BOOK OF ABSTRACT

5th NATIONAL SEMINAR ON HAJJ BEST

PRACTICES ON CROWD & HEALTH ISSUES

27th & 28th August 2013, Equatorial Hotel, Penang

Edited by

Professor Ahamad Tajudin Khader

Naimah Kassim

3.30 pm - 3.50 pm	**Paper 4** Dr. Nor Diana Mahudin *Department of Psychology, UIAM* Title: Psychological and Physiological Adaptation to Crowd Density: A Study of Malaysia Males
4.10 pm - 4.30 pm	**Paper 5** Taha Omar *School of Social Sciences, USM* Title: On The Best Practices of Hajj: A Historical Analysis
4.30 pm - 4.50 pm	**Paper 6** Dr. Abdul Razak bin Muttalif *Institusi Perubatan Respiratori* Title: Pneumonia in Syisyah Hospital, Makkah
4.50 pm - 5.10 pm	**Paper 7** Dr. Nyi Nyi Naing *School of Medical Sciences, USM* Title: Validation of Knowledge, Perception and Practice (KPP) Questionnaire on Respiratory Tract Infection Protective Measures Among Malaysian Hajj Pilgrims
5.10 pm - 5.30 pm	**Refreshment break**
	End of day 1

* Each paper should be present in 20 minutes inclusive Q & A sessions

RELATIONSHIPS BETWEEN RELIGIOUS BACKGROUNDS, BEHAVIORS AND EMOTIONS OF MU'TAMIR DURING UMRAH RITUALS

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ABSTRACT - Umrah is one of the compulsory worship in Islam and the rituals can only be performed at Kaabah and Masjidil al-Haram, Mecca. Muslims from all over the world going to Mecca for this ritual and as a result witnessed crowds of Muslims (mu'tamir). As year by year, the quantity of mu'tamir is accelerating and getting bigger in quantity. This scenario set up a situation of crowds especially during tawaf and saie rituals, which consequently create some negative behaviors and emotions from them. Instead of crowds, negative behaviors and emotions were also influence by the other factors which exists at that time such as, hot weather, limited space, pushing attitudes and scramble for certain place. Therefore, the study was engaged to examine mu'tamir's behaviors and emotions during the rituals and to show a relationship of both items with religious backgrounds. At this stage, the study was at aim to scrutinize the function of religious backgrounds in preparing a mu'tamir before, during or after performing the rituals. Therefore, a study was carried out by interviewing some respondents from Malaysia and Indonesia. It was found that the religious backgrounds have given a significant influence to the mu'tamir which prepared them mentally and physically to be a good Muslims, as the intention for umrah is for worship. Therefore, they chose to evade every negative behaviors and emotions and focused in achieving the success of worship in preferred form.

Keywords: Religious backgrounds, behaviors, emotions, umrah, crowds (* - correspondent author)

PSYCHOLOGICAL AND PHYSIOLOGICAL ADAPTATIONS TO CROWD DENSITY: A STUDY OF MALAYSIAN MALES

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ABSTRACT - The evidence from the literature is mixed regarding the cross-cultural differences in human adaptation to crowd density. While some studies show that members from collectivistic culture experience adverse effects of crowd density, others show that this is not the case. The extent to which culture affect human's psychological and physiological states, therefore, remains controversial. The primary aim of this study was to investigate the reactions and adaptations of Malaysian males to short-term exposure to crowded situations. Being a collectivist culture, it is anticipated that the participants' reactions as well as psychological and physiological adaptations to crowd density would be consistent with the collectivist cultural orientation. One Malay male participant had physiological (i.e., skin temperature, heart rate, and human thermal) responses recorded while surrounded by another nine Malay male participants in a space 1.5m wide by 1.0m long (i.e. density approximation of 0.12m2) inside a climatic chamber, representing a jammed-pressed crowd. Subjective measures of crowding and warmth sensation were also recorded using a 22-items questionnaire. The results show that an exposure to a high crowd density resulted in hotter body temperature than in steady state, with the chest as the warmest part, followed by thigh, calf, and upper arm. The objective measures of crowding are further supported by the participants' subjective responses. It was also observed that the participants employed several cognitive and behavioural coping strategies to tolerate the strain induced by the crowd density. Findings are discussed in relation to the implications for the understanding of crowd behaviours among Malaysians, particularly in respect to crowd density during Hajj.

Keywords: Physcological, crowds,

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ABSTRACT

The evidence from the literature is mixed regarding the cultural differences in human adaptation to crowds. While some studies show that members from collectivistic culture experience adverse effects of crowd density, others show that this is not the case. The extent to which culture affect human's psychological and physiological states, therefore, remains controversial. The primary aim of this study was to investigate the reactions and adaptations of Malaysian males to short-term exposure to crowded situations. Being a collectivist culture, it is anticipated that the participants' reactions as well as psychological and physiological adaptations to crowds would be consistent with that of collectivist cultural orientation. One Malay male participant had physiological (i.e., skin temperature, heart rate, and human thermal) responses recorded while surrounded by another 9 Malay male participants in a space 1.5m wide by 1.0m long (i.e., density approximation of 0.12m^2) inside a climatic chamber, representing a jammed-pressed crowd. Subjective and behavioural measures of crowdedness and warmth sensation were recorded using questionnaires. The results show that an exposure to a high crowd density resulted in hotter body temperature than in steady state, with the chest as the warmest part, followed by thigh, calf, and upper arm. These physiological adaptations to crowdedness are further supported by participants' psychological responses. It was also observed that the participants employed several cognitive and behavioural coping strategies to tolerate the strain induced by the crowd density. Findings are discussed in relation to the implications for the understanding of crowd behaviours among Malaysians, particularly during the *Hajj* season.

Keywords: crowd, density, thermal, psychological, physiological, adaptations

INTRODUCTION

Studies have established that behavioural, psychological, and physiological adaptations all play key roles in assuring thermal comfort, physical health, and environmental satisfaction (Brager & de Dear, 1998; Parsons, 2010). However, past research on human thermal adaptation has concentrated mainly on the indoor and built environments rather than on outdoor settings, especially those related to large event gatherings such as *Hajj*. At present, the nature of human ability in adapting to changes of thermal environment where highly crowded people mass in large-scale event remains largely unclear. Nevertheless, studies conducted on human thermal responses in crowded buildings have found that the occupants' heat and moisture emission can result in stressed indoor temperature and humidity conditions (Kang, Xue, & Bong, 2001). Naturally, it can be assumed that similar thermal responses, if not identical, can be observed in outdoor, crowded environments.

Examining the body responses to crowded setting such as *Hajj* is important because heat-related illnesses are major health hazards affecting pilgrims (*Hujjaj*), especially when the *Hajj* period coincides with the hot climate seasons (Gautret et al., 2009; Noweir, Bafail, & Jomoah, 2008). In a study that evaluated the climatic heat load in 10 *Hajj* locations, it is reported that heat exposure at all these locations significantly exceeded the ASHRAE comfort zone at all times (Noweir, Bafail, & Jomoah, 2008). This climatic heat load, which originates from high levels of ambient temperature, heat radiation from sun, heat emissions from motor vehicles, as well as the heat gain from the activity level of people in performing the rituals, may result in a variety of heat illnesses, including heat cramps, heat exhaustion, and heat stroke (Khogali, 1983; Noweir, Bafail, & Jomoah, 2008). However, despite the seriousness of this issue, there has been relatively little research into the nature and extent of physiological thermoregulation and psychological adaptation among the *Hujjaj*. Taking into account the lack of existing literature, it is reasonable to say that these human adaptations in large event crowds are worth to be explored.

Another key gap in the current research involves understanding cultural differences and coping mechanisms within a variety of crowd density. For example, the few studies available that specifically address human thermal responses in crowds (e.g., Braun & Parsons, 1991) did not explicitly examine cultural variables. This is an important deficit in the literature as cultural variations in coping with crowds may influence thermal adaptation. In the wider thermal environment literature, there is some evidence that human thermal adaptations are, to some extent, varied from one culture to another. For instance, Wijayanto and colleagues (2011) reported that Malaysians displayed enhanced efficiency of thermal sweating and thermoregulatory responses in dissipating heat loss during heat loading in comparison to the Japanese. Similar cross-cultural differences have been reported in the psychological crowding literature. Asians and Latin Americans, for example, have been consistently reported to perceive high-density situations as less crowded than White and Black North Americans (Evans, Lepore, & Allen, 2000; Gillis, Richard, & Hagan, 1986). Despite the importance of these findings, only few, if not none, empirical studies have investigated the cultural differences in the psychological and physiological adaptations in crowds. The understanding of this factor is crucial as cultural characteristics may affect the nature and extent of reactions to crowd density. Consequently, research on how a particular ethnic culture adapts and copes in large event crowds is especially relevant because crowds can affect people responses in both positive and negative ways.

Given the limited amount of work conducted in this area, this study aims to investigate the psychological and physiological adaptations of Malay participants in

a dense crowd, using an experimental design approach. It is predicted that there will be a noticeable physiological changes such as increased body temperature and greater sweat loss as a result of adaptation to the crowded condition. Although it is also anticipated that there will be an increase in psychological discomfort, the specific Asian ethnic background of the participants is assumed to be able to withstand or tolerate the adverse psychological and physiological effects of the crowd density.

LITERATURE REVIEW

Reactions and adaptations to crowd density are, to some extent, conditioned by cultural context. However, the evidence from the literature is mixed with regard to the cross-cultural differences on the consequences of and adaptations to crowdedness. While some studies show that members from noncontact, low context, or individualistic cultures experience adverse effects, others reveal that members from the opposite cultures can also experience similar stress as the results of crowd density. For example, Evans, Lepore, and Allen (2000) found strong correlations between residential density and psychological distress among Anglo-American or African-American residents relative to Hispanic household members and among Anglo residents in comparison to citizens of Asian descent. Similar findings were reported recently by Pons and Laroche (2006), who found that high density affects Mexicans (i.e., representing high context culture) less negatively than their Canadian counterparts (i.e., representing low context culture). In another institutional setting, a study found that higher density correlates strongly with physical illness among Anglo-American and African American prison inmates compared to Mexican-American inmates (McCain, Cox, & Paulus, 1980). On the contrary, several studies have reported adverse psychological consequences of crowds within high-contact and collectivist cultures. Both adults (Fuller et al., 1993; Ruback & Pandey, 1991; Evans et al., 1989) and children (Evans et al., 1998) living in Southeast Asia alike are found to be impacted by the negative outcomes of crowded living conditions. Similar results were reported in retail studies such as by Ozdemir (2005) who found that Turkish mall users felt more crowded than American mall users. Despite the inconsistency of these findings, it is clear that culture has a bearing on the way in which people are affected by the crowded settings.

From the previous studies, it can be inferred that the different factors influencing the perception, reaction, and adaptation to crowded situations might be weighted differently, depending on one's cultural origin. One possible modifying factor in this relationship is the temperature within the crowd. Heat, when combined with crowded conditions, is shown to contribute to aggressive behaviour. Griffitt (1970) found that interpersonal relations are more negative and critical at elevated temperatures (i.e., more than 32°C, 90°F) than in normal conditions (20°C, 68°F). These results were supported by a later study by Griffitt and Veitch (1971) who found that people were less friendly toward each other on hot days and regarded each other more negatively when many people were crowded into one room. Another interesting finding is that the participants imagined themselves to be warmer in a crowded room than in an uncrowded room, even though temperatures in both were identical. This, according to Griffitt and Veitch, implies that "hot weather" or negative interpersonal responses may occur in crowded conditions where only moderate temperature prevails. A more recent study by Braun and Parsons (1991) supported this notion as they discovered that there is a tendency to associate heat, odour, and discomfort with the feeling of being crowded. Their experiment found that for conditions normally within the comfort range, low density crowds can cause significant thermal strain and this can be attributed to restrictive

evaporative loss in the thermal microclimate as well as to other heat exchange mechanisms.

To summarise, the existing literature suggests that culture, combined with physical determinants such as heat or temperature, among others, can have a significant effect on one's perceptions, reactions, and adaptations to crowds. Research has also points out that although some studies claimed that significant cultural differences exist in relation to attitudes towards density and crowdedness, more recent studies argue that despite the cross-cultural differences in crowdedness threshold, the adverse consequences of crowd density are comparable from one culture to another. All of these issues are interrelated and future research, therefore, needs to take into account the debate on cultural factors, especially those of a specific culture, in crowd behaviour studies. Given the apparent need for a more comprehensive research on this topic, the next section discusses the significance and importance of the current study.

Why the current study is important?

There are two major gaps in our current knowledge. First, where human thermal adaptation to crowds have been explored, researchers have tended to focus on indoor or built environments (e.g., Kang, Xue, & Bong, 2001), and less on outdoor, large event settings. Second, while the cultural differences in the perception of and reaction to crowdedness have been studied, the cultural factors that influence the physiological and psychological adaptations of people in different levels of crowd density remain relatively unexplored. The study reported here attempts to deal with these issues. More specifically, it attempts to explore and examine human psychological and physiological responses and adaptations in crowds, with a particular focus on Malay males. This study is important in the area of human thermal environment and crowd behaviour for two reasons. First, it provides some empirical data on the nature and extent of human thermal responses in crowds, hence improve our understanding of how the body reacts in crowded situations. Second, the study offers insight into the cultural characteristics of a crowd that could influence thermal sensations and comfort, with potential implications for understanding crowd behaviours during *Hajj*.

METHODOLOGY

Design

A climatic chamber experiment was carried out on a male participant under one condition of crowd density. In the experiment, the participant and other 'crowd' members were required to stand to allow a higher occupant density for crowding that could not be achieved if seated. All participants in the crowded situation were males. The exposure period in the thermal chamber, which was set at 50% relative humidity, air temperature of 30°C, and 0.15ms^{-1} air velocity, with the crowd was 60 minutes. The participant first stood in isolation for a preliminary 30 minutes so that a steady thermal state could be achieved.

Participants

One Malay male participant (23 years, 1.70m, 63kg) had subjective and physiological responses recorded while being surrounded by another 9 Malay male participants in a climatic chamber. Details of the participant's age, height, and weight are provided in Table 1.

Table 1
Descriptive statistics of the participant's age, height, and weight

Participant's data	Value
Age	23
Height (cm)	170
Semi-nude weight (kg)	63.099
Weight in jeans & t-shirt (kg)	64.143
Weight in jeans, t-shirt & instruments before experiment (kg)	65.263
Weight in jeans, t-shirt & instruments after experiment (kg)	65.242

All participants (i.e., 1 real subject, 9 crowd members) wore cotton T-shirts and jeans; each clothing insulation value was estimated as 0.60 clo. The exposure period in the thermal chamber with the crowd was 60 minutes. The participants stood in a space 1.5m X 1.0m (i.e., density approximation of 0.12m^2) inside the chamber representing a jammed-pressed crowd. As part of the ethical considerations, all participants gave written informed consent and completed a medical questionnaire.

Measures

Four types of measurements were taken. First, three environmental measures, namely globe temperature, air temperature, and relative humidity, were assessed to observe any fluctuation in the thermal condition caused by the crowded condition. All data were taken at 1-minute intervals.

Second, the physiological measures, which comprised of the mean skin temperature, core (aural) temperature, and heart rate, were taken at 1-minute intervals. As the experiment also aimed to measure the reduction in evaporative heat loss that may be caused by the effects of crowding, participant's weight differences before and after the experiment were calculated.

Third, subjective measures of crowding and warmth sensation were recorded using a 22-item questionnaire, categorised in 2 parts. Part 1 consists of 5 open-ended questions such as "*How would you describe your condition now?*", "*How would you describe your feelings now?*", "*What are your concerns now?*", and "*How would you like to be now?*". These questions were designed to tease out the participants' feelings, concerns, and expectations in a crowd. The last item in this part asks what people *actually feel in that crowded situation with what they want it to be*. Meanwhile, the second part of the questionnaire consists of 13 closed-ended items measuring feelings of crowdedness and 5 closed-ended questions that assess thermal environment. The questionnaire was completed at 10-minute intervals by all participants.

Finally, participants' movements and the group responses and activities, which represent the observed behavioural measures, were recorded by taking photographs of crowd members' standing position every 15 minutes.

Procedures

All equipments were calibrated and set up according to the manufacturers' recommendations prior to the experiment. Next, an area of 1.5m X 1.00m was

marked at the middle of the climatic chamber to denote the place where the crowd have to stand. The density approximation was 0.12m^2 in order to achieve a jammed-pressed condition (Braun & Parsons, 1991). Next, the chamber was set at 50% relative humidity and air temperature of 30°C with air velocity of approximately 0.15ms^{-1}.

Once the participant had provided informed consent, he was weighed and had his height measured. He was then instrumented to take physiological measures. Once instrumented, the participant was asked to enter the chamber and stand at the spot marked "S". He was provided with a clipboard which has the subjective questionnaires and wore a sticker marked "**S**". The participant remained inside the chamber for 30 minutes to achieve a steady thermal state and started answering the questionnaires.

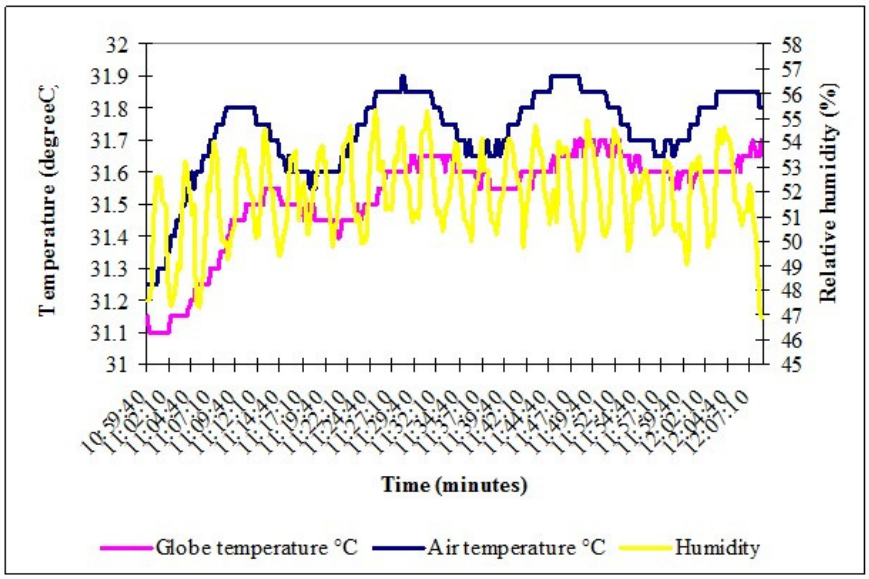
Participants who were recruited as crowd members arrived half an hour later. Prior to entering the chamber, their height and weight were measured. Each crowd member was given a sticker that has an identification code for their position inside the marked area and a clipboard containing the subjective questionnaires. After all of them have been measured and weighed, they were asked to enter the chamber and stood inside the marked area, surrounding participant "S". Thereupon, they completed the questionnaires at every 10 minutes. Throughout the experiment, all participants were asked "*How do you feel now*?" every 15 minutes in order to collect group responses. Photographs were also taken to record the movement of all members of the crowd. After 60 minutes, the experiment was stopped and the participant was removed from the chamber and weighed with his clothing and instruments on.

RESULTS

Environmental measures

It was observed that there was an increase in all environmental parameters associated with higher temperatures and greater humidity (see Figure 1).

Figure 1
Observed air temperature, globe temperature, and relative humidity of the climatic chamber



Physiological adaptations

Over the 1 hour session, the participant's mean skin temperature rose from 33.5℃ to 34.7℃, while heart rate increased from 71 to 83 beats per minute. The difference between participant's weights measured before and after the experiment indicated sweat loss as 21 grams (0.7413 oz.). Chest was the warmest area of the body, followed by thigh, calf, and upper arm.

Psychological adaptations

Perception of crowding: The participant initially felt very crowded, squashed, uncomfortable, slightly irritable, slightly dissatisfied, and slightly intolerant. As he knew the others in the crowd well, he did not feel that he had to avoid interaction. This is consistent with Gormley and Aiello's results (1982) which state that perception of crowding and control over social interaction can be influenced by the nature of interpersonal relationship. The crowd members, whereas, felt very crowded, squashed, and uncomfortable. Although the crowd felt pleasant with each other, individually, they reported being tense, irritable, dissatisfied, and intolerant.

From the subjective responses of all participants, the initial 30 to 40 minutes of the exposure showed a significant increase in "avoidance of interaction", feeling of "not being able to escape", and agreeing that "more effort to move in the crowd is needed." There is also no significant difference between the standing positions of the participants in the crowd with their subjective evaluations. Not only the participant who stood in the middle of the crowd reported feeling crowded and squashed, crowd members who stood at the corners of the area commented feeling crowded, squashed, and wanted more space too.

Two significant comments were made by the crowd members. First, because the chamber is well-lit, the area tend to be perceived as larger; and second, the actual size of the chamber, which has high ceiling relative to the marked area where they have to stand tend to make the area looked more spacious, hence they did not feel extremely crowded in there. This finding implies the importance of physical features of an environment as one of the contributing factors in crowding appraisal.

Reactions to crowding: Greatest intolerance was reported during the initial 30 to 40 minutes of the exposure. This can be clarified by the participants' interpretation of the situation i.e., tolerance for crowdedness depends on the amount of time that the individual expects to remain in the crowd. On the whole, it was found that degree of tolerance, interaction, satisfaction, crowd evaluation, thermal comfort, irritability, and tension all seem to decrease over the duration of exposure. Hence, it can be said that time is related to experiences of and reactions to crowding.

Behavioural measures: These measures indicated that there was a tendency for individuals to reduce crowd density by subtle movements away from those around them. Interviews with crowd members suggested factors such as density level, space satisfaction, heat, air quality, lighting, adaptation, room volume, duration of exposure, focus of attention, nature of relationships, and social atmosphere are all affect crowd stress levels. In particular, the expectation about the crowded situation – especially knowledge of when they could leave the crowd, influenced strain experienced. Altogether, the participants were concerned about the following issues: hot temperature, standing duration, the need for more space,

wanting to get out, thinking of food or drinks, tiredness, air quality, and doing other activities such as working.

DISCUSSION AND CONCLUSIONS

This experiment empirically investigates the psychological and physiological adaptations of Malay males in a crowded situation within a controlled environment. The results show that an exposure to a high crowd density resulted in hotter body temperature than in steady state with the chest as the warmest part, followed by thigh, calf, and upper arm. This finding indicates the physiological adaptations by the participants in an attempt to compensate for the increased heat and temperature in the crowd.

The physiological adaptations to crowdedness are further supported by the participant's psychological responses. It appears that physical (i.e., duration of exposure to the crowd and physical features of the environment) and social (i.e., nature of interpersonal relationship and the expectation about the crowd) conditions bear an important role in the participants' reactions and adaptations to crowd density. In addition, participants in this experiment experienced psychological distress as a function of density and crowdedness, similar to that of other people from other cultures reported in the literature. This finding, therefore, did not entirely support the popular belief that collectivistic cultures (i.e., Asians) can better withstand or tolerate the adverse psychological and physiological effects of crowdedness. Interestingly too, the participants employed several cognitive and behavioural coping strategies to tolerate the crowd. These strategies include thinking about how to confront the stress in the crowd, planning active coping efforts, suppressing attention to other activities, making the best of the situation by viewing it in a more favourable light, applying psychological disengagement through daydreaming or self-distraction, and making jokes about the crowded situation.

Collectively, these results have important implications for the understanding of human thermoregulation and psychological adaptations in crowds among Malaysians - especially the Malays. Previous research has concentrated only on the associations between crowd density with their associated outcomes using Chinese, Indians, Turkish, and Mexicans participants. This experiment, however, highlighted the significant variables that could directly or indirectly involve in physiological as well as psychological reactions and adaptations in crowds as experienced by Malay participants. More importantly, the results show that the adaptations to crowd density do not translate into greater resilience for psychological distress. This finding, to some extent, challenges the widely held assumption that people from more collectivistic cultures such as Malaysia are more tolerant of crowding.

In addition, the results of this study have potential practical applications in preparing Malaysian *hujjaj* for the extremely high crowd densities during *Hajj*. Knowing how crowd densities can affect human physiological and psychological reactions can promote greater awareness of the seriousness of heat exposure and the means of protection from it. Once the *Hujjaj* are made aware of these issues, they will be more physically and mentally prepared to perform the rituals under the high crowd density levels. Consequently, an improved understanding of the cultural variations that contribute to the physiological and psychological adaptations to crowd density can play a significant part for the *Hajj* authorities in designing useful crowd management and interventions as well as implementing functional crowd safety policies.

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