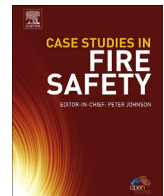




ELSEVIER

Contents lists available at ScienceDirect

Case Studies in Fire Safety

journal homepage: www.elsevier.com/locate/csfs

Case study

The effects of cultural differences between the us and saudi arabia on emergency evacuation—Analysis of self reported recognition/reaction times and cognitive state

Majed Almejmaj^{a,b,*}, Jeanine LM Skorinko^a, Brian J. Meacham^a^a Worcester Polytechnic Institute, Worcester MA, USA^b BuroHappold Engineering, Dubai, United Arab Emirates

ARTICLE INFO

Article history:

Received 1 September 2016

Received in revised form 11 December 2016

Accepted 15 December 2016

Available online xxx

Keywords:

Human behavior

Pre-movement

Recognition time

Reaction time

Evacuation

ABSTRACT

Engineers rely on studies that publish building evacuation data from various occupancies when conducting an egress analysis; this usually includes the people's pre-movement and movement times. However, much of the available data was collected in Western cultures, such as the U.S., which brings into question their validity to other non-Western cultures, such as Saudi Arabia. This study examines how cultural differences between the U.S. and Saudi Arabia can affect occupants' self-reported recognition/reaction times, and the cognitive state of occupants during a fire drill. The results of this research indicate that the U.S. populations are more likely to recognize and react to a fire alarm faster than the Saudi populations during a fire drill.

© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

When conducting a performance based-design, engineers tend to compare the Available Safe Escape Time (ASET) to the Required Safe Escape Time (RSET) [1,2]. ASET is the time it takes until untenable conditions are reached in the space while RSET is the time it takes occupants to evacuate the space [2]. To determine the RSET, engineers conduct an analysis using tools that depend on published data covering the time it takes people to recognize/react to visual, audio and social cues along with the movement time after recognizing the severity of the situation and reaching a place of safety; such data can be found in for various occupancies in a number of fire protection engineering guides [1,2].

Studies have shown that individuals who have been previously exposed to fire alarms are more likely to recognize the cues than those who have not [3], which would result in prompt evacuation [4]. This illustrates the importance of fire drills as it can result in a shorter recognition and reaction times.

Researchers have been highlighting the need for additional data regarding the delay time to start the evacuation process [2]. While there have been some published data covering a number of occupancies obtained from fire drills and actual emergency incidents in various countries [5–8], no such data exists for the middle east, more specifically Saudi Arabia. This raises a question regarding the applicability of using such pre-movement times when conducting an egress analysis study for the Saudi Arabian culture, especially when recent data indicates a deficiency in fire training and education for such culture [9].

* Corresponding author at: BuroHappold Engineering, Dubai, United Arab Emirates.
E-mail address: majed.almejmaj@burohappold.com (M. Almejmaj).

<http://dx.doi.org/10.1016/j.csfs.2016.12.002>

2214-398X/© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

This paper presents the results of an online survey that was randomly distributed to participants in the United States and Saudi Arabia to assess how culture can affect occupant self-reported alarm recognition/reaction times and cognitive state during fire drills.

2. Fire drill frequency

The level and frequency of fire training and education are specified in various international codes (e.g. *International Fire Code*, National Fire Protection Association *Life Safety Code*) [10,11] for a number of occupancy types. Such codes also specify the level of participation in fire drills; for example, the *International Fire Code* requires that employees and occupants of Group E occupancies (Education) participate in fire drills, which are conducted on a monthly basis [10]. This indicates that these codes have identified training as a requirement because experience and research have shown the importance that fire drills play in familiarizing occupants and employees with emergency procedures. For example, in a study comparing occupant response time and activities from a number of university library evacuation drills in various countries, UK participants (45% with previous experience of the building's alarm tone) had a quicker response time than that of Czech Republic participants (2% with previous experience of the building's alarm tone) [12–14].

In 2007, Saudi Arabia created its first official building code, the Saudi Building Code (SBC), which was based on the International Building Code (IBC), 2003 edition. This would require the implementation of the IFC, 2003 edition, requirements in Saudi Arabia with regards to fire drill training and frequency. However, recent surveys demonstrated that the majority of the Saudi general population had never participated in a fire drill [9]. This brings into question the validity of applying Western alarm recognition/response times to other cultures and assuming that they will react in a similar manner, especially when studies have shown that fire drill experience can greatly vary between countries.

3. Cognitive state during an emergency event

When a fire alarm sounds in a building unfamiliar to its occupants (e.g. hotel, department store), the occupants will undergo some level of stress due to their disorientation [15]. Proulx developed a stress model that shows different levels of stress experienced by an occupant during a fire emergency. As occupants receive ambiguous information from their surroundings (e.g. fire alarm signal, smoke, people movement), their level of stress increases due to the uncertainty of the situation and their concern for their safety [16,17]. This raises concern for cultures that are not familiar with code required fire alarm signals and fire drill procedures. Thus, there is a need to investigate the exact information conveyed during fire drills and the conveyed information on the occupants' cognitive state and reaction to determine occupants' stress levels and whether additional information needs to be conveyed during fire drills and fire emergencies.

4. Research problem

Given the requirements for the use of a fire alarm notification signal, evacuation training and the fact that data suggests little training and no familiarity with code required fire alarm signals in Saudi Arabia, a research study was conducted to obtain a richer data set relative to (a) recognition and response during a fire drill, and (b) occupant cognitive state during a fire drill in Saudi Arabia and the U.S.

It is hypothesized that due to the low implementation of fire drills in Saudi Arabia, the participants will take longer to recognize and react to a fire alarm signal, and experience more negative feelings during a fire incident than their U.S. counterparts. To accomplish this, an online survey was distributed to random participants from both cultures.

5. Method

5.1. Survey design

While the survey was designed to cover various aspects of fire alarm recognition, fire drill and fire incident experience (68 questions), this study focuses on the effects of culture on three main components: 1) participants self-reported alarm recognition time during a fire drill, 2) participants self-reported response time during a fire drill, and 3) cognitive state during the experienced fire drill. The survey was designed in a way that allows it to be divided into three separate parts when needed, which was beneficial with the Saudi participants as they were reluctant to complete the entire survey due to its length and the inability to provide financial compensation for the participants' time. For this reason, the survey targeting participants from Saudi Arabia was divided into three separate surveys, which caused some variance in the number of responses for each survey, as many participants chose not to complete some of the survey. On the other hand, each U.S. participant answered the entire survey (68 questions) in one setting and were provided with financial compensation. This study discuss results of the section covering previous fire drill experience survey. Other sections will be discussed in future publications.

Download English Version:

<https://daneshyari.com/en/article/6702005>

Download Persian Version:

<https://daneshyari.com/article/6702005>

[Daneshyari.com](https://daneshyari.com)