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***Research paper***

# Assessing the Effects of Crowding Perception and Gender Among Southeast Asia Pilgrims in Mina, Saudi Arabia

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**Abstract**

This study gives a better understanding of the effect of crowding on pilgrims at the Hajj. It explores the levels of perceived crowding of Southeastern Asian pilgrims and investigates the effects of gender on their perceived crowding. Questionnaire in both Bahasa Melayu and English languages were administered for data collections from randomly selected pilgrims, (n=128), from the Southeast Asia Hajj group at Mina for three days (10th, 11th and 12th of Dhul-Hijjah). Results revealed that pilgrims witness high levels of crowd perception within their stay at Mina. In addition also, differences between the overall perceived crowding, perceived human crowding and perceived spatial crowding among pilgrims were revealed. Perceived human crowding was found as an indicator to the overall perceived crowding at Mina. Future research could be carried out to assess the effects of other factors such as education and cultural backgrounds and these findings can help authorities in charge of formulating policies manage crowd levels and perception.

***Keywords***: *Pilgrims; Saudi Arabia; Crowding Perception; The Hajj*

## 1. Introduction

The ability to understand and predict crowd behavior in crowded events, such as the Hajj, allows for effective and competent management (Berlonghi, 1995). In fact, it will assist in providing and implementing 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 crowding settings (Machleit et. al, 2000). Also literature suggests that perceived crowding can differ between a male and female and, hence, impact on their responses (Regoeczi, 2008). A female with high level of crowding perception can withdraw from the crowd or feel helpless in a crowded situation. While on the other hand a male can react differently. For instance, a male can use aggression to cope with crowding conditions (Turner & Turner, 1999).

This study is concerned with the overall levels of crowding perception and its dimensions in terms of human and spatial perceived crowding. The study explores the perceived crowding of Southeastern Asian pilgrims at Mina during the Hajj and to investigate the effects of gender on their perceived crowding. Three objectives were set out in order to achieve this purpose, namely; to reveal significant differences in the levels of crowding perception and its effects across gender in Southeastern Asian pilgrims. The relationship between the respondent's crowd perceptions, perceived human crowding and perceived spatial crowding would be examined to identify the greater indicator of perceived crowding. Three different statistical tests were applied to the collected data, which includes independent sample t-test, a correlation analysis, and a linear regression analysis, so as to achieve the set objectives. Findings from these analyses can guide future researchers on perceived crowding and its dimensions as potential areas to minimize the effect of crowding at Hajj. Also, the findings will reveal important aspects of the pilgrims experience at Mina that the Hajj planners need to consider in managing the crowd.

## 2. Literature Review

### 2.1. Crowded Situation at Mina During the Hajj

Mina is described as a narrow valley surrounded by high rugged mountains on the northern and southern sides. It is located approximately 7 km from the Holy Mosque. The total area of Mina is approximately 8.12 $Km^2$ (Barhamain, 1997; Koshak, 2005). However, a considerable part of this area is unsuitable to be used by pilgrims. Out of the total area, 48% of Mina is very steep slopes, with an approximate area of 3.9 $km^2$. Whereas the flat land area is approximately 4.2 $km^2$.

This restricted area makes Mina a very crowded location as more than 2.5 million pilgrims gather in Mina at the first and fourth stages of Hajj (figure 1) (Alsolami et. al, 2016). The first stage consists of one day and one night. At this stage, pilgrims stay at Mina without performing any rituals, but prepare for the departure to Arafat, the next stage of the rituals. The fourth stage consists of three to four days (Tayan et. al, 2014). Pilgrims return from Arafat after spending the night at Muzdalifah, the third stage of the Hajj. After the sunrise in 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

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Aqaba using small stones (Osman & Shaout, 2014)[1]. After that, there are three rituals that pilgrims will perform, but based on their mode of Hajj (Ifrad, Tamattu and Qiran)[2]. However, these rituals are: to sacrifice an animal, to shave or shorten the hair and to perform Twaf. After that, pilgrims return to their tents to rest. From the noon of 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 starts from the noon and extends up to the following morning. These activities and rituals render the pilgrims exposed to high levels of crowding situations and, hence, directly affect them. In fact, five of the top ten fatal crowding related incidents, such as stampedes, have been recorder during the Hajj at Mina (Hsieh et. al, 2009).

| 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 |

**Figure1. Abstracted stages of the 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)

### 2.2. Perceived Crowding and Gender

Perceived crowding is defined as a negative perception that caused by the high number of people attending the event (Kim et. al, 2016). This term is commonly used to accentuate the subjective or evaluative nature of the concept crowding (Shelby et. al, 1989). Previous studies have examined the relationship between perceived crowding and gender, and exhibit that there are gender differences in crowding perception. For instance, Zehrer & Raich ( 2016) report that males and females, at winter sport event, perceive similar levels of crowding, but females were critical about the crowding than males. At Lankawi Island, Malaysia, Rasoolimanesh et. al. (2016) found that males perceive high levels of crowding than females. In addition, Evans et. al. (2001) reported that males were negatively affected by crowding as they perceive high levels of crowding compared to females. Therefore, the relationship between perceived crowding and gender is significant. This study assesses how gender impacts perceived crowding in Mina at the Hajj.

### 2.3. Dimensions of Perceived Crowding

Perceived crowding is a multi-dimensional concept that comprises of two dimensions, they are human crowding and spatial crowding (Li et. al., 2009; Machleit et. al., 1994). Human crowding arises from the number of individuals and the extent of social interaction in the same physical environment. Relationship between perceived human crowding and individual experience of crowding is a kind of vacillating relationship. For example, studies by Kazakeviciute & Banyte ( 2012), Byun & Mann (2011), Jones et. al. (2010), Eroglu et. al. (2005), and Machleit et al. (2000), found that perceived human crowding has a negative effect and is perceived as unpleasant experience. On the other hand, other researchers such as Kim, & Lee (2009), Wu & Luan (2007), Pons et. al. (2006), and Eroglu et al. (2005) reported a positive effect of perceived human crowding. Whereas, Mehta et. al. (2013) found that there is a curvilinear relationship between perceived human crowding and pleasure experienced by shoppers/consumers.

While, spatial crowding on the other hand refers to the individual feelings of been restricted in a particular space by population of people or physical elements or both (Kim, & Lee, 2009). Many studies on perceived spatial crowding reported that it has a negative impact on individual experience (Jones et al., 2010; Kazakeviciute & Banyte, 2012; Kim et. al., 2016). However, there is one study conducted by Wu & Luan (2007) who reported that perceived spatial crowding has a positive impact on emotions. The results show that high levels of perceived spatial crowding are associated with high positive emotions. Wu & Luan (2007) argued that proximity to physical and nonhuman elements create collectivism environment with an interpersonal interactions with other patrons. Such environment will generate positive emotions.

Therefore, it is clear, based on the number of studies, that perceived spatial crowding has a negative impact on emotions and satisfaction.

Perceived crowding offers an opportunity to understand and predict the effect of crowded situation on crowd (Kim, & Lee, 2009). Also, the understanding of the behavior of individuals will minimize the effect of problems caused by the negative perception of crowding (Zeitz et. al., 2009).

There has been very little discussion so far in understanding crowding perception of the pilgrims in Hajj. For instance, Ghani et al. (2014) measure three psychological components of Malaysian pilgrims, namely: observable crowd behaviors, emotions and cognitions, as psychological components of crowd behavior in the Hajj (Ghani et al., 2014). In addition, Alnabulsi & Drury (2014) focus on crowd density and safety, using social identity theory, Their findings indicate that crowding has a positive impact on pilgrims when they are in a group that share the same social identity (Alnabulsi & Drury, 2014). Finally, Halabi (2006) 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 (Halabi, 2006).

These studies so far have overlooked the issue of crowding situation's effects on pilgrims' different levels of crowding perception. Hence an assumption will be made on this study that pilgrims from 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.

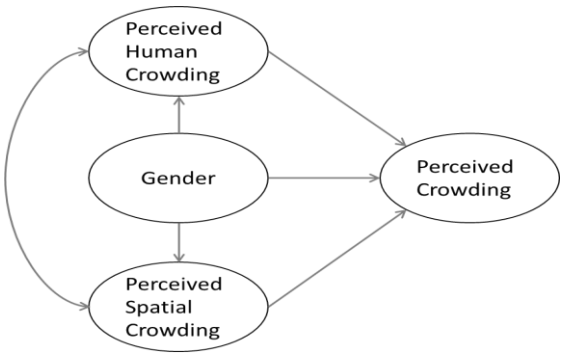



**Figure 2.** Model of perceived crowding proposed and tested in this paper.

## 3. Methodology

### 3.1. Study Location

Out of the Hajj's holy sites, Mina was selected as the location for this study. Emphases were particularly 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 (Al-Kodmany, 2013). Secondly, the spatial constraints of Mina that makes it a crowded site was considered. Lastly, this study investi-

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

2 Ifrad is to perform the Hajj alone (without Umrah). Tamattu is complete Umrah rituals and come out of the state of sanctity and on the first stage of Hajj pilgrim pronounce Ihrarn, for the Hajj. Qiran is combining Umrah and Hajj in one state of sanctity.

gated pilgrims' perceived crowding levels at routes between the tents' blocks in Mina, especially the routes leading to Jakarta Bridge which was recently expanded, and where most of the over-crowding situations occur.

### 3.2. 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 proficient in speaking 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 7:00am 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.

### 3.3. 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 (1986). 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 (2011), Li et. al. (2009), and Machleit et. al. (1994), that were originally designed and developed for retail settings. Nevertheless, due to pilgrims limited available time to fill 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 little too busy, c) There was not much traffic in Mina routes, and d) There was a lot of pilgrims but 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 language, and then it was translated to Bahasa Melayu language by a professional translator. To validate the instrument, the questionnaire was reviewed by three academicians who use both languages and 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.

### 4.1. Levels of Perceived Crowding, Human Crowding and Spatial Crowding

Figure 3 displays the basic results of perceived crowding, perceived human crowding and perceived spatial crowding frequencies reported by pilgrims from the South East Asia Hajj pilgrims. As regards to perceive crowding, the figure highlighted that approximately 49.7% of respondents felt extremely crowded and 41% felt moderately crowded. This indicates that most of the respondents experienced high levels of perceived crowding.
While in perceived human crowding, the percentage of respondents whom reported that Mina routes seemed very crowded to them 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. So, almost two thirds of respondents feel crowded due to perceived human crowding.

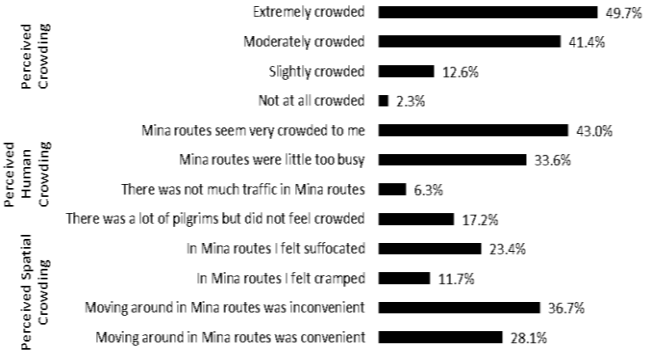



**Figure 3.** Pilgrims levels of perceived crowding.

In terms of perceived spatial crowding, In contrast, 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.

### 4.2. The Levels of Crowding Perception, Perceived Human Crowding and Spatial Crowding Across Gender

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 a fairly lower than the 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 more crowding than the males.

**Table1.** Levels of crowding perception, perceived human crowding and spatial crowding across gender in Southeast Asia 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 | | | 43 | 2.98 | 1.035 | | | 43 | 2.28 | 1.098 | | |
| Male | 59 | 5.71 | 1.885 | 7.248 | .009 | 85 | 3.05 | 1.122 | .551 | .459 | 85 | 2.32 | 1.136 | .254 | .615 |

**Table 2.** Relationship between respondents' crowding perception, perceived human crowding and spatial 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).

**Table 3. Effect of perceived human crowding and spatial crowding on perceived crowding levels.**

| | Perceived crowding | | | |
|---|---|---|---|---|
| | Standardized Coefficients | | | |
| **Dimensions** | **β** | **t** | **Sig.** | **$R^2$** |
| Perceived human crowding | .102 | .888 | .377 | |
| Perceived spatial crowding | -.042 | -.365 | .716 | .009 |

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

### 4.3. The Relationship between the Respondent's Crowding Perception, Perceived Human Crowding and Spatial 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 is (0.323, $p < 0.01$). Hence, the more pilgrims perceived human crowding, the more perceived spatial crowding they experience.

### 4.4. The Effect of Perceived Human Crowding and Spatial Crowding on Perceived Crowding Levels

Table 3 reported the results of a linear regression analysis that was 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 spatial crowding β (t=- 0.365, p>0.05). Therefore, perceived human crowding is a significant predictor of perceived crowding. At the human crowding aspect, 43% of the respondents stated that Mina routes were very crowded to them and their perception on the crowding through the human evaluation was negative. This is consistent with previous studies by Kazakeviciute & Banyte (2012), Byun & Mann (2011), Jones et al. (2010), Eroglu et al. (2005), and Machleit et al. (2000) and suggests that the pilgrim negatively perceives the large number of pilgrims at Mina. Whereas, at the perceived spatial aspect, pilgrims felt that moving around in Mina routes was a negative experience as they felt suffocated (23.4%), cramped (11.7%) and inconvenient (36.7%. This negative effect of perceived spatial crowding is consistent with previous literature ( e.e Jones et al., 2010; Kazakeviciute & Banyte, 2012; Kim et al., 2016).

## 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 means that almost half of the respondents among the pilgrims perceived that the human crowding in Mina caused inconvenience to them while performing Hajj.

Although the Jamarat Bridge has been expanded, the 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 deeply investigated to verify which of them was the grass-roots cause of the crowding occurred.

Moreover, it was found that gender has a very large effect on the perceived crowding. This is consistent with previous studies (Evans et al., 2001; Rasoolimanesh et al., 2016; Zehrer & Raich, 2016). The finding also shows that female pilgrims perceived more crowding than the males. This result contradicts previous studies (Evans et al., 2001; Rasoolimanesh et al., 2016), who reported that males perceive high levels of crowding than females. However, the findings support the findings of Zehrer & Raich (2016), who claimed that females are more critical to crowding than males. These results suggest that females are affected by the crowding levels at Mina. This might be due to the explanation offered by Turner & Turner (1999), where a female with high level of crowding perception can feel helpless in a crowded situation.

This study also found that there is no significant effect of gender on either human or spatial perceived crowding. 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 spatial 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 out that there is a significant positive correlation between perceived human crowding and perceived spatial crowding (0.323, $p < 0.01$) in which there is high levels of perceived human crowding associated with higher levels of perceived spatial crowding. This results might suggest that pilgrims population at Mina causes restrictions that was perceived as spatial constraints (Li et al., 2009). However, in spite of the strong correlation between human perceived crowding and spatial perceived crowding, this study has found out that human perceived crowding is a greater predictor of perceived crowding than the spatial dimension.

## 6. Conclusion

This paper revealed 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 gathering 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 draw the important of human perceived crowding dimension at the Hajj, more investigations are needed to determine other factors affect human perceived crowding. The Hajj includes a wide range of pilgrims from different age group, education and cultural backgrounds. Moreover, levels of services and mode of transportations. All are potential areas of further investigation to develop the proposed model in this paper.

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