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Actual Use Levels and Perceived Crowding in the Peak Season at Tourist Sites in Xi'an

ABSTRACT

As a major destination in China, Xi'an receives around thirty million visitors annually in recent years. Some of the famous sites in Xi'an, such as the "Terracotta Army", have an image of being crowded, especially during the Golden Weeks. There is though little documentation in the tourism literature on visitors' use levels and perceived crowding at Xi'an sites. This study addresses crowding issues from five separate sites in Xi'an. Results showed that tourists' use levels, perceived tolerance and preference differed in the ordinary peak season and the Golden Weeks. Evidence for crowding was confirmed and potential management actions discussed.

Keywords: crowding, use-levels, preference, tolerance, management.

INTRODUCTION

Crowding has been studied in tourism and recreation research since the 1970s (Stankey and Lime, 1973). Most crowding-related studies derive from the work of North American researchers, focusing on the key concepts of carrying capacity, limits of acceptable change and crowding norms (Vaske et al., 1986; Manning et al., 1999; Donnelly et al., 2000; Roupael and Hanafy, 2007). Numerous studies have employed the perceived normative theory to study crowding problems (e.g. Shelby and Heberlein, 1986; Manning, 1999; Vaske and Donnelly, 2002; Needham et al., 2004). The crowding norm concepts have helped researchers understand key aspects of crowding attitudes. Further, crowding norms are usefully linked to management actions since they provide suggestions for limiting numbers and improving conditions. Clearly crowding management plays an important role in developing tourism sustainability at tourism settings.

The increasing use of tourism settings in countries such as China and India, has generated concerns about the ability of these developing areas to sustain acceptable

levels of social impacts. Crowding studies are also necessary in these countries. Xi'an in Western China was employed as the case study area because it is a middle-sized history and heritage city. In recent years, history or heritage resources have undertaken excessive tourism pressure as much as natural resources (Borg, 2004). History or heritage resources are still sensitive to excess tourism demand because of their historical, socially, environmentally and economically complex. Tourism may be the threat to both local heritage protection and local settlement environment. This paper focuses on crowds in the heritage sites in Xi'an to note if excessive tourism has occurred in the limited areas. This paper investigates visitors' actual use levels and compares these levels with visitors' perceived use levels (tolerance and preference to other visitor activities) at several Chinese tourist sites in Xi'an, Western China. This paper also compares visitors' actual use levels between two different time periods, the average peak season (April 1 to 31 October) and the busiest Golden weeks (either May 1 to May 7 or October 1 to October 7). The Chinese sites studied comprise urban and cultural settings. Only a few previous researchers have studied crowding problems in urban settings (Gillis et al., 1989; Rustemli, 1992; Yagi and Pearce, 2007). This paper continues this set of studies, but focuses on the readjustment of the North American concepts and indicators in these additional Chinese cultural settings. This paper uses data from both observations of crowding numbers and surveys of tourists' perceptions of crowding at a range of tourism sites in Xi'an. The broad goals are to assess visitor use levels at sites, establish preference and tolerance activities and determine, if crowding exists, what management actions might be put in place. These critical points can be expressed as four aims.

Aim 1 is to investigate the actual use levels of select and typical tourism sites in Xi'an in two different time periods, employing data derived from observations. The actual use levels can indicate the tourist flow and crowds in the sites.

Aim 2 is to investigate perceived use levels within the same set of tourist sites, employing data derived from questionnaire surveys. The perceived use levels can indicate tourists' perception of crowding.

Aim 3 is to compare the actual use levels and the perceived use levels of the same set within tourist sites in Xi'an. This comparison can indicate whether crowding issues occur in the sites.

Aim 4 is to indicate the crowding management activities within tourist sites in Xi'an.

LITERATURE REVIEW

Measuring crowding numbers

Increasing numbers of visitors bring problems to tourist sites, including ecological impacts and social implications. Several researchers have reported ecological impacts in the areas of soil erosion, environmental pollution and facility damage (Shelby et al., 1988; Manning et al., 1995; Ormiston et al., 1997; Thomas, Pigozzi and Sambrook, 2005). Additionally, social impacts negatively affect the quality of experience at tourist sites (Shelby and Heberlein, 1984). Rising visitors cause conflict among visitors with different purposes such as those who seek solitude and those who prefer a more social atmosphere (Manning, 1997). Rising numbers of visitors also lead to crowding when the usage of environmental and social resources exceeds the carrying capacity of areas (e.g. Shelby and Heberlein, 1984; Shelby, Vaske and Harris, 1988; Manning et al., 1999; Hammitt and Cole, 1998). The United Nations World Tourism Organisation has offered the following definition of carrying capacity:

“the maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic and socio-cultural environment and unacceptable decrease in the quality of the visitors' experience” (WTO, 1981).

A number of management frameworks and approaches contribute to the control of crowding. The carrying capacity approaches have been introduced as the commonly

used technique for controlling crowding to avoid natural and social impacts in sensitive environments (Eagles et al., 2002). The limits to acceptable change approaches define parameters, such as visitor experience or satisfaction, or moreover, for determining environmental impacts (Kostopoulou & Kyritsis, 2006). The limits to acceptable change approaches point out that the impacts of visitor numbers are inevitable. However, the negative outcomes can be minimized by the positive economic, social and environmental achievements.

These management approaches can effectively segregate large numbers of people from one another. The identification of the peak visitor flows helps manage the physical capacity of the sites, especially in the short-term peak periods. Such approaches require details about source markets, the demographic characteristics of visitors, peak tourism activity and alternative attractions which are essential to keep the optimal use of the environmental resources and distribute tourists in the peak periods (United Nations World Tourism Organization [UNWTO], 2004). In fact, researchers on crowding management always look beyond the actual number of visitors in their studies. In particular researchers need to assess tourists' perceptions of the acceptability of the encountered numbers of visitors.

The perceived normative theory

The term “perceived crowding” means an individual’s perception of setting density for specific environments (Shelby & Heberlein, 1986). Much of the perceived crowding related research was based on the linkage of encounters, norms and crowding. Norms are “the evaluative standards employed by people to define behaviours or conditions” (Vaske et al. 1986). Therefore, norms can be used to measure visitors’ perceptions. Encounters refer to “the number of other people that an individual observes in a setting” (Vaske & Donnelly, 2002). This linkage of encounter – norm – crowding means that actual visitor use levels and perceived crowding is

mediated by the tourists' perceptions of the number of people in the area (reported encounters).

Most previous studies have identified a positive relationship between use levels and perceived crowding. When people reported more encounters than their norms, they felt "very crowded"; when people reported less encounters than their norms, they felt "not at all crowded"; and when encounters equalled their norm, they felt "slightly" or "moderately" crowded (cf. Vaske & Donnelly, 2002). Manning et al. (1999) further illustrated this relationship by their "hypothetical social norm curve". Different points along the norm curve represent tourists' different acceptable responses to encounters. Exceeding the expected point is uniformly seen as a negative outcome. This simple relationship can be challenged in tourist attractions where people from communal and non Western cultures may enjoy the popularity and possibly even more people than expected (Urry, 1990). In this paper, crowding preferences are explored in a Chinese tourism context.

Norm-measurement approaches and their application in management actions

A number of good examples of using norm-measurement are represented by the work of Manning and colleagues. The most widely used measurement of crowding norms involves a visual approach (e. g. Manning, Lime, Freimund, & Pitt, 1996; Manning, Lime, & Hof, 1996; and Manning et al., 1999). The commonly used evaluate dimension which have been related to use levels are "preference", "desirability", "ideal", "acceptability", "satisfaction", and "tolerance" (e. g. Hammitt & Rutlin, 1995; Manning et al., 1999; Watson 1995; Young et al., 1991). Questionnaires are usually employed. In these sorts of studies closed-ended questions ask respondents to rate the acceptability of photographs by using a nine-point response scale across the range "very acceptable" (+4) and "very unacceptable" (-4) (e. g. Heberlein & Vaske, 1977; Manning et al., 1999; Manning, Lawson et al., 2002; Manning, Wang et al., 2002;

Needham et al., 2004). Open-ended questions ask respondents questions such as “Which photograph shows the number of people that would be so unacceptable that you would no longer visit this site?” (e. g. Hall & Roggenbuck, 2002; Manning et al., 1999).

With different goals in planning and management, tourism managers depend on different evaluation dimensions. According to Manning and his colleagues (1999), there was a clear hierarchy of crowding norms among these evaluative dimensions. “Absolute tolerance” reflects the finding that respondents tend to tolerate higher use levels, more crowding. By way of contrast, “preference” dimension means that respondents prefer to low use levels, less crowding. “Acceptability” reflects the point that respondents are more willing to accept higher use levels if there is no difficulty of public access. It is noteworthy that each of the evaluative dimensions has potential advantages and disadvantages in guiding tourism management issues. For example, management based on preference-related norms may cause low numbers of visitors in an attraction but high quality experiences for visitors. By contrast, management based on tolerance may lead to high visitor numbers but lower quality experiences. It may be critical to keep a balance between use level and quality of recreation experiences in management decision making (Manning et al., 1999; Manning, Lawson et al., 2002).

METHODS

Research design

In the recent decades, researchers indicated that good research practices involve the use of multiple methods to highlight the validity of the research findings (Johnson & Onwuegbuzie, 2004). This research used the mixed-methodology of quantitative and qualitative seen as complementary to each other. The quantitative and qualitative approaches used in this study relied upon the use of descriptive research in the form of questionnaires and observation. The mixed-methodology can be used to investigate

whether the crowding issues occur in attractions in the destination Xi'an. Collecting visitors' actual use in attraction and their perceptions of such use was a practical mixed method to compare visitors' actual use levels and perceived use level. The results of this comparison would indicate whether crowding issues exist. If the crowding existed, the practice of crowding management activities is needed. Visitors were selected as the audience directly involved in this study because their evaluation is important to assess the environments and efficacy of tourism development in order to make management practice about its future in Xi'an.

The observation was used in this study to collect data of actual use levels at different locations within attractions from large and varied groups of visitors. The questionnaire survey was employed for the collection of perceptions of such use levels (perceived use levels) at different locations within attractions from large and varied groups of visitors. After the data collection and analysis phases completed, the results would contribute to tourism development and the related management practices in Xi'an. Figure 1 illustrated the research design in this study.

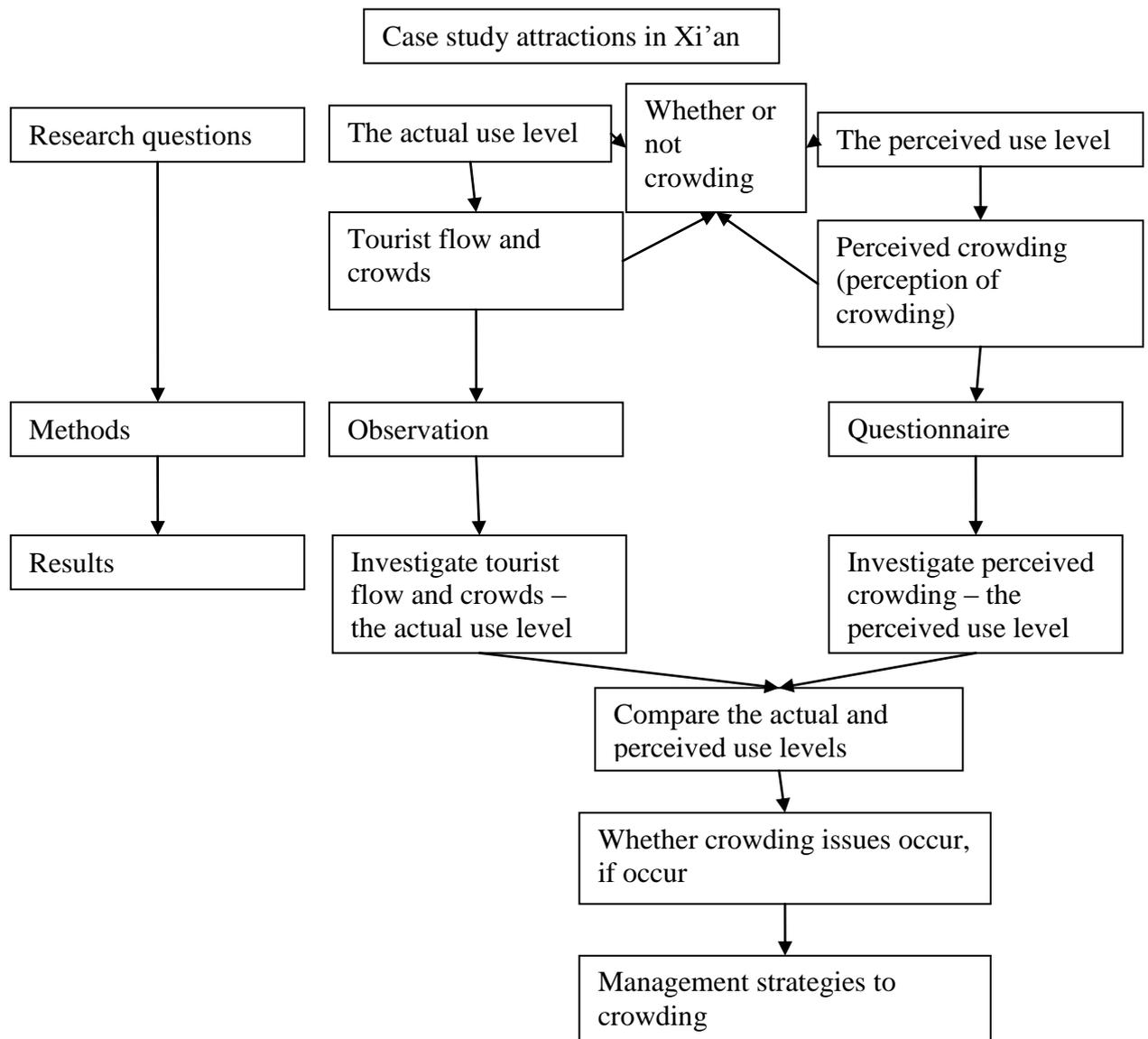


Figure 1: Model of the research design

Study area

Xi'an is a significant cultural tourism destination in China. There is a population of over 6 million distributed in an area of 10 square kilometres. Xi'an is located in the warm temperate zone with four prominent seasons, hot summers, cold to very cold winters and a gentle spring and autumn. Xi'an has over 6,000 years of history and used to be the capital for 11 imperial dynasties. Xi'an is very famous for its ancient historical sites, cultural relics and archaeological discoveries such as the Terracotta Army site. Approximately thirty million domestic and international tourists come to Xi'an making it an important destination to assess crowding at major locations (Xi'an Tourism China, 2007).

From the major attractions in Xi'an five sites were selected to vary the factors of scale, levels of fame and type of attraction (Table 1). The sites selected were the Terracotta Army site, the Shanxi History museum, the Huaqing Hot Springs, the Forest Stone of Steles, and the Famen temple. Although the sites selected offer a considerable variety in attraction types, they share a commonality in being relatively popular and at times having large to very large numbers of visitors.

Table 1 The sample list of tourist sites in the study

Name	Fame	Type	Size
The Terracotta Army	World Heritage	Museum	Large
Shaanxi History Museum	Not World Heritage	Museum	Medium
Huaqing Hot Spring	Not World Heritage	Cultural park	Large
Forest Stone of Steles	Not World Heritage	Museum	Medium
Famen Temple	Not World Heritage	Temple	Medium

Actual use levels

Observations were conducted in key places at each of the five sites to record the actual site use figures to be used in the study. Data were recorded at five locations within each site, including the entrance point, a main pathway, a shop, and then two major points of interest. Observations were made at all sites on two select days at each site in peak season (April 1 to October 31). Further at each site a day of observations occurred during the particularly busy Golden weeks (either May 1 to May 7 or October 1 to October 7); at each site the other day of observations occurred during the ordinary peak time (from May 15 to September 30). There were three times of the day (opening time to 11.30am, 11.30 am-2.30pm and 2.30pm –closing time) when the visitor use levels were recorded. The number of visitors at each location in a ten minute period was the measure employed. This amount of time best fitted the flow of

visitors at most of the points and locations studied. Additionally this approach ensured variability in the use level data for the different parts of the attraction. As actual use levels recorded varied systematically across different time periods and at the actual sites, the ecological validity or naturalness of the questions and the study was enhanced. No distinctions were made among visitors with different origins when counting the number of site users.

Visitors' perceived crowding

To measure perceived encounters, a structured questionnaire survey was conducted in the period September to November 2007 at the tourism sites in Xi'an. A convenience sample of 287 questionnaires was successfully completed, 65 questionnaires for the Terracotta Army site, 58 questionnaires for the Shanxi History museum, 54 questionnaires for the Huaqing Hot Springs, 54 questionnaires for the Forest Stone of Steles, and 56 questionnaires for the Famen temple. Eighty per cent of respondents were Chinese domestic visitors. The questionnaire was built heavily on the previous literature in recreation crowding assessment and normative studies of crowding. There were several photographs used for the assessment of respondents' norms, including the evaluative dimensions of tolerance and preference. Respondents were given photographs of five different locations within each site where they were visiting at the time or after the time. Photographs were taken in different levels of crowding, but only the photograph which showed the mid point of the use level at each location of the site was used. Respondents were then asked for their tolerance and preference ratings for more or less people than depicted in the photograph. Respondents could indicate their perceptions on a 5 point scale where eight times as many as the people showing, four times as many as showing, twice as many as showing, the same number of people and half as many as the people showing were the defining points on the response scale. The sample question 1 is below:

1. What number of people would you tolerate to see compared to the number of people showing in the photo? Please rate on a scale of “1= half as many as the number of people showing on the photo” to “5= eight times as many as the number of people showing on the photo”.

- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> |
| 1 | 2 | 3 | 4 | 5 |
| Half as many as showing | Same as showing | Twice as showing | Four times as showing | Eight times as showing |

RESULTS

Actual use levels

Much information was collected by observations on the actual use levels of component parts of the five tourist attractions. For each attraction there are data concerning the time of day and there are data pertaining to the ordinary peak season compared with data about the special Golden week visitors. The data from the five sites employed represent the common patterns (refer Figure 2 to Figure 6). It is useful to read scores on the Y axis which can show contrasts in the data across the figures.

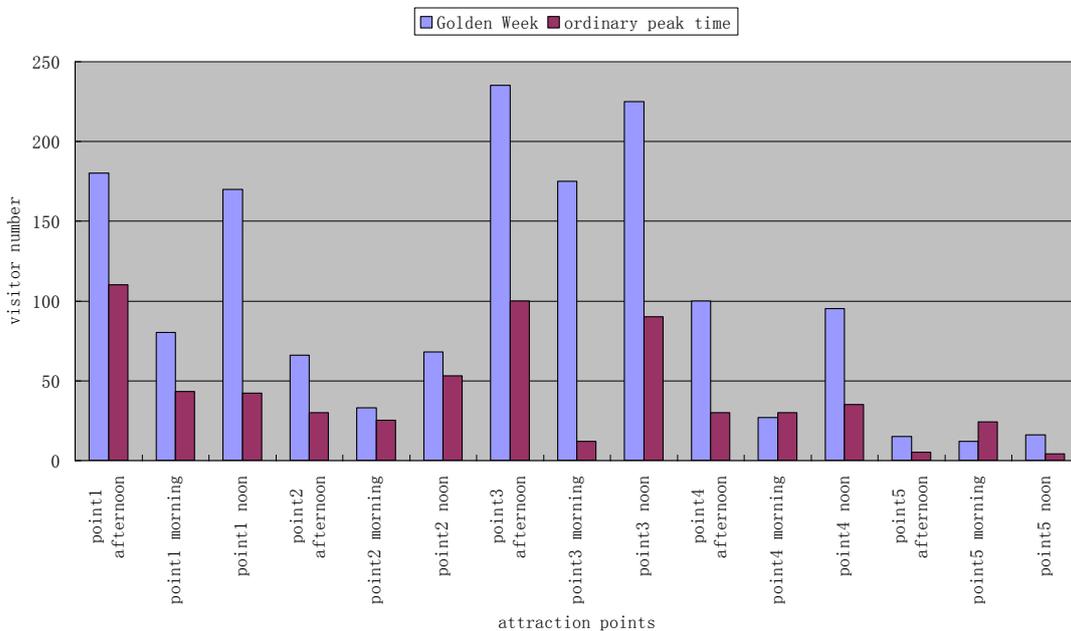


Figure2 Compared daily visitor use levels between the ordinary peak season and the Golden Weeks – Terracotta Army, 2007

Based on Figure 2, at the Terracotta Army visitor numbers were consistently higher at noon and in the afternoon than in the morning at most locations within the attraction.

This generalization occurred in both ordinary peak season and Golden Weeks. In addition, there was a substantial difference between actual visitor numbers in the ordinary peak time and in the Golden weeks.

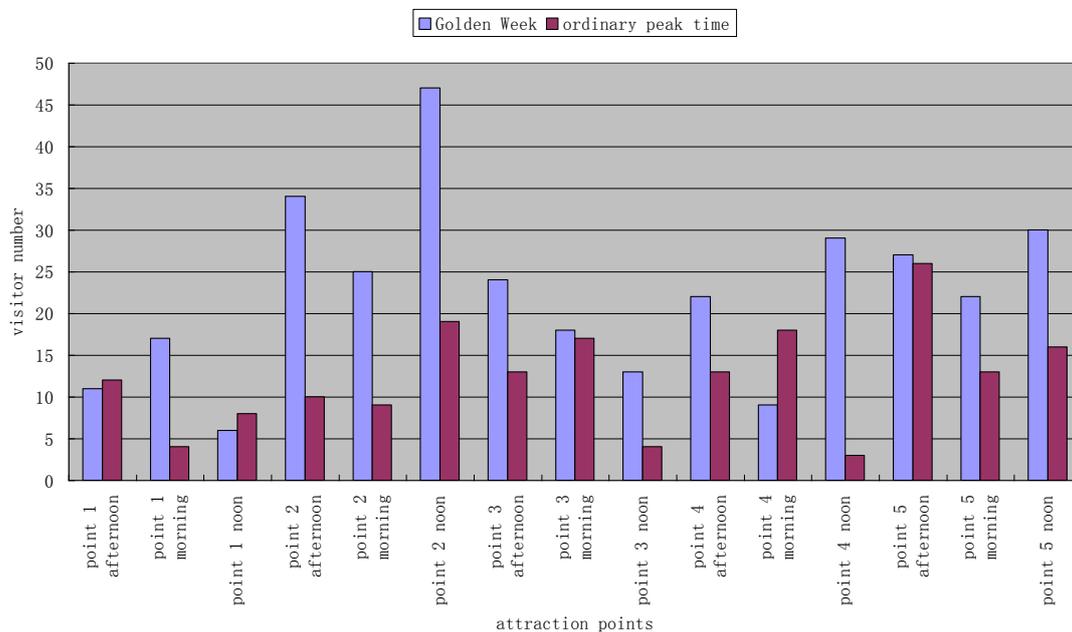


Figure 3 Compared daily visitor use levels between the ordinary peak season and the Golden Weeks – Shaanxi History Museum, 2007

The data indicated that there was little difference in the actual visitor numbers at different time points throughout day (morning, noon, afternoon) at these locations. Additionally, a small difference existed between the daily actual visitor numbers in the ordinary peak time and the daily actual visitor numbers in the Golden Week.

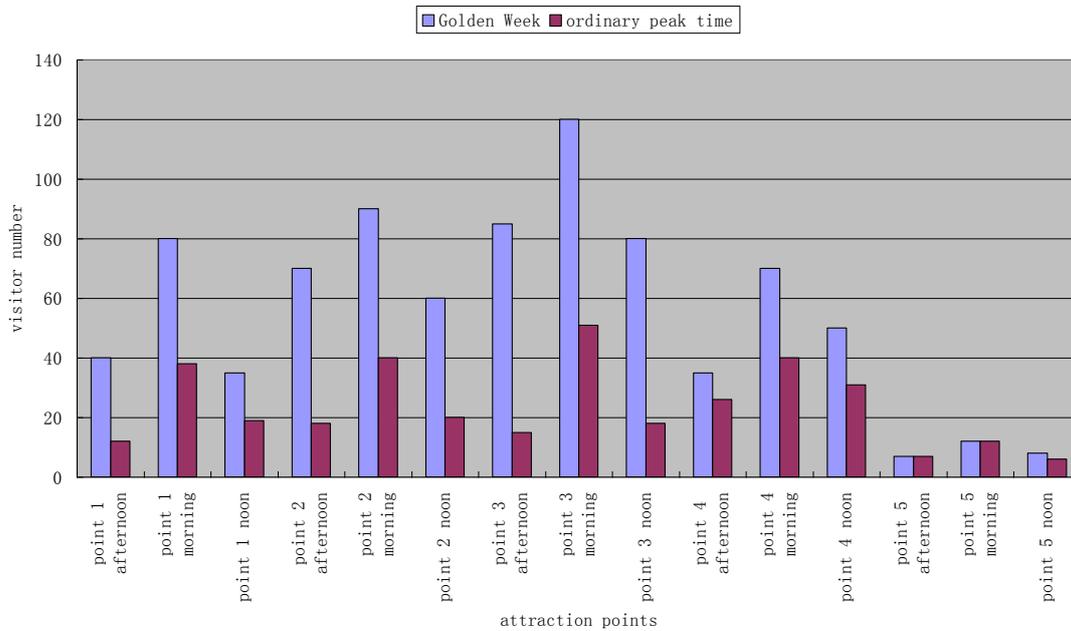


Figure 4 Compared daily visitor use levels between the ordinary peak season and the Golden Weeks – Huaqing Hot Spring, 2007

Based on Figure 4, the actual visitor numbers were higher in the morning than at the noon and in the afternoon. Moreover, there was a difference between the daily actual visitor numbers in the ordinary peak time and the daily actual visitor numbers in the Golden Week at most locations.

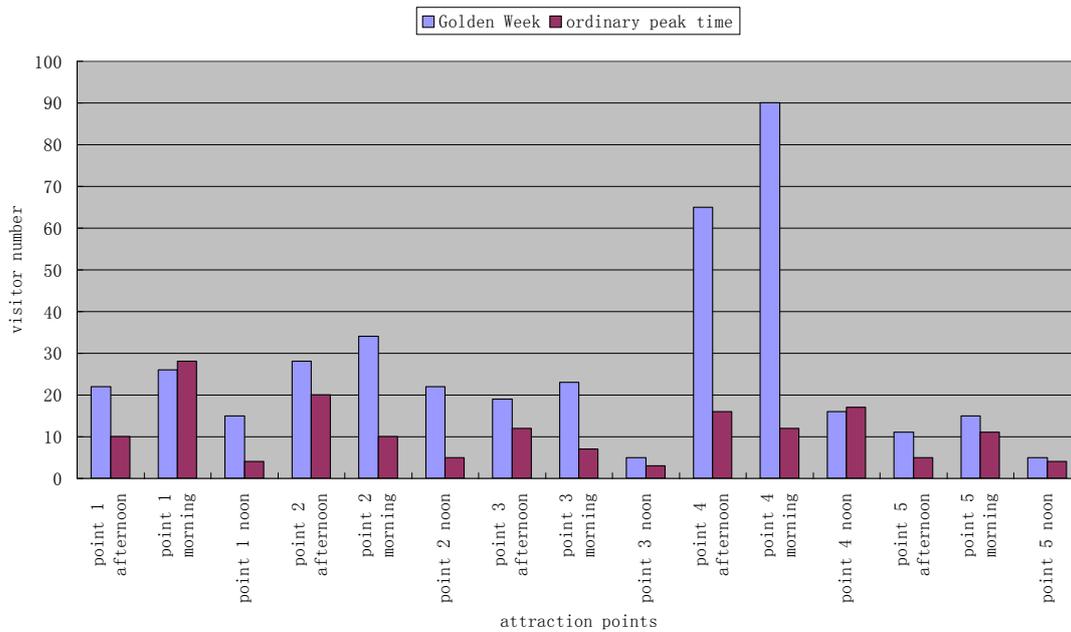


Figure 5 Compared daily visitor use levels between the ordinary peak season and the Golden Weeks – Forest of Stone Steles, 2007

In the Forest of Stone Steles, the actual visitor numbers were higher in the morning and afternoon than at the noon at most locations. In addition, there was a small difference between the daily actual visitor numbers in the ordinary peak time and the daily actual visitor numbers in the Golden Week at most locations except for point 4. Location 4 is an exhibition room in the same style with other exhibition rooms in the Forest of Stone Steles. A substantial difference can be recognized in exhibition rooms between the ordinary peak time and the Golden Week.

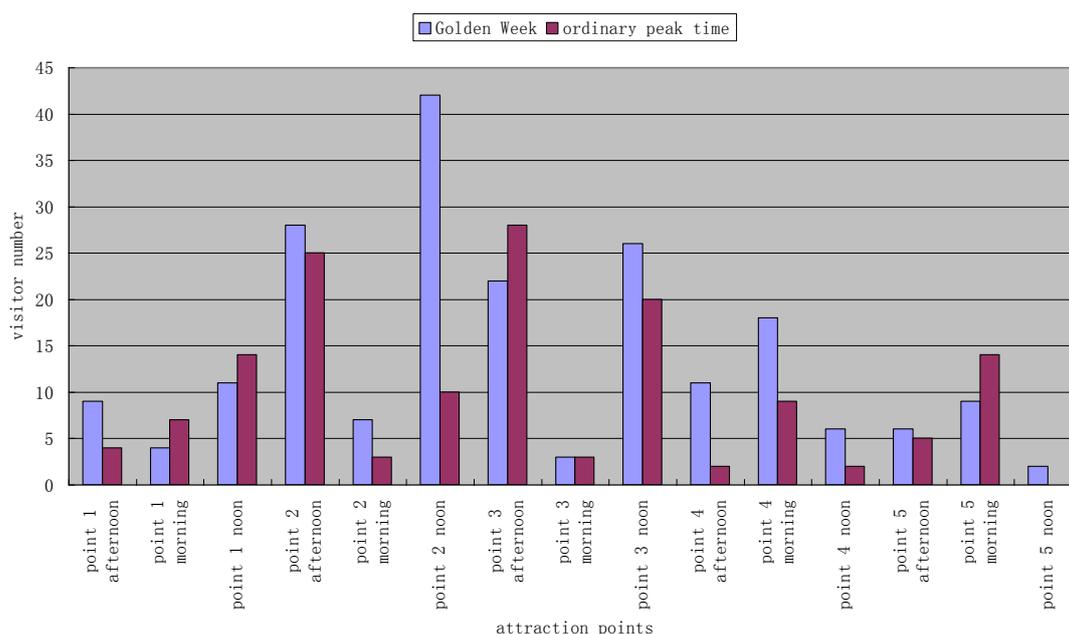


Figure 6 Compared daily visitor use levels between the ordinary peak season and the Golden Weeks – Famen Temple, 2007

Based on the data about the Famen Temple, the actual visitor numbers were averagely located at different time points. In addition, a small difference was identified between the daily actual visitor numbers in the ordinary peak time and the daily actual visitor numbers in the Golden Week over most locations.

The visitors’ actual use levels of these five sites present similarities and several differences. One significant similarity is the uniformly higher visitor numbers in the Golden week period than the numbers in the average peak season. Seasonality has become the negative factor to influence the tourism development in Xi’an and might

become a negative impact on visitors' perceptions. At the Terracotta Army and the Huaqing Hot Spring, the difference was very obvious. At the Terracotta Army, the domestic visitors who accounted for a large percentage of the market had the holiday at same time, and hence came to the site in the same time periods. At the Huaqing Hot Spring, it was not as famous as the Terracotta Army yet a large number of international and national tourists visited the site, because the site was located close to the Terracotta Army. Often, travel itineraries linked the two sites. The difference of visitor numbers was not big between the ordinary peak time and the Golden Weeks at the other three attractions. One reason may be that local or regional visitors accounted for a comparatively large percentage of the market, and these visitors were not influenced by travel opportunities in the Golden Week. Additionally these three attractions were not as famous as the Terracotta Army, thus many international or domestic visitors had not recorded these sites in their travel list.

A further apparent problem was that the time of day data varied at some attractions such as the Huaqing Hot Spring because of inappropriate trip itineraries. In the Forest Stone of Steles, the numbers of visitors were likely to be crowded in exhibition rooms. The observational data reinforce the influence of the domestic Chinese visitors and the way in which their allocated holiday periods leads to high visitor numbers throughout the attractions at concentrated periods.

Perceived use levels

The respondents were asked to identify the number of encounters they could tolerate and the number of visitors they preferred to see at the sites. The perceived visitor use levels (encounters visitors could tolerate or prefer) were derived from the actual number of visitors depicted in the benchmark photograph. By example of the "tolerated encounters" at the Entrance in the Terracotta Army, the number of visitors depicted in the photograph is "38", the scales of "tolerated encounters" rated by

respondents are “1, 3...” which mean “half as many as the encounters showing in the photograph” and “twice as many as the encounters showing in the photograph”..., the number of respondents are “65”, and then the mean number of visitors that respondents would tolerate $= (38 \times 0.5 + 38 \times 2 + \dots) / 65 = 62$.

Again information about these five sites is presented in Table 2.

TABLE2 Daily perceived visitor use levels in the five attractions

Location	Number of visitors depicted in the benchmark photograph	Mean number of visitors that respondents would tolerate	Mean number of visitors that respondents would prefer
Terracotta Army			
		(N= 65)	(N= 65)
1 Entrance	38	62*	42
2 A main pathway	18	31*	23*
3 Exhibition space Pit 1	67	56	41*
4 Exhibition space Pit 2	15	16	12*
5 Shop	12	14	11*
Shaanxi History Museum			
		(N= 58)	(N= 58)
1 Entrance	18	31*	24
2 Main pathway	15	39*	28*
3 A part of Exhibition Room 1	18	20	15
4 A part of Exhibition Room 3	17	22	14*
5 Shop	20	32*	21
Huaqing Hot Spring			
		(N= 54)	(N= 54)
1 Entrance	39	53*	37
2 Main pathway	18	31*	22
3 the square in the middle of the hot spring ruins	39	42	36
4 Exhibition Room of Lotus Pool	38	41	31*
5 Shop	15	20*	15
Forest Stone of Steles			
		(N= 54)	(N= 54)
1 Entrance	15	34*	23*
2 Main pathway	17	27*	19
3 the space in front of Jingyun Bell	23	29	23
4 Exhibition Room 2	18	15*	12*
5 Shop	7	13*	9
Famen Temple			
		(N= 56)	(N= 56)
1 Entrance	12	23*	18*
2 Main pathway	16	28*	21
3 the room on the second level of Treasure Exhibition	26	32	24

Room			
4 the space in front of the epitaph in Exhibition Room 3	15	17	14
5 Shop	11	21*	16*

*p < .05

In Table 2, the number with “*” means the perceived tourist numbers (tolerance and preference) are significant. The perceived tourist numbers were used as the basis for comparison with the actual tourist number derived from the observation. A single sample t-test was used to compare the visitor actual use levels and the visitor perceived use levels. The single sample t method tests if a sample mean is different from a hypothesized population mean (Pagano, 1983). In this paper, a single sample t-test indicated that the “mean number of visitors that respondents would tolerate” and the “mean number of visitors that respondents would prefer” were rated as significant based on the “mean number of visitors depicted in the benchmark photograph.” t can be calculated by the equation below:

$$t_{obt} = \frac{\bar{X}_{obt} - \mu}{\sqrt{\frac{\sum x^2}{N(N-1)}}}$$

$$\sum x^2 = \sum (X - \bar{X})^2 = \sum X^2 - \frac{(\sum X)^2}{N}$$

The details to undertake these targeted t test comparisons can be documented as

follows. On the first step: calculate t_{obt} directly from the raw scores.

\bar{X}_{obt} = “the mean number of visitors that respondents would be prepared to tolerate at a location” or the “mean number of visitors that respondents would prefer to see at a location”; μ = the “mean number depicted in the benchmark photograph of a location”; N = “the number of respondents to answer the question about tolerance and preference of a location”; and X = “the original data of number of visitors that the respondents would be prepared to tolerate or prefer.”

On the second step: evaluate the statistic based on its sampling distribution.

If $|t_{obt}| \geq |t_{crit}|$, the result is significant. t_{crit} is found in the Table of Distribution of t under the appropriate alpha level and df. For this study with $\alpha = 0.05_{2tail}$ and $df = N - 1$, from the Table of Distribution of t, $t_{crit} = \pm 2.000$. So the “mean number of visitors that respondents would be prepared to tolerate at a location” or the “mean number of visitors that respondents would prefer to see at a location” is significant

when $|t_{obt}| \geq 2.000$.

If the mean perceived number is significant, it means that the mean perceived number can be used to indicate tourists’ perceptions. Tourists can tolerate or prefer to see such numbers of encounters. If the mean perceived number is not significant, this mean perceived number can not be used to indicate tourists’ perceptions. It cannot confidently indicate that tourists can tolerate or prefer to see such numbers of encounters.

Based on data in Table 2, many perceived numbers were significant in each attraction, and they could arguably indicate tourists’ perceptions of the attraction. There was only a small gap between the tolerance use level and preference use level at the five locations within each attraction.

Compare actual use levels and perceived use levels

Scoring on the evaluative dimensions is useful in measuring visitors’ perceived use levels. It is noteworthy to compare visitors actual use levels and their perceptions to other users. The difference between actual use levels and perceived use levels is useful in indicating crowding situation. Further, tourism management can be guided by such differences in order to promote visitors’ quality of experience and their satisfaction. Continually, the comparisons about the five attractions are presented in Table 3. As the perceived use levels, including both numbers of tolerance and

preference, are significant at a few of locations, therefore there can be the range of perceived use levels at these locations. The lowest end of the range represents the number of encounters that visitors would prefer to see and the top of the range represents the number of encounters that visitors would tolerate to see. At the locations, either numbers of tolerance or numbers of preference are significant, therefore only the significant numbers can indicate the perceptions of visitors. Whatever, the actual use levels cannot exceed the perceived use levels, otherwise crowding would happen in the locations. The ranges of visitors' actual use levels are generated from the Figures 2-6, from the lowest to highest.

TABLE3 A comparison of visitors' actual use levels and their perceived use levels

Location	Perceived use levels	Range of visitors' actual use levels
Terracotta Army		
1 Entrance	62	42-180
2 A main pathway	23 - 31	25-68
3 Exhibition space Pit 1	41	12-235
4 Exhibition space Pit 2	12	30-100
5 Shop	11	4-24
Shaanxi History Museum		
1 Entrance	31	4-17
2 Main pathway	28 - 39	9-47
3 A part of Exhibition Room 1	N/A	4-24
4 A part of Exhibition Room 3	14	3-29
5 Shop	32	13-30
Huaqing Hot Spring		
1 Entrance	53	12-80
2 Main pathway	31	18-70
3 the square in the middle of the hot spring ruins	N/A	15-120
4 Exhibition Room of Lotus Pool	31	26-70
5 Shop	20	6-12
Forest Stone of Steles		
1 Entrance	23-34	4-28
2 Main pathway	27	5-34
3 the space in front of Jingyun Bell	N/A	3-23
4 Exhibition Room 2	12-15	12-90
5 Shop	13	4-15
Famen Temple		
1 Entrance	18-23	4-14
2 Main pathway	28	3-42
3 the room on the second level	N/A	3-28

of Treasure Exhibition Room		
4 the space in front of the epitaph in Exhibition Room 3	N/A	2-18
5 Shop	16-21	0-14

Based on the data in the Table 3, the actual use levels at some locations, for example at location 5 in the Terracotta Army (the shop), were close to the perceived use levels. Therefore, visitors were unlikely to be bothered by others at these locations. However, the numbers of actual visitor use levels at many locations highly exceeded visitors' perceived use levels at some time points, especially at locations in the Terracotta Army, locations in the Huaqing Hot Spring and location 4 in the Forest Stone of Steles. The results indicated that visitors were very likely to be disturbed by other people at these locations, and a reduced number of people or management practices could promote their quality of experiences at these sensitive locations. The site Terracotta Army exceeds all others studied in this study in terms of the disparity between observed and preferred or tolerated numbers of visitors. The data analysis indicated that perceived crowding has occurred in the Terracotta Army, the Huaqing Hot Spring and the Forest Stone of Steles by different reasons. In the Terracotta Army, its uniqueness and scarcity caused the perceived crowding problems in this attraction. In the Huaqing Hot Spring, the sensitive time points in the morning could be considered as the main reason of perceptions of crowding. In the Forest Stone of Steles, conditions were not used efficiently leading to the perceived crowding issue. Management practices such as better design of itineraries, distribution and improvement of conditions would be necessary to promote visitors' quality experience and enhance their positive perceptions. More specific crowding issues, the impacts and concerning management actions will be discussed in the next discussion section.

DISCUSSION

The key results pertaining to aim one indicate differences in the actual use levels across the day for the sites in Xi'an. Additionally, the results demonstrated that use levels exceeded the numbers of encounters visitors perceived (tolerance or preference) in many locations in Xi'an; hence it can be argued that crowding occurred in Xi'an. There is a need for appropriate actions to control the perceived crowding corresponding to aim four.

In particular, the different use levels over time indicated that some particular time points could be recognized as the sensitive times at the Terracotta Army, the Huaqing Hot Spring, and the Forest Stone of Steles. The sensitive time points were caused by the tourists' itinerary. For example, the sensitive time points in the Huaqing Hot Spring reflected the problem of travel patterns. The pressure was caused because the Huaqing Hot Spring was the first stop in the day tours of the region; tourists in large groups usually arrive there in the early morning. As many tourist groups pour into the site at a particular time point, it is easy to cause a crowded situation at a specific time (cf. Coccossis & Mexa, 2004). Such time problems can be avoided by designing appropriate itineraries to distribute tourists evenly around the sites. Therefore, cooperation is very important for controlling tourists' itineraries. It is important to establish supportive and mutually beneficial relationships with other attractions and other support services and departments.

In addition, the results identified that there were sensitive locations within some sites in Xi'an. An important reason may be the composition of sites in Xi'an. These sites frequently adopted an axis-layout, which presented a very clear intuitive visual signal for the infrastructure and tour routes for visitors. However, few branches are possible and the routes are closely prescribed thus generating points of congestion.

Nevertheless one advantage of this structural composition is often a final broad open

public area or square provided for tourists. The big open space can limit crowding if used in conjunction with other management and tour design tools. It can also be noted that the limited space of some rooms within these sites presented some problems. For example, the exhibition rooms in the Forest of Stone Steles museum were not big enough to accommodate a large number of visitors in the Golden Weeks. Therefore, in the busiest days, a good way is to direct tourists to the open places, such as squares, to escape the crowds in the small exhibition rooms of these sites. Zoning can be an appropriate tactic to control crowding (Coccossis & Mexa, 2004). The important issue is that site managers need to understand the different thresholds in various sub-areas, especially in the ecologically sensitive areas. For example, the sub-areas can be classified from the least visited to the most visited in the Forest of Stone Steles Museum. The very sensitive exhibitions rooms in Forest of Stone Steles can be identified as those most vulnerable to crowding. Thus entry can be permitted only to authorized limited numbers (Coccossis & Mexa, 2004; Kostopoulou & Kyritsis, 2006). This should mean that on the busiest days, only small groups of tourists are permitted entry. One or two exhibition rooms, routes and the small square in front of the Pavilion Book of Filial Piety could be developed into a space of considerable natural interest, where the traditional tourist activities (photographing, eating, and relaxing) can be allowed. Finally, the big square in front of the gate could be developed as a buffer zone, where compatible activities are allowed.

The Terracotta Army site has attempted to disperse crowds in busy periods (Kostopoulou & Kyritsis, 2006). In the Golden Week, the entry to the best known exhibition room was permitted only once for each visitor. Considerable areas were made available to permit tourist activities (such as shopping zone) free from cars and parking problems. Only the largest squares permit every kind of tourist activities.

A key finding is that the sensitive time points and sensitive locations at sites in Xi'an were attributed to seasonality. Sites in Xi'an faced tourism peak season and low season. The seasonality effects were obvious in Xi'an because the destination involved the marked hot and cold temperature fluctuations of the Temperate Zone. According to the analysis, there was a difference of the actual visitor use levels between the average peak time and the Golden Weeks at several attractions in Xi'an. Further, the composition of tourists in Xi'an could be regarded as a factor leading to crowding. For example, group tourists were the main tourist market in Xi'an. These tourists only went to the most popular places and for a limited time. Therefore, many less famous sites undoubtedly had a lack of visitors in contrast to crowds at the famous sites. In the peak season, especially in the Golden Weeks in Xi'an, the increasingly large numbers pose a growing challenge to the quality of experience. In dealing with this problem, one core issue which can be identified is the promotion of facilities and services. The facilities and services need to be utilized efficiently for good tourist attraction management. For the sites in Xi'an, the over-used facilities in the peak season can be renovated in the low season. This can at least repair some of the damage to the sites, ensuring the high quality of environments of these sites. Additionally, employees who have been busy in the peak season can engage in training in the low season to improve their performance.

In assessing aim two (the aim relates to the investigation of the perceived crowding), it can be noted that the perceived visitor use levels were nearly identical for the tolerance dimension and the preference dimension. There was only a small gap between the two evaluative dimensions. In the literature on normative crowding, the evaluative dimension of tolerance has been commonly utilized to indicate the lowest level of acceptability for tourists' quality of experience. By way of contrast preference has indicated a high level of tourists' quality of experience at least in terms of

reactions to crowding. In North American studies, there was often a big difference between the two normative dimensions, for the norm of tolerance was sometimes more than four times the preference-based norm (Manning et al., 1999). However, this study in China presented different results for these sites and suggests that while preference is still for fewer people than an absolute base tolerance level, the figure can be close for people used to many crowds.

The comparison related to aim three revealed that the actual use levels were much higher than the perceived use levels (tolerance and preference); it means that crowding issues occur at some locations for the sites in Xi'an. Tourists' quality of experience was likely to be problematic because of crowding at these locations. This assertion can be made because previous studies have shown that tourists had higher quality experiences when the actual visitor number was close to the preferred visitor number (Manning et al., 2005). More specifically the results also suggest some managerial options. For the locations characterized by high sensitivity (high demand), a standard of quality near the "tolerance" can be the major purpose, aiming to provide tourism experience opportunities for visitors. For locations characterized by low sensitivity (low demand), visitors can be encouraged to these locations. If such management actions are followed visitors should be more satisfied with their experience of the site.

Additionally, good managerial conditions reduce tourists' negative perceptions of a place (e.g. Mowen et al., 2003; Needham et al., 2004). The reason is that perceptions are not only affected by visitor numbers and behaviour, but are also influenced by event design, capacity, and the application of management practices. For example, appropriate information can reduce negative crowding perception in settings. In recent years sites in Xi'an have made a large investment to enhance their facilities and

services. However, they may still not be doing enough to satisfy tourists in the peak time when too many tourists arrive at the same time. Education and monitoring have been the focus to control tourists' actual use levels and influence tourists' perceptions in the peak season. The linking of the perceptions noted in this article to satisfaction or desire to be in the settings can be pursued in more detail in future studies. Those studies and the consideration of further crowding issues in Chinese tourism represent substantial research opportunities of global interest.

CONCLUSION

The article investigates the crowding issues occurred in history sites in Xi'an. The study of crowding issues could be indicators for improvement of tourism development in these history sites. The results revealed that seasonality and inappropriate itineraries were the critical factors leading to crowding. Sites were facing tourism pressure as crowding in the peak season, especially in the Golden Weeks, regarding as seasonality. In addition, locations within a few of sites were very crowded at particular time points because of the inappropriate itineraries. To minimize negative impacts caused by seasonality and inappropriate itineraries, it is not only means to reduce the numbers of visitors but improving the distribution over time and space based on visitors' perceptions. In the busiest time periods, large numbers of visitors, especially visitors in large groups, cannot be allowed to arrive at the same location at the same time. A wide range of programs, such as exhibitions at different times, can be a method to distribute visitors. Moreover, crowds and tourist activities need to be controlled in a limited space. In the history sites, exhibition rooms can be considered as spaces where crowding usually occurs. Therefore, management practices are not only necessary to distribute visitors to other locations but also promoting visitors' tolerance to crowds in the exhibition rooms. The mobility of tourist flows can be quickened in order to reduce tourism pressure in the exhibition rooms. Monitor tourism activities helping visitors to escape disturbance from others. High quality

facilities and service, such as hypermedia and experienced tour guides, take effect in providing positive images for visitors. In this article, only a small sample of history sites was used to indicate the relationship of actual use level, encounters and perceived crowding. Investigating and testing crowding issues in future research might be in wider or more comprehensive application in history or heritage places. Future contribution to tourism crowding studies can focus on the motivations, the demographic nature of visitors and accessibility in history places, regarding as elements to influence perceived crowding.

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