Measurling Hajj Crowd Perceotion Levels Among The Southeast Asian Pilgrims

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Abstract

Mina is one of the three holy areas that pilgrims visit for a minimum of three days when performing Hajj rituals. This makes Mina a very crowded place that may reach up to 2.5 million pilgrims daily due to its spatial constraints during the Hajj. As people contribute to the state of crowded place, environmental psychology studies have posited that perceived crowding affects their behavior. Therefore, this paper focuses on crowding perception and measures the overall crowding perception, the perceived human crowding and the perceived spatial crowding. The study adopted survey questionnaire in soliciting information from pilgrims. A random size of 128 pilgrims in Mina from the Southeast Asia Hajj group was selected for three days (10th, 11th and 12th of Zul-Hijjah). Three different statistical tests have been applied to the collected data which included independent sample t-test, a correlation analysis, and a linear regression analysis. The outcome established that pilgrims witness significant effect of crowd perception during their stay at Mina. The implication of this finding determines the level to which the pilgrims feel secure from crowded conditions while performing their rituals.

1. Introduction

The ability to understand and predict crowd behavior in mass gathering, such as the Hajj, allows effective and competent management[1]. In fact, it will assist in providing crowd management and crowd control strategies by building upon the understanding of crowd nature. This will, in turn, increase safety for event participants.

In any crowded setting, perceived crowding levels usually vary among individuals. Some individuals feel crowded, whereas others do not feel crowded, even though they are at the same crowd settings[2]. Also, the literature suggests that perceived crowding can differ between males and females and, hence, impact on their responses [3]. Females with high level of crowd perception, in particular, can withdraw from the crowd or feel helpless in a crowded situation. In contrast, males can react differently. For instance, males can use aggression to cope with crowding conditions[4].

Consequently, this study aims to explore the overall levels of crowding perception and its causes in terms of human and spatial perceived crowding. In this regard, three objectives were set out in order to achieve this aim, namely; to reveal significant differences in the levels of crowding perception, perceived human crowding and spatial human crowding across gender with a focus on Southeastern Asian pilgrims. The relationship between the respondent's crowding perceptions, perceived human crowding and spatial crowding and to identify the greater indicator of perceived crowding will then be examined.

In achieving these objectives, the study utilized quantitative method in the research. Moreover, this study has found that there is a significant difference in the pilgrims' levels of perceived crowding across gender. Also, this paper clearly differentiates between the overall perceived crowding, human perceived crowding and spatial perceived crowding and exhibit their different levels among the pilgrims. Finally, the results of this paper show that human perceived crowding is a major predictor of the pilgrims overall perceived crowding.

These findings will guide future researchers in two dimensions of perceived crowding as potential areas to minimize the effect of crowding. Moreover, it is important for Hajj planners to note that not only physical settings of Mina affect pilgrims' experience of crowding, but also the pilgrims' level of perceived crowding.

2. Background Studies

- Significance of Mina rituals during Hajj season

Pilgrims gather in Mina at the first and fourth stages of Hajj (Figure 1). The first stage consists of one day and one night. In this stage, pilgrims stay at Mina without conducting any rituals, but prepare for the departure to Arafat, the next stage of the ritual. The fourth stage consists of three to four days[5]. Pilgrims return from Arafat after spending the night at Muzdalifah, the third stage. After sunrise on the first day of the fourth stage, the pilgrims start their rituals at Mina by going to Jamarat Bridge to perform the first ritual which is pelting the symbol of Devil that is called Aqaba using small stones[6][1]. After that, there are three rituals that pilgrims will perform based on their mode of Hajj (Ifrad, Tamattu and Qiran)[2]. These rituals are: to sacrifice an animal,

[1] There are three stoning locations at Jamarat Bridge: the small, medium and the large which are also called the Aqaba.

[2] Ifrad is performing the Hajj alone (without Umrah). Tamattu is completing Umrah rituals and emerging in the state of sanctity and on the first stage of Hajj pilgrims pronounce Ihrarn, for the Hajj. Qiran is combining Umrah and Hajj in one state of sanctity.

to shave or shorten the hair and to perform Twaf[1]. After that, pilgrims return to their tents to rest.

From noon on the second day until the end of this stage, pilgrims commute daily from their tents at Mina to Jamarat Bridge to stone the three symbols of the Devil. The stoning time begins at noon and extends to the following morning.

No.	Date (from the twelfth month of the Hijri calendar)	Place (Holy site)
1	8th (day and night)	Mina
2	9th (noon to Sunset)	Arafat
3	9th [night to (10th before sunrise) it is allowed for some cases to move earlier from Muzdalifah to Mina]	Muzdalifah
4	10th after sunrise–12th or 13th before sunset	Mina
5	After 12th or 13th	Makkah

Figure 1 Abstracted stages of Hajj. Source: Tayan, O., Al BinAli, A. M., & Kabir, M. N. (2014). Analytical and Computer Modelling of Transportation Systems for Traffic Bottleneck Resolution: A Hajj Case Study. Arabian Journal for Science and Engineering, 39(10)

- **Dimensions of Perceived Crowding**

There are two dimensions of perceived crowding, human crowding and spatial crowding[7].Human crowding arises from the number of individuals and the extent of social interaction in the same physical environment. In many settings such as during festivals, it is perceived as a positive crowding when the number of participants are sufficient[8]. Furthermore, the relationship between perceived human crowding and individual experience of crowding is a kind of vacillating relationship; sometimes it is positive and sometimes it is negative[9][10].

Meanwhile, spatial crowding is defined as the degree to which an individual feels restricted in a given physical movement [8]. It is caused by factors such as a restriction of movement within a given environmental setting, shortage of available physical space, or by the layout of the environment. It is an indicator of the physical (human and non-human) obstacles that prevent the individual from achieving his goal. Therefore, it has a negative relationship with an individual's crowding experience [2].

The perceived crowding offers an opportunity to understand and predict the effect of a crowded situation on the crowd[11]. In addition, understanding the behavior of

[1] Tawaf is an act that takes place at the Grand Mosque which includes moving around the Alkaba (God's House) seven times.

individuals will minimize the effect of problems caused by the negative perception of crowding[12].

Despite the value of understanding crowding perception in crowded settings, so far there has been a very little discussion about understanding the nature of crowds in the Hajj. For instance, Ghani et al. measured three psychological components of Malaysian pilgrims, namely: observable crowd behaviors, emotions and cognitions, as psychological components of crowd behavior in the Hajj[13]. In addition, Alnabulsi & Drury focused on crowd density and safety using social identity theory, and claimed that crowding has a positive impact on pilgrims when they are in a group that share the same social identity[14]. Halabi considered worshippers' behavior from the social perspective at the Grand Mosque, inside and outside the building, that control their preferences and activities at the Grand Mosque[15]. Nevertheless, these studies did not address the issue of crowding situation's effect on pilgrims' behavior and different levels of crowding perception.

Therefore this study assumed that pilgrims from the Southeast Asia Hajj group would differ in their perceived crowding. Also, it assumed that the two dimensions of perceived crowding would have different and significant effect on the overall perceived crowding. This effect would be moderated by the gender of the pilgrim.

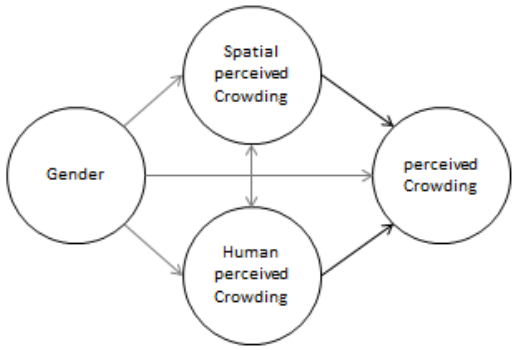

Figure 2 Model of perceived crowding proposed and tested in this paper

3. Research Methodology

- Study location

Of all the Hajj's holy sites, Mina was selected as the location for this study. In particular, it focuses on the camp area dedicated for pilgrims from South East Asia. The main reason of selecting Mina is due to pilgrims' period of stay. Pilgrims stay at Mina for a minimum period of three days as part of the Hajj rituals[16]. Second, the spatial constraints of Mina that make it a crowded site was considered. Last, this study investigated pilgrims' perceived crowding levels at routes between the tent blocks in

Mina, especially the routes leading to Jamarat Bridge which was recently expanded, and where most of the overcrowding situations occur.

- Respondents and Data Collection Procedures

Data were collected on a simple random basis from 128 pilgrims (female n= 43 and male n= 85) from Southeast Asia Hajj groups in Mina during the 2015 Hajj season. During the three days (10th, 11th and 12th of Dhul-Hijjah), three numerators, who speak English and Malay, were trained and assigned to collect data in Mina. On the first day, data were collected over two time periods. The first period was between 7:00 am and 12:00 pm. The second period was between 11:30 pm and 2:30 am. On the second and third day, data were collected between 11:30 am and 7:30 pm. These data collection periods were designed to capture the pilgrims' crowding experience to and from the Jamarat Bridge.

- Instruments and Measurement of Variables

Data were collected using an on-site survey questionnaire that consists of 4 parts. However, the data used in this paper were extracted from the first and third parts of the survey form. The first part includes socio-demographic questions such as age, gender, marital status and level of education. The third part contains crowding perception measurements. In the questionnaire, perceived crowding was measured using an easy to fill out and a widely used measure that was developed by Shelby & Heberlein[18]. It is a 9 point scale (responses of 1 or 2= not at all crowded, 3-4 = slightly crowded, 5-7 = moderately crowded, and 8-9 = extremely crowded).

For human and spatial perceived crowding, this study adopted and developed measurements proposed by Byun & Mann[19], Li, Kim, & Lee [7], and Machleit, Kellaris, & Eroglu [20], that were originally designed and developed for retail settings.

Nevertheless, due to pilgrims limited available time to complete the questionnaire in Mina, the human perceived crowding measure was further developed to become a single item measure containing four options: a) Mina routes seem very crowded to me, b) Mina routes were a little too busy, c) There was not much traffic in Mina routes, and d) There were many pilgrims but it did not feel crowded. Similarly, spatial perceived crowding was developed to be a single item measure with four options: a) In Mina routes I felt suffocated, b) In Mina routes I felt cramped, c) Moving around in Mina routes was inconvenient, and d) Moving around in Mina routes was convenient. The pilgrim can select one option from the four options that best describes how he or she felt in Mina routes. The questionnaire was written in English and then translated to Malay language by a professional translator. To validate the instrument, the questionnaire was reviewed by three academicians who use both languages and are familiar with the field of study.

4. Results

Analysis was conducted using the Statistical Package for the Social Sciences (SPSS) for Windows version 22.0 (SPSS Inc., Chicago, IL, USA). In this regard objective one was achieved using independent-Sample t test. Thereafter objective two was tested using correlation analysis to find the relationship between gender, experience, and level of education and the respondent's crowding perception, perceived human crowding and spatial human crowding. Finally, objective three was established using linear regression analysis to test the effect of perceived human crowding and spatial human crowding on perceived crowding levels.

- Frequencies

Figure 1 displays the basic results of perceived crowding frequencies reported by pilgrims from the South East Asia Hajj group. This figure highlighted that approximately 44% of respondents felt extremely crowded and 41% felt moderately crowded. This indicates that most of the respondents experienced high levels of perceived crowding.

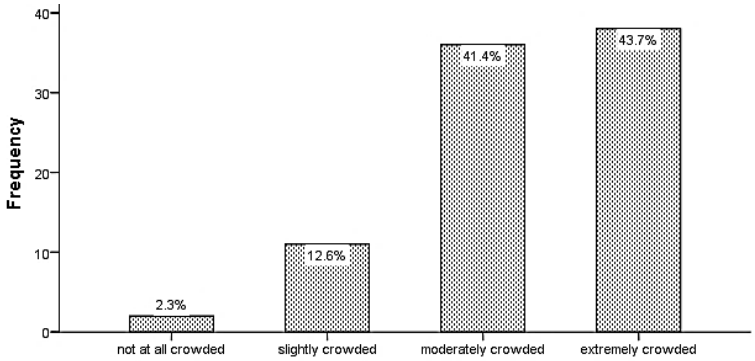

Figure 3: Pilgrims levels of perceived crowding.

Correspondingly, Figure 2 displays the basic results of perceived human crowding. The percentage of respondents that reported Mina routes to be very crowded was 43%. In addition, 33.6% of the respondents stated that Mina routes were a little too busy. In contrast, 17.2% of respondents mentioned that there were a lot of pilgrims, but they did not feel crowded. Thus, almost two thirds of respondents felt crowded due to perceived human crowding.

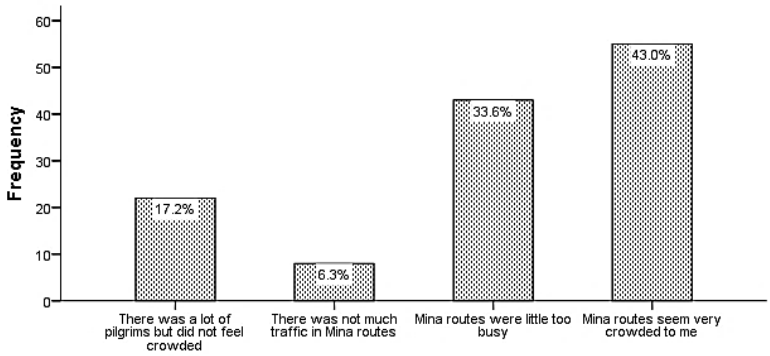

Figure 4: Pilgrims perceived human crowding.

In contrast, Figure 3 shows the frequencies of perceived spatial crowding as indicated by respondents. 36.7% of respondents felt that moving around in Mina routes was inconvenient. Moreover, 23.4% of respondents felt suffocated. These numbers represent pilgrims' movement difficulties in Mina routes due to overcrowding conditions. On the other hand, 28.1% of respondents reported that moving around in Mina routes was convenient. This outcome shows that some of the respondents can smoothly navigate their way around in Mina without suffering from high perceived spatial crowding.

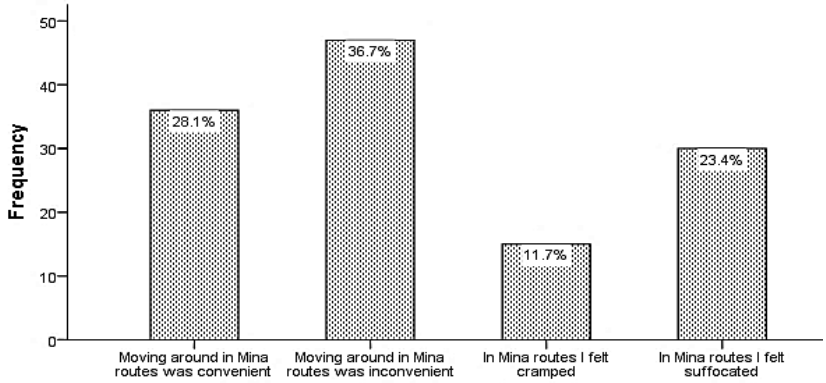

Figure 5: Pilgrims perceived spatial crowding.

- Analysis results of objective 1: the levels of crowding perception, perceived human crowding and spatial human crowding across gender in Southeastern Asian pilgrims.

The results of the t-test in Table 1 show that significant differences exist in terms of gender on perceived crowding, perceived human crowding and spatial perceived crowding levels. In terms of perceived crowding, the mean score of female ($\bar{x}$ = 8.54) was significantly higher than Male ($\bar{x}$ = 5.71) and with significant level of.009 (F=7.248,

p<.05). Whereas, in perceived human crowding, the mean score of female ($\bar{x}$ = 2.98) was fairly lower than male ($\bar{x}$ = 3.05) with level of .459 (F=.551, p>.05) which indicates that there was no significant difference across gender. Similarly, in perceived spatial crowding, the mean score of female ($\bar{x}$ = 2.28) was almost lower than the male ($\bar{x}$ = 2.32), with a significant level of .615 (F=.254, p>.05). Interestingly, these results show that the female pilgrims perceived conditions to be more crowded than the males.

Table 1: Levels of crowding perception, perceived human crowding and spatial human crowding across gender in Southeastern Asian pilgrims.

	Perceived crowding					Perceived human crowding					Perceived spatial crowding				
Gender	N	Mean	SD	F	Sig	N	Mean	SD.	F	Sig	N	Mean	SD	F	Sig
Female	28	8.54	1.201	7.248	.009	43	2.98	1.035	.551	.459	43	2.28	1.098	.254	.615
Male	59	5.71	1.885			85	3.05	1.122			85	2.32	1.136		

- Analysis results of objective 2: the relationship between the respondent's crowding perception, perceived human crowding and spatial human crowding.

Table 2 displays the correlations of the respondent's crowding perception, perceived human crowding and spatial crowding. Based on the analysis approach, each of the dimensions reported its own mean. The mean for crowding perception was ($\bar{x}$ = 6.62), perceived human crowding ($\bar{x}$ = 3.02), and perceived spatial crowding ($\bar{x}$ = 2.30). In this study, the correlation between perceived human crowding and spatial human crowding was a significant and positive correlation as its score was (0.323, p< 0.01). Hence, the more pilgrims perceived human crowding, the more perceived spatial crowding they experienced.

Table 2: Relationship between respondent's crowding perception, perceived human crowding and spatial human crowding

		Mean	SD	1	2	3
1	Perceived Crowding	6.62	2.147	1.00		
2	Perceived human crowding	3.02	1.090	.088	1.00	
3	Perceived spatial crowding	2.30	1.119	-.009	.323**	1.00

* Correlation is significant at the 0.05 level (2-tailed).**Correlation is significant at the 0.01 level (2-tailed).

- Analysis results of objective 3: the effect of perceived human crowding and spatial human crowding on perceived crowding levels.

Table 3 reported the results of a linear regression analysis that were used to test the effect of perceived human crowding and spatial human crowding on perceived

crowding levels. The results indicate that the effect of perceived human crowding β (t=0.888, p>0.05) on perceived crowding was greater than the effects of perceived human crowding β (t=- 0.365, p>0.05). Therefore, perceived human crowding is a significant predictor of perceived crowding.

Table 3: Effect of perceived human crowding and spatial human crowding on perceived crowding levels

Dimensions	Perceived crowding			
	Standardized Coefficients β	t	Sig.	R2
Perceived human crowding	.102	.888	.377	.009
Perceived spatial crowding	-.042	-.365	.716	

5. Discussion

It was found that the Southeast Asia pilgrims viewed crowding in three variations: levels of perceived crowding, perceived human crowding, and perceived spatial crowding. Remarkably, the majority of them (85%) felt Mina was a crowded place to perform the Hajj rituals for a three-day-stay due to its spatial constraints. These numbers represent that pilgrims perceived high level of crowding while they are in Mina. This clearly means that almost half of the respondents among the pilgrims perceived that the human crowding in Mina caused them inconvenience while performing Hajj. Although the Jamarat Bridge has been expanded, human crowding is still going on and that has to be resolved for a better Hajj performance. In an attempt to understand this phenomenon, the result of perceived level human crowding and spatial crowding were highlighted in which both results acquired were then investigated in-depth to verify which of them was the grass-roots cause of the crowding which occurred. From the aspect of human crowding, 43% of the respondents stated that Mina routes were very crowded to them and their perception of the crowding through the human evaluation was negative. Whereas, at the perceived spatial aspect, 36.7% felt that moving around in Mina routes was inconvenient.

Moreover, it was found that gender has a very large effect on the perceived crowding and no significant effect on either human or spatial perceived crowding. These results show that the female pilgrims perceived more crowding than the males. Logically, since the perceived crowding consists of human perceived crowding and spatial perceived crowding, the effect of gender on the perceived crowding should be extended to its dimensions. However, when studying the effect of gender on human perceived crowding and spatial perceived crowding, it was discovered that the human and perceived crowding levels among males contradicts the effect of gender on the perceived crowding. Therefore, the correlation between perceived human crowding

and spatial perceived crowding support each other in the sense of having a similar influential effect. This study found that there is a significant positive correlation between perceived human crowding and perceived spatial crowding (0.323, $p < 0.01$) in which there are high levels of perceived human crowding associated with higher levels of perceived spatial crowding. In spite of this strong correlation between human perceived crowding and spatial perceived crowding, this study has found that human perceived crowding is a greater predictor of perceived crowding than the spatial dimension.

6. Conclusion

Conclusively, this paper discovered that pilgrims' perceived human crowding is an effective dimension in understanding the effect of crowding on pilgrims during Hajj. This outcome implies the need for understanding and predicting crowd behavior in mass gatherings generally, and in the Hajj season specifically. This kind of understanding allows for effective and competent management in order to improve the safety system for the pilgrims.

Although this paper indicates the importance of human perceived crowding dimension at the Hajj, more investigation is needed to determine other factors which affect human perceived crowding. The Hajj includes a wide range of pilgrims from different age groups, education and cultural backgrounds in addition to levels of services and mode of transportation. All are potential areas for further investigation to develop the proposed model in this paper.

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