedure by utilizing SPSS 25.0 and AMOS 24.0. First, exploratory factor analysis (EFA; Bryant & Yarnold, 1995) was conducted to identify maximum common dimensions loaded on their corresponding multi-item variables. Second, the measurement model's reliability and validity were estimated using confirmatory factor analysis (Fornell & Larker, 1981), and then a common method variance was tested. Finally, structural equation modelling was performed to test H1–H7. Additionally, to examine the potential biased effect of interpretation types, multi-group difference analysis was implemented.

5. Results

5.1. Exploratory factor analysis

To identify potential dimensions that measure interpretation quality and benefits gained, separate EFAs using principal components analysis with oblique rotation were initially performed on the two variables. Two components underlying interpretation quality and four underlying

Table 1
Measurement instruments.

Construct	Items	Sources
Interpretation quality	ISQ1. The interpretation system is informative and relevant to the theme.	Gan and Lu (2012) Hwang et al. (2005) Kuo et al. (2016) Moscardo (1996)
	ISQ2. The interpretation language is accurate and relevant to the theme.	
	ISQ3. The interpretation method is heuristic.	
	ISQ4. The interpretation process is vivid.	
	ISQ5. The interpretation is artistic.	
	ISQ6. The interpretation is easy to understand.	
	ISQ7. The interpretation service is considerate.	
	ISQ8. The interpretation system is well-equipped and reasonable.	
	ISQ9. The means of interpretation are varied.	
Benefits gained	*The interpretation helps you …*	Cohen (2011) Kang et al. (2012) Kuo et al. (2016) Nowacki (2009) Tilden (1957)
	BEG1. learn the local natural environment (e.g., geology, weather).	
	BEG2. learn the local social economy and culture.	
	BEG3. learn basic information about the site (e.g., area, location).	
	BEG4. experience the site well with the help of guiding services.	
	BEG5. learn about the property damage from the Tangshan Earthquake.	
	BEG6. learn about the casualty loss in the Tangshan Earthquake.	
	BEG7. learn about the relief effort in the Tangshan Earthquake.	
	BEG8. learn about the process of post-quake reconstruction.	
	BEG9. learn about local socioeconomic development.	
	BEG10. learn about local residents' current lives.	
	BEG11. understand the value of the earthquake heritage site.	
	BEG12. learn about the earthquake heritage site's current situation.	
	BEG13. learn about the earthquake heritage site's utilization state.	
	BEG14. learn about the operation and management of the site.	
	BEG15. communicate with the site staff.	
	BEG16. receive education on disaster preparedness and prevention.	
	BEG17. obtain the patriotism education and be more patriotic.	
	BEG18. obtain life education to contemplate and better cherish life.	
Interpretation satisfaction	INS. Are you satisfied with the interpretation after visiting?	Gan and Lu (2012)
Tourist satisfaction	TRS. Are you satisfied with your trip to the earthquake heritage site?	Kuo et al. (2016) Chen and Tsai (2007)
Loyalty	LOY1. Would you like to revisit the earthquake heritage site?	Nowacki (2009)
	LOY2. Would you recommend the site to your family or friends?	

Table 2
Respondent demographics ($N = 336$).

Characteristics		Frequency	%
Gender	Male	177	52.7
	Female	159	47.3
Age	≤19	75	22.3
	20–29	111	33
	30–39	73	21.7
	40–49	39	11.6
	50–59	22	6.5
	≥60	16	4.8
Education	Junior school and below	75	22.3
	Senior high school	67	19.9
	Specialized secondary school	24	7.1
	Junior college	57	17
	Undergraduate	91	27.1
	Postgraduate	22	6.5
Occupation	Student	119	35.4
	Civil servant	14	4.2
	Enterprise employee	45	13.4
	Teacher or scientist	32	9.5
	Self-employed	16	4.8
	Farmer	12	3.6
	Freelancer	28	8.3
	Retiree	18	5.4
	Unemployed	2	0.6
	Other	50	14.9
Residence	Hebei province (China)	209	62.2
	Other	127	37.8
Interpretive media	Personal interpretation	79	23.5
	Non-personal interpretation	257	76.5

Table 3
Exploratory factor analysis of multi-item variables.

Item	Component						
	1	2	3	4	5	6	7
ISQ1		0.742					
ISQ2		0.803					
ISQ3		0.847					
ISQ4		0.863					
ISQ5		0.909					
ISQ6		0.793					
ISQ7					0.858		
ISQ8					0.878		
ISQ9					0.751		
BEG1				0.751			
BEG2				0.793			
BEG3				0.806			
BEG4				0.580			
BEG5	0.677						
BEG6	0.957						
BEG7	0.940						
BEG8	0.869						
BEG9	0.808						
BEG10	0.508						
BEG11	0.535						
BEG12			0.427				
BEG13			0.740				
BEG14			0.974				
BEG15			0.879				
BEG16						0.653	
BEG17						0.840	
BEG18						0.764	
LOY1							0.890
LOY2							0.916

Note. ISQ = interpretation quality, BEG = benefits gained, LOY = loyalty.

benefits gained were extracted with eigenvalues exceeding 1.0; thus, a single EFA including all multi-item variables was conducted. The score of KMO (0.931) verified that the dataset was adequate for factor analysis (Hair, Black, Babin, & Anderson, 2010). All factor loadings (range: 0.427–0.974) were above the acceptable threshold of 0.40 (Table 3; Field, 2009). Seven components were confirmed, explaining 73.55 % of the total variance.

As the results of EFAs, interpretation quality and benefits gained could be measured by two and four factors, respectively. The first interpretation quality factor was "interpretation information quality," with six items (ISQ1−ISQ6) referring to the extent visitors perceived the interpretation content and process as informative, vivid, or heuristic (Gan & Lu, 2012). The second factor was "interpretation service quality,

" with three items (ISQ7−ISQ9) describing the service and setting quality perceived by visitors. Benefits gained are closely associated with learning and education. The first factor "basic knowledge of the tourism attraction" (BEG1−BEG4) was informational, indicating visitors viewed the site as a tourist attraction (Biran et al., 2011) and learned about its basic characteristics and related environment. The second factor "deeper knowledge of the disaster and its influence" (BG5−BG11) highlighted that interpretation could enrich visitors' understanding of what occurred during and after the earthquake, expanding their knowledge regarding the consequences, influences, and changes in the local community. The third factor "experience of heritage value" (BEG12−BEG15) reflected visitors' concerns about conservation and utilization of the earthquake heritage site and their appeal for learning its current statement. The fourth factor "obligation and contemplation" (BEG16−BEG18) represented emotional responses in mental education to the interpretation, leading visitors to have more patriotic feelings, cherish life, and treasure the present.

Although there was no cross-loading problem in the pattern matrix (Table 3), "understand the value of the earthquake heritage site" (BEG11), which measured "experience of heritage value," loaded on the second factor of benefits gained. To avoid multicollinearity issues, Pearson correlation analysis (2-tailed) was used on all constructs, showing that BEG11 was highly correlated with BEG12 with a coefficient of 0.707. This was higher than its correlations with other items loaded on the factor "deeper knowledge of the disaster and its influence" ($r = 0.529$–0.635). Therefore, BEG11 was omitted from the analysis.

5.2. Confirmatory factor analysis

Confirmatory factor analysis was performed to verify whether the relationship between observed variables and their underlying latent factor(s)/construct(s) exists (Worthington & Whittaker, 2006). As multivariate normality is the most fundamental assumption in data analysis, before the CFA, the absolute values of skewness and kurtosis were used to confirm normal distribution of the data. Skewness values for all items ranged between −0.167 and −1.21, while kurtosis values ranged between −0.638 and 1.768. Therefore, no values exceeded the conventional criteria (skewness <3, kurtosis <8).

As presented in Table 4, interpretation quality and benefits gained were measured indirectly through the indicators of two and four first-order factors, respectively. Thus, a second-order CFA was used to provide a more parsimonious account for the constructs applying to the testing of the research model (Brown, 2006; Kline, 2011). In the measurement model, interpretation quality and benefits gained represented second-order factors with presumed direct effects on their first-order factors (Kline, 2011).

The measurement model showed acceptable fit indices (Hair et al., 2010): χ^2 (333) = 767.649, $p < 0.001$, $\chi^2/df = 2.305$, GFI = 0.859, CFI = 0.931, TLI = 0.922, RMSEA = 0.062 (90%CI), and SRMR = 0.055. Further, the model was validated by assessing its convergent and discriminant validity. Convergent validity was supported (Table 4): (1) All item factor loadings and path loadings (loaded on second-order factor) were significant and higher than 0.60 (Gefen, Straub, & Boudreau, 2000); (2) Composite reliability and Cronbach's α for each construct was greater than 0.70 (Fornell & Larker, 1981); (3) The average variance extracted (AVE) for each construct exceeded 0.50 (Fornell & Larker, 1981). Discriminant validity was confirmed using the criterion that the square root of the AVE for each construct should be higher than its correlations with other constructs (Table 5).

5.3. Common method variance

Considering that questionnaires were collected from the same participants at a time, the common method variance (CMV) could be a major source of measurement error. Harman's single-factor analysis was conducted to check whether the CMV is an issue in the data. The results showed that the first factor accounts for 41.678 % of the variance at the unrotated stage, which is less than the recommended threshold of 50 % (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003; Luo, Zhang, Hu, & Wang, 2016). Further, the highest value of correlation between constructs (0.853, Table 5) were less than 0.9 for the maximum level of correlation between constructs (Bagozzi, Yi, & Phillips, 1991). Therefore, the CMV was not a concern in this study.

Table 4
Convergent validity testing results.

Construct	Item	loading	Composite reliability	AVE	Cronbach's α
Interpretation quality			0.803	0.671	
Interpretation information quality		0.787			0.914
	ISQ1	0.783			
	ISQ2	0.768			
	ISQ3	0.851			
	ISQ4	0.769			
	ISQ5	0.759			
	ISQ6	0.771			
Interpretation service quality		0.850			0.910
	ISQ7	0.877			
	ISQ8	0.913			
	ISQ9	0.851			
Benefits gained			0.898	0.689	
Basic knowledge of the tourism attraction		0.926			0.855
	BEG1	0.735			
	BEG2	0.769			
	BEG3	0.790			
	BEG4	0.758			
Deeper knowledge of the disaster and its influence		0.800			0.907
	BEG5	0.735			
	BEG6	0.782			
	BEG7	0.788			
	BEG8	0.834			
	BEG9	0.829			
	BEG10	0.732			
Experience of heritage value		0.780			0.833
	BEG12	0.796			
	BEG13	0.800			
	BEG14	0.687			
	BEG15	0.609			
Obligation and contemplation		0.807			0.786
	BEG16	0.718			
	BEG17	0.789			
	BEG18	0.726			
Loyalty	LOY1	0.879	0.843	0.728	0.839
	LOY2	0.827			

Table 5
Discriminant validity testing results.

Construct	M	AVE	Correlation		
			Interpretation quality	Benefits gained	Loyalty
Interpretation quality	3.73	0.671	***0.819***		
Benefits gained	4.02	0.689	0.775	***0.830***	
Loyalty	4.19	0.728	0.475	0.606	***0.853***

Note. The boldface diagonal elements are the square roots of the average variance extracted (AVE).

5.4. Hypothesis testing – main effects

Following the second-order factor solution in the CFA, the hypotheses were examined using SEM. A good fit between the research model and the dataset was demonstrated: χ^2 (386) = 865.954, $p < 0.001$, $\chi^2/df = 2.243$, GFI = 0.853, CFI = 0.928, TLI = 0.919, RMSEA = 0.061 (90% CI), SRMR = 0.064. Although the GFI was lower than the recommended threshold of 0.90 (Hair et al., 2010), the other fit criteria were met.

Considering that the score of GFI is highly influenced by the sample size, as an exploratory empirical study, the general model was considered adequate and powerful.

Fig. 4 shows the SEM results. Accordingly, interpretation quality perceived by visitors had a strong positive effect on benefits gained from the interpretation (β = 0.764, *t*-value = 8.687, $p < 0.001$) and a significant positive effect on interpretation satisfaction (β = 0.344, *t*-value = 3.336, $p < 0.001$). Therefore, H1 and H2 were supported. Benefits gained positively affected interpretation satisfaction (β = 0.284, *t*-value = 2.846, $p < 0.01$) and tourist satisfaction (β = 0.371, *t*-value = 6.080, $p < 0.001$), supporting H3 and H4. H5 which assumed a positive effect of interpretation satisfaction on tourist satisfaction was also accepted (β = 0.364, *t*-value = 6.898, $p < 0.001$). Dark tourism site loyalty was significantly influenced by interpretation satisfaction (β = 0.215, *t*-value = 3.616, $p < 0.001$) and tourist satisfaction (β = 0.484, *t*-value = 7.749, $p < 0.001$), supporting H6 and H7; 39.8 % of the variance for dark tourism site loyalty was explained.

5.5. Hypotheses testing – moderating effects

5.5.1. Mean differences

To estimate the potential different patterns of interpretation experience processes embedded in both interpretation types, systematic analysis of multi-group differences was conducted with independent sample *t*-test and multiple group difference analysis. As Table 6 shows, each variable's mean in the personal interpretation group ($n_1 = 79$) was greater than the means of the non-personal interpretation group ($n_2 = 257$). Thus, visitors who participated in guided tours were more likely to have positive experiences than those who opted for non-personal materials. The results of independent sample *t*-test (Table 7) further confirmed the significantly different levels between the two interpretation types in interpretation quality (t (334) = 2.735, $p < 0.05$), interpretation satisfaction (t (334) = 2.533, $p < 0.05$), and tourist satisfaction (t (334) = 2.725, $p < 0.05$). Therefore, H8 was partially supported.

5.5.2. Multi-group differences

Before performing multiple group analyses to compare the path coefficients between visitors using personal and non-personal interpretation services, the acceptability of measurement invariance must be established (Hair et al., 2010). The current study uses the multisample confirmatory factors analysis to assess measurement invariance. Per the multi-group analysis procedure in the AMOS, results established partial measurement invariance between the two groups (Table 8), which supported the requirement for comparing and interpreting the group differences of covariance-based SEM (Byrne, 2004).

Path coefficients between personal and non-personal interpretation sub-models were compared after comparing mean differences for each variable (Table 9). Interpretation quality's effect on interpretation satisfaction showed a significant difference between the two groups. This is because it was not significant in the personal interpretation group, but highly significant in the non-personal interpretation group. The mean difference results denoted that visitors who do not use personal interpretation perceive lower interpretation quality and satisfaction than those who use personal interpretation. However, interpretation quality affected interpretation satisfaction for them more significantly and positively. The effect of tourist satisfaction on loyalty had a more positive path coefficient with a significant *t*-value for visitors guided by personal interpretation. Therefore, tourists process interpretation differently according to interpretation type, partially addressing the research question concerning the biased effect of interpretation type.

6. Discussion and conclusion

This study investigated tourists' interpretation experience processes by constructing an integrated model that considers various determinants (i.e., interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction) and behavioral intention (loyalty) with biased effects of interpretation type in the dark tourism context. The structural relationships between all variables, as well as the moderating effects of interpretation type in the study, were tested using data obtained from a visitor questionnaire survey at Tangshan Earthquake memorials, China. Results supported the proposed conceptual model's feasibility and applicability. The findings indicated that interpretation experience processes varied between personal and non-personal interpretation. Moreover, compared with non-personal interpretation, those who utilized personal interpretation perceived higher interpretation quality and satisfaction with both interpretation service and the trip. These findings contribute a dynamic influencing mechanism toward interpretation and its consequences for scholars and destination managers in the dark tourism field.

6.1. Findings

As an exploratory study, the results indicate that, in the dark tourism context, visitors assess interpretation quality and benefits gained from

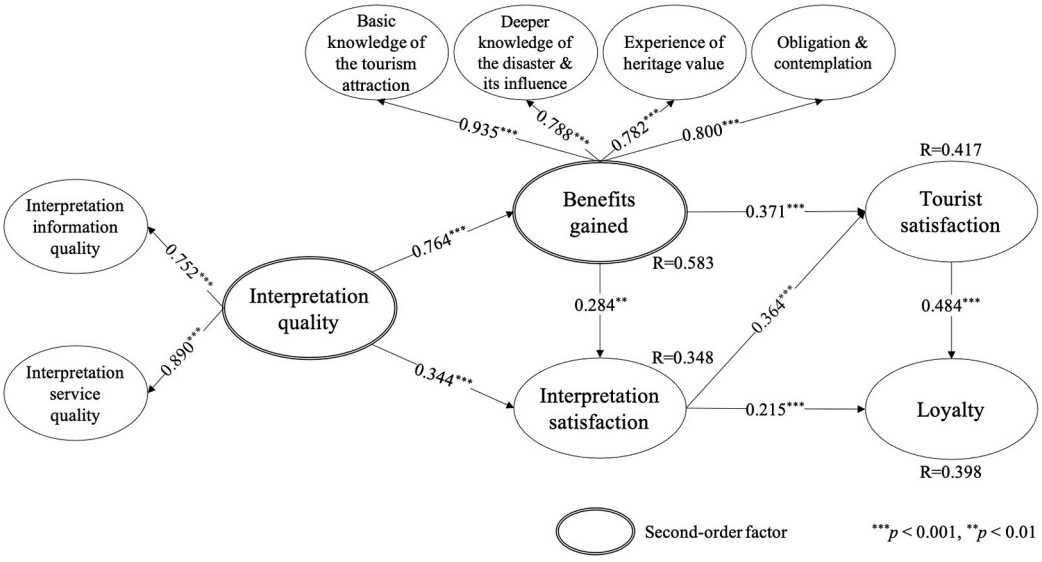

Fig. 4. Structural equation modelling results.

Table 6
Mean scale for each variable.

Group	Interpretation quality		Benefits gained		Interpretation satisfaction		Tourist satisfaction		Loyalty	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Total	3.73	0.72	4.01	0.59	4.02	0.84	3.90	0.82	4.19	0.70
Personal	3.92	0.74	4.09	0.54	4.23	0.68	4.10	0.73	4.30	0.64
Non-personal	3.67	0.71	3.98	0.60	3.96	0.87	3.84	0.84	4.16	0.72

Table 7
Independent sample *t*-test of personal and non-personal interpretation.

Group	Interpretation quality		Benefits gained		Interpretation satisfaction		Tourist satisfaction		Loyalty	
	t	Sig.	*T*	Sig.	*t*	Sig.	*t*	Sig.	*t*	Sig.
Personal Non-personal	2.735	0.007	1.410	0.159	2.533	0.012	2.725	0.007	1.514	0.131

Table 8
Summary of measurement invariance testing.

Model	Description	χ^2	*df*	$\Delta\chi^2$	Δdf	*p*	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho 2
Unconstrained	Baseline model	1291.188	670	–	–	–				
Measurement weights	Factor loadings constrained equal	1324.025	691	32.837	21	0.048	0.005	0.005	−0.001	−0.001
Structural covariances	Variances and covariances constrained equal	1332.015	699	40.827	29	0.071	0.006	0.006	−0.002	−0.002
Measurement residuals	Error covariances constrained equal	1430.086	739	138.898	69	0.000	0.019	0.021	0.001	0.001

Table 9
Structural path coefficient differences by interpretation type.

Path	Personal ($n_1 = 79$)		Non-personal ($n_2 = 257$)		*t*-Value
	Estimate	*p*	Estimate	*p*	
Interpretation quality → Benefits gained	0.713	0.000	0.859	0.000	0.727
Interpretation quality → Interpretation satisfaction	0.115	0.640	0.678	0.002	1.733†
Benefits gained → Interpretation satisfaction	0.763	0.013	0.371	0.025	−1.122
Benefits gained → Tourist satisfaction	0.630	0.002	0.507	0.000	−0.546
Interpretation satisfaction →Tourist satisfaction	0.394	0.002	0.348	0.000	−0.323
Interpretation satisfaction → Loyalty	0.050	0.681	0.171	0.000	0.930
Tourist satisfaction → Loyalty	0.611	0.000	0.356	0.000	−1.974*

Note. $^*p < 0.05$; $^\dagger p < 0.10$.

multiple dimensions. Interpretation quality comprises "interpretation information quality" and "interpretation service quality." Benefits gained include "basic knowledge of the tourism attraction," "deeper knowledge of the disaster and its influence," "experience of heritage value," and "obligation and contemplation." It echoes prior literature that tourists mainly benefit from the educational and emotional functions of visiting museums (Dimitrovski, Senić, Marić, & Marinković 2017; Yan, Zhang, Zhang, Lu, & Guo, 2016). This finding also well corresponds to the multi-dimensional operation of benefits gained for tourists in dark tourism, including both cognitive and affective benefits (Oren et al., 2021; Tang, 2014). It is notable that, unlike Tang (2014) and Oren et al. (2021) who emphasized the personal development visitors gained from dark tourism (e.g., "fulfilment and self-realization" and "moral-related benefit"), this study further revealed that visitors can have an intimate connection between citizens and the nation through visiting the dark tourism sites and their sense of patriotism increases. That is, the affective benefits include not only individual spiritual sublimation but also the thoughts and feelings for the collective and the country.

The hypothesized model proposed in this study is feasible to identify the role of interpretation quality and positive consequences for retaining tourists' loyalty. First, tourists' perceptions of interpretation quality had a positive effect on the benefits gained from dark tourism sites. This is in line with the extant literature (Nowacki, 2009) in that interpretation quality is an important antecedent for tourists to appreciate the benefits they obtained from dark tourism sites. Second, interpretation quality and benefits gained significantly and positively affects interpretation satisfaction. Similarly, Huang et al. (2015) confirmed that, in the heritage tourism setting, the higher the cognitive and affective interpretation outcome, the higher the guide interpretation satisfaction that tourists can perceive. The finding in this study further validated such conclusions in the dark tourism setting. It indicates that interpretation satisfaction is a complex psychological experience process, where it can be comprehended as the individual psychological evaluation of the objective performance of others (interpretation), as well as subjective perception of internalization degree for the effect aroused by others toward self. Hence, the relationship between the individual (tourist) and the other (interpretation) should be considered comprehensively, rather than focusing only on one of them.

Moreover, dark tourists' interpretation satisfaction and benefits gained will positively impact their overall satisfaction; interpretation and overall satisfaction will positively impact their loyalty. These findings indicated that, although interpretation is a service offered by dark tourism sites, it is a crucial factor that affects tourists' overall experience and post-tour evaluation (overall satisfaction and loyalty). Therefore, this study addressed the research gap regarding the absence of focus on the satisfying interpretation and its direct prediction in improving tourists' entire satisfaction and destination loyalty. Notably, at the

earthquake memorials, tourists assess interpretation differently based on the distinctive interpretation types: personal and non-personal. Consistent with Roberts and Edwards (2014), Beattie and Schneider (2018), and Weng et al. (2020), tourists who utilize interpreters or tour guides perceive higher interpretation quality, and they have higher interpretation and tourist satisfaction than whose who utilize non-personal interpretation services. The possible reasons are as follows: personal interpretation could effectively respond to changing contexts by offering personalized service and emotional expression, which could improve tourists' involvement and fulfil diverse audience needs. Thus, their interpretation and overall satisfaction have been improved to a certain extent. Further, these findings informed a higher guide satisfaction in a natural disaster site and reinforced the proposition that the value of cultural heritage sites and museums is more effectively interpreted by a tour guide (Grinder & McCoy, 1985; Weng et al., 2020).

Finally, a multi-group difference analysis deconstructed the dynamic patterns of the interpretation experience process. The findings illustrated that the impact of interpretation quality on interpretation satisfaction was more significant in visitors who used non-personal than those who used personal interpretation, although they reported higher interpretation quality. Unlike the interpretation form delivered by the interpreter or tour guide, multiple methods are capable to be designed within the non-personal interpretation, such as light and sound design, character re-enactment, and hands-on activities, which provide access for visitors to immersive experience (Wyatt et al., 2020). Such immersive experience underpinned by the edutainment interpretation design may engage visitors with more sense of empathy to the disaster and tragedies brought by the earthquake, and it consequently may catalyze a more satisfying experience with the interpretation. Further, this study indicated that the impact of tourist satisfaction on destination loyalty performs higher among visitors who use personal than non-personal interpretation services. The possible reasons may lie in the link between emotions and storytelling embedded in the oral interpretation of tour guides or narrators. According to Cheal and Griffin (2013), storytelling can have even more power when the visitors are narrated by tour guides in the authentic contexts or at the original places, which is difficult to be replaced by technology-based interpretation. Hence, visitors guided by narrators or tour guides, which can be more beneficial from the emotional experience triggered by the storytelling (Sigala & Steriopoulos, 2021), experience more satisfaction from the entire tour and are more likely to revisit or recommend dark tourism destinations.

6.2. Implications

This study has several theoretical implications. First, the study explored the influencing mechanism of the relationships between interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction, and loyalty. Previous studies paid little attention to dark tourism interpretation and its role in tourist satisfaction and loyalty. Hence, this study enriches the literature on dark tourism by providing a conceptual model from the perspective of interpretation type. Second, while previous studies on dark tourism sites mainly focused on the supply perspective, this study could effectively fill the research gap by providing a new perspective from tourists. Therefore, the findings widen the scope of research on interpretation in the dark tourism context, which should not only contain research from a supply perspective but also involve studies from a demand perspective or even a combination of the two. Third, this study empirically compared the different roles of personal and non-personal interpretation among tourists' perceived interpretation quality, benefits gained, interpretation satisfaction, tourist satisfaction and destination loyalty. Moreover, this study supports not only the importance of personal interpretation but also identifies the unique value of non-personal interpretation, which could improve understanding of both interpretation types.

Furthermore, this study provides an exploratory theoretical tool for comprehensively understanding the complicated influencing mechanism between "transmission" and "reception" within destination management. We verified the significance of interpretation issues in destination management, which could improve understanding of how tourists process the different interpretations and how they shape tourists' satisfaction and loyalty to the destination. Hence, destination management organizations (DMO) will be beneficial from taking more insights of the interpretation's power. The study also provides practical implications for museum managers. Interpretation at dark tourism sites should not only pay attention to tourists' desire for knowledge but also to their emotional needs and sense of obligation. Thus, dark tourism site managers should increase tourist satisfaction and loyalty by emphasizing the interpretation system's emotional and mind links to the visitors. Also, dark tourism sites will benefit from providing comprehensive and diverse interpretative media, both personal and non-personal, to promote tourists' experiences and destination loyalty. Further, targeted improvements and upgrades should be made toward different types of interpretation. More explicitly, under the premise of ensuring the optimization of both types of interpretation, on the one hand, priority should be given to working on the quality of non-personal interpretation to promote interpretation satisfaction more successfully. On the other hand, valid measures ought to be taken to efficaciously promote overall tour satisfaction for visitors using personal interpretation to upgrade their destination loyalty more significantly. It should be noted that although some differentiations for personal and non-personal interpretation exist on the impact of tourist satisfaction and loyalty, this does not imply that the stakeholders can simply focus on one type of interpretations in the destination management practice. Instead, it should be systematically considered and arranged to comprehensively enhance the satisfaction and loyalty of tourists.

6.3. Limitations and future research

This study had several limitations. The case selected in this study is typical dark tourism destinations of natural disasters. Therefore, the conclusions of this study can offer considerable help for similar types of destinations on academic research and destination management. However, whether these conclusions are applicable for dark tourism sites established in memory of the human-made disasters (e.g., war and prison tourism sites) still needs to be tested. Future research should be expanded to more diverse research contexts, such as memorial sites for human-made disasters. Moreover, a mixed-method approach combining in-depth visitor interviews and questionnaires is recommended in future research as a quantitative approach might not fully reflect the comprehensive situation of dark tourists' perception of experience in using different interpretation types.

Author statement

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Declaration of competing interest

None.

Acknowledgements

This work was supported by the National Natural Science Foundation of China [grant number 41701168] and the Fundamental Research Funds for the Central Universities, China [grant number 63202072].

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