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Evaluating the Effect of Crowd Design, Information and Management on Crowd Safety in KL Car- in Free Morning Sporting Events

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Abstract: The KL Car-Free Morning event in Kuala Lumpur is a popular sporting event promoting physical activity and a healthy lifestyle. It occurs every Sunday and involves closing streets for activities like cycling, running, and walking. With the growing number of participants, safety concerns have emerged, necessitating proper planning and safety measures. Event design includes street closures, accessible route design, safety measures, varied activities, evaluation and monitoring, and community engagement. The purpose of these studies is to investigate the effect of crowd design, information, and management on crowd safety in KL Car-Free Morning Sporting Events. A quantitative method was used research as a research design and a survey method was for data collected. The population of this study are all the participants that join this event either from running, cycling, walking, rollerblading, or skateboarding activities. SPSS was used as a tool for data analysis. The findings of this study present that crowd design and management significantly affect crowd safety and crowd information does not significantly affect crowd safety. This study is important for the event organizer to understand the factors that will affect the safety of the participants.

Keywords: *Crowd Design, Crowd Information; Crowd Management; Crowd Safety.*

1. Introduction

Managing crowded places is challenging (Still, Papalexi, Fan, & Bamford 2020). Safety is an important aspect of sporting events because it ensures the well-being and protection of athletes, coaches, and spectators. Sporting events can be physically demanding and intense, and there is a greater risk of injuries, accidents, and other hazards if proper safety measures are not in place. The safety of humans in crowded environments has been recognized as a rapidly growing research area and has been of significant concern to many government agencies (Helbing et al., 2007). Increases in urban populations and mass events have raised interest among researchers and authorities regarding the problems of pedestrian and crowd dynamics (Haghani and Sarvi, 2018).

The KL Car-Free Morning event in Kuala Lumpur is a popular sporting event promoting physical activity and a healthy lifestyle. It is held in Dataran DBKL, Kuala Lumpur, every Sunday from 7.00 a.m. until 9.00 a.m. and involves closing streets for activities like cycling, running, and walking. The event offers a diverse range of activities, catering to various preferences and fitness levels of the participants. The first KL Car-Free Morning event took place in May 2014, marking the beginning of a recurring event that provides opportunities for residents and visitors to engage in physical activities in a car-free environment. The KL Car-Free Morning event in Kuala Lumpur can attract many participants, with the number reaching up to 3000. Event planning and execution prioritize the safety and security of all attendees, including participants, spectators, and staff. The specific risks associated with each event influence the safety and security plans.

Crowd safety has become an increasingly important concern in recent years due to a rise in mass gatherings and events worldwide (Haghani, Coughlan, Crabb, Dierickx, Feliciani, van Gelder, et al., 2023). According to Carmack (2016), a professional safety presence at any large sporting event is a must. A sports arena demands an extremely high level of safety. It's a large space with people coming and going, possibly inebriated fans, and the potential for security issues and conflict situations. This is especially important in high-risk events such as running or cycling that are placed on the road. Furthermore, putting in place proper safety measures can help reduce the risk of litigation and legal action.

Crowd safety risks can take various forms, including physical injuries, property damage, stampedes, violence, fire or explosion hazards, communicable diseases (Taibah et al., 2020), and other hazards that may arise from the interaction of large numbers of people in a confined space (Subramanian and Verma, 2022). If an accident or injury occurs and it is determined that adequate safety precautions were not taken, the event organizers or facility owners may be held liable. Not only that, but safety is essential for the event's continuity and integrity. A safety incident can cause the event to be canceled or delayed, which can have an impact on the event's overall outcome and the audience's experience (The Chivalry Group, 2021).

Hence, the purpose of these studies is to investigate how event organizers manage events while ensuring safety measures are in place. This can include the factor crowd design, crowd management, and crowd information as independent variables and crowd safety as dependent variables. The goal of these studies is to identify best practices and effective methods for event organizers to manage events while prioritizing the safety of all involved. This can help mitigate the risk of accidents, injuries, and other hazards that can occur during an event and ensure a positive experience for attendees.

2. Literature Review

Event and Safety: Safety is a critical aspect of any sporting event, as large crowds of people are often present. A study by Still and Papalexi, (2020), highlights the importance of safety in sporting events, due to the rising number of incidents at such events and the responsibility of event organizers and city officials to ensure the safety of participants and spectators. Recent studies have also emphasized the need for effective event management and crowd management strategies to maintain safety at sporting events and suggested best practices such as implementing technology-based solutions and conducting risk assessments to prevent incidents. These studies demonstrate the need for further research in this area to improve safety measures and crowd management techniques to ensure the safety and enjoyment of all attendees.

Crowd Management: Crowd management is a critical aspect of safety at sporting events. It involves the organization and coordination of people in a crowd, as well as the implementation of measures to ensure the safety of the crowd. Crowd management includes several different elements, such as crowd design, crowd information, and specific crowd management strategies. Crowd design involves the physical layout of the event and the placement of crowd control barriers, as well as the placement of emergency exits and the number of available seating options. Crowd information includes providing clear and accurate information to the crowd, such as event schedules, seating arrangements, and emergency procedures. Specific crowd management strategies include the use of security personnel, the implementation of security screenings, and the use of technology such as CCTV cameras to monitor the crowd. Overall, effective crowd management is crucial for the safety and well-being of the crowd, as well as the smooth and efficient operation of the event. It requires a proactive approach, careful planning, and the coordination of various stakeholders, including event organizers, security personnel, and local authorities (Munirah et al., 2022).

Crowd Design: Recent studies have focused on the design of car-free events and how they can impact participation and community engagement. A study from 2020, conducted in Paris, France, found that closing the streets to motorized traffic for the car-free event not only increased the number of people cycling but also led to an increase in the number of people walking and socializing (Glazener et al., 2022). Furthermore, a study from 2021, conducted in New York City, USA, found that the design of the car-free event, including the inclusion of various activities such as fitness classes, live music, and food vendors, led to increased participation and community engagement (OECD, 2020).

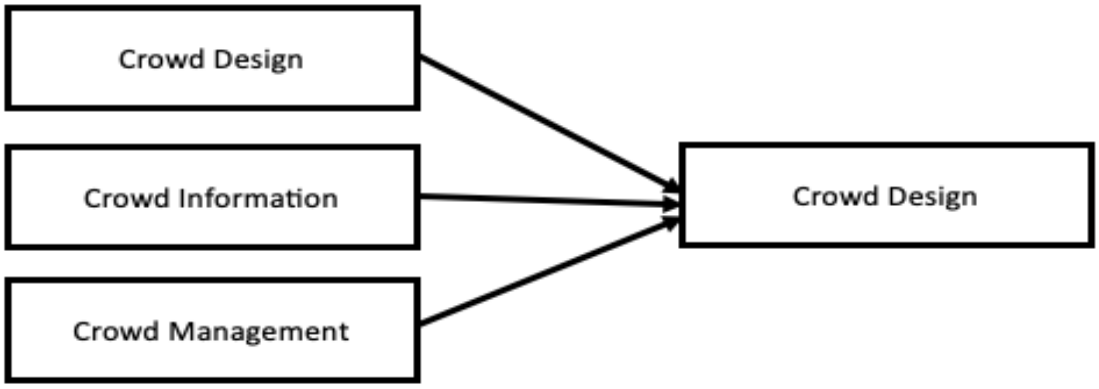
Crowd Information: Recent studies have also focused on the role of information in promoting car-free events and increasing participation. A study from 2020, conducted in Berlin, Germany, found that providing information about the event through social media and other online platforms, as well as through traditional media such as newspapers and television, significantly increased awareness, and participation (Schulz et al., 2022). Additionally, a study from 2021, conducted in London, UK, found that providing real-time information about the event through mobile apps and social media helped to increase participation and promote active transportation (Abbas et al., 2019).

Crowd Management: Recent studies have also emphasized the importance of effective management in the success of car-free events. A study from 2020, conducted in Sydney, Australia, found that effective management and coordination with local organizations and businesses helped to increase participation and support for the event (OrthoMedia, 2021). Similarly, a study from 2021, conducted in Mexico City, Mexico, found that effective management and coordination with local government and community groups helped to increase participation and support for the event, and helped to improve air quality during the event (Molina et al., 2019).

Safety Measurements of an Event: Safety measurements at sporting events are crucial in ensuring the safety of attendees. A study by Still and Papalexi, (2020), found that implementing measures such as security screenings, crowd management strategies, and emergency response plans can significantly reduce the risk of injuries and accidents at sporting events. The study also highlighted the importance of regular evaluations and updates to these safety measures to ensure they remain effective. Another suggestion suggests that the use of technology, such as CCTV and incident management software, can also play a vital role in enhancing the safety and security of sporting events. The study found that these technologies can improve communication, coordination and response time during an emergency, and aid in the identification and management of potential risks.

Research Framework (Conceptual / Theoretical): The theoretical framework was adapted and modified from previous studies one of them from Still et al. (2020) about assessing crowd safety management and from Peckover et al. (2022). Based on the study of crowd management, the report by Still et al. (2020) showed the importance of crowd safety in a sporting event. Based on the study of crowd satisfaction, the report by Peckover et al., (2022) showed the importance of participant's satisfaction in a sporting event.

Figure 1: Research Framework



Sources: Adapted from Still et al. (2020) and Peckover et al. (2022).

3. Methodology

A quantitative method was used to analyze the research data collected for this study. The population of this study are all the participants that join this event either from running, cycling, walking, rollerblading, or skateboarding activities. This study utilized a convenience sample. To gather information, this study implemented a questionnaire. The survey will provide a few sections of questions from Sections A (demographic questions), B (Independent variable), and section C (Dependent variable). All the data that have been collected from our questionnaire will be analyzed using Statistical Package for Social Science (SPSS) software because it provides a wide range of statistical tools and methods that are well-suited for analyzing social science data. The main analysis used for this study is descriptive analysis to analyze the demographic profile, reliability analysis, and regression analysis to analyze the effect between the independent variable and dependent variable.

4. Research Findings and Discussion

Table 1 contains information on the demographic data of the respondents and in this study, a total of 67 respondents were surveyed. The gender distribution revealed that 53.7% of the respondents identified as male, while 46.3% identified as female. Among the participants, 41.8% fell within the 18-25 age range, with the majority being undergraduate students. The second-largest age group was 26-30 years of age, accounting for 29.9% of the sample. The age groups of 31-40 years old and 41 and above constituted 20.9% and 7.5% of the student participants, respectively. In terms of monthly income, 31.3% of the university students reported earnings below RM2000, 40.3% earned between RM2000 and RM5000, 19.4% earned between RM5000 and RM7500, and 9% reported earning more than RM7500.

Table 1: Demographic Analysis

Category	Demographic	Frequency	Percentage
gender	Male	36	53.7
	Female	31	46.3
Age	18 - 25	28	41.8
	26 - 30	20	29.9
	31 - 40	14	20.9
	41 and above	5	7.5
Income	Below RM2000	21	31.3
	RM2000-RM5000	27	40.3
	RM5000-RM7500	13	19.4
	More than RM7500	6	9.0
Employment Status	Full-time	49	73.1
	Retired	1	1.5
	Student	16	23.9
	Unemployed	1	1.5
Education Level	High school (SPM)	8	11.9
	Diploma	15	22.4
	Bachelor's Degree	33	49.3
	Master's Degree	11	16.4
Frequency of Participating in a Running Event	Never	7	10.4
	Weekly	14	20.9
	Monthly	28	41.8
	Yearly	18	26.9

When examining the employment status, it was found that most university students were engaged in full-time studies (73.1%), while a small percentage were either retired (1.5%) or unemployed (1.5%). Regarding education level, the university students represented a diverse group, with 11.9% having completed high school (SPM), 22.4% holding a diploma, 49.3% having a bachelor's degree, and 16.4% possessing a master's degree. Finally, in terms of the frequency of participating in running events, 10.4% of the university students reported never participating, while 20.9% participated every week. Monthly participation was reported by 41.8% of the students, and 26.9% participated in running events every year.

Reliability Analysis: Based on Cronbach's alpha analysis, all variables are considered reliable because they achieve an alpha value of more than 0.60. The results shown in Table 2, crowd management has the highest Cronbach's alpha value where its alpha value is 0.951, followed by crowd information where its alpha value is 0.937, and then crowd design with an alpha value of 0.900. The dependent variable crowd safety presents a 0.939 reliability value.

Table 2: Reliability Analysis

Variable	No of Item	Cronbach's Alpha
Crowd Design	5	0.900
Crowd Information	5	0.937
Crowd Management	5	0.951
Crowd Safety	5	0.939

Regression Analysis: The result in Table 3 indicates that R = 0.829, R2 = 0.795, adj R2 = 0.785, F = 80.263, p<0.001. The multiple correlation coefficient between the variables which are crowd design, crowd information, and crowd management towards crowd safety is 0.890. It indicates that the independent factors considered in the regression model are highly and positively correlated with the dependent variable. Therefore, it represents a high contribution to the crowd safety. The three independent factors account for 79.5% of the variance in crowd safety reflecting convergent validity. Hence, 20.5% of the variations in crowd safety are due to other factors not investigated in this study.

Table 3: Regression Analysis

Independent Variables	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t-stat	p-value	VIF
Constant	1.278	-	1.581	0.119	
Crowd Design	0.248	0.247	2.145**	0.036	4.014
Crowd Information	0.235	0.243	1.553	0.125	7.393
Crowd Management	0.441	0.441	2.979**	0.004	6.631
R				0.829	
R^2				0.795	
Adjusted R^2				0.785	
F-test				80.263	
Sig.				0.001	

Dependent Variable: Crowd Safety

The adjusted R^2 is 0.785 indicating the result of this study is generalizable to other populations. Given that the adjusted R^2 is close to the R^2 value, it represented that no overfitting of the model to the sample occurred (Hair et al., 2006). The regression model fits the data very well. The F-test is 80.263 at p<0.001 indicating a significant association between the variables. In viewing the unstandardized coefficients, the positive sign on the independent factors is an indication of a positive relationship between independent and dependent variables.

Table 3 present the effect between the independent and dependent variable. based on the analysis, crowd design (B=0.248, t=2.145, p=0.036) and crowd management (B=-0.441, t=-2.979, p=0.004) shows the significant effect toward crowd safety. In contrast, crowd information (B=0.235, t=1.553, p=0.125) presents an insignificant effect on crowd safety.

Discussion: Crowd design and management are pivotal for ensuring event safety. Proper planning and execution in these areas help prevent overcrowding, enabling safe movement within the venue. In emergencies, effective crowd management ensures swift and orderly evacuations, reducing the risk of stampedes or panic. Based on the findings of the research, the majority of the participants are found to be satisfied with the overall safety of the KL Carfree Morning Event. Visible safety personnel, clear signage, and well-defined pedestrian and traffic zones managed by DBKL event organizers contributed towards participant's sense of security and comfort.

Effective crowd control, which includes well-trained staff, smooth traffic flow, and well-organized registration procedures, contributes to participant satisfaction overall and increases the possibility that they will attend future athletic events. This demonstrates the significance of the discoveries made by Still et al. (2020) and Peckover et al. (2022). Managing crowds well is essential for reducing disputes, boosting security, and responding quickly to medical emergencies. It is important to take accessibility into account so that everyone

can participate securely. Clear communication and trained personnel are important for enforcing safety regulations and managing potential dangers. Crowd design and management are proactive strategies that protect attendees, uphold the event's reputation, and guarantee that everyone has a safe and happy time.

However, the finding of this study shows that crowd information has little bearing on crowd safety. Because it cannot, on its own, stop accidents or emergencies, crowd intelligence is not always important for crowd safety. Planning, managing, and communicating effectively are the main factors that affect safety. Information can be useful, but to assure safety at crowded events, it must be combined with effective crowd design and management strategies.

5. Conclusion

Every event must prioritize crowd safety because it directly affects both the attendees' welfare and the event's overall success. First and foremost, it is a moral and ethical obligation to protect the crowd. Every breach in crowd safety can result in accidents, injuries, or even fatalities, which can have severe repercussions for people and communities. Event organizers have a responsibility to safeguard the lives and health of attendees. Second, the reputation of the event planners as well as the event itself depends on audience safety. An organization's reputation might be damaged and legal liabilities could result from a single safety event. A negative public opinion of an event may also have an impact on future attendance and sponsorships.

Effective crowd safety measures improve attendees' overall experience. When people feel secure and at ease, they are more likely to enjoy and take part in events. Everyone may participate completely in the event's offerings, from concerts and sporting events to festivals and conferences, if the crowd is properly handled. In conclusion, crowd safety is more than simply a logistical issue; it's also a moral duty, a way to protect one's reputation, and a way to make the event experience better. Crowd safety is a crucial consideration in event planning that should never be disregarded.

The study's main drawback is the small sample size. This study is crucial for comprehending the significance of crowd safety and will aid event planners in planning their events. Findings from this study will aid event planners in developing plans and long-term business strategies. So, as a suggestion for future research, the researcher might consider additional variables including venue choice, audience size, and behavior, as well as emergency response and medical services. All of these are significant factors that necessitate research to make the event viable.

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