

# Fire safety training: Its importance in enhancing fire safety knowledge and response to fire

*Huseyin and Satyen argue that training in fire safety could lead to a reduction the rate of fire casualties*

## Abstract

Fire-related accidents often result in injuries and sometimes death, which can be prevented through fire safety training. To estimate the extent to which fire safety training should be provided, it is essential to assess the current level of fire safety knowledge within the general community. Thus the objectives of the present study were to explore: (a) the level of fire safety knowledge among people of different age groups and investigate its relationship to the level of fire safety training, and (b) the manner in which people from different age groups would respond to a fire based on their fire safety training. Data from 158 participants aged between 18 and 80 years showed that fire safety training increases: (a) the level of fire safety knowledge and, (b) the accuracy of response to a fire. The results also show that middle-aged individuals would respond more accurately to a fire than younger and older adults. The findings demonstrate the importance of fire safety training in enhancing people's fire safety knowledge and their response in the event of a fire which could lead to a reduction in the rate of fire casualties. There are implications for incorporating fire safety training as part of health improvement programs to reduce the number of fire-related injuries and fatalities.

## Introduction

Residential fires, workplace fires, and environmental fires such as bushfires result in severe and fatal burn injuries (Mallonee *et al.*, 1996). Fires also lead to property loss, psychological distress, and sometimes loss of life (March, Amaya- Jackson, Terry, & Costanzo, 1997). Many studies (e.g., Brennan, 1999; Country Fire Authority [CFA] and Metropolitan Fire Brigade [MFB], 1999; DiGuseppi *et al.*, 2002; Halpern & Hakel, 2003; Kennedy, 2003; National Fire Protection Association [NFPA], 2000; Proulx, 2003) have identified fire safety training as a way of increasing public fire safety knowledge and improving their response to a fire with the aim of reducing the number of fire-related casualties. In spite of fire safety training programs currently available, it is unclear why reports indicate a lack of fire safety knowledge, delayed threat recognition, and delayed evacuation among the general community, especially among younger and older persons (e.g., Brennan, 1999; CFA & MFB, 1999; Melbourne Metropolitan Fire Brigade [MMFB], 2001; Proulx, 2003). These findings warrant the need to investigate the extent to which fire safety training is provided and the level of fire safety knowledge within the community.

## Importance of Fire Safety Training

Involvement in a fire can be a devastating experience and the consequences can be distressing and fatal. Several studies (Australian Bureau of Statistics, 2000; Brennan, 1999; CFA & MFB, 1999; Fire Protection Association Australia [FPAA], 2004; Istre, McCoy, Carlin, & McClain, 2002; MMFB, 2001; National Association of State Fire Marshals [NASFM], 1996; National Centre for Injury Prevention and Control [NCIPC], 1998; NFPA, 2000) have outlined the importance of fire safety knowledge in the community's role in the prevention and preparedness to deal with a fire. It is therefore essential that the community is provided with training to retain an adequate level of fire safety knowledge. It is also important that people retain an adequate level of knowledge about the importance of maintaining functional fire safety equipment (Brennan, 1999; DiGuseppi *et al.*, 2002; Mallonee *et al.*, 1996). However, many studies (e.g., Brennan, 1999; CFA &

MFB, 1999; NASFM, 1996; NCIPC, 1998) have revealed that the general community does not retain an adequate level of fire safety knowledge and acts dangerously (e.g., leaving cooking unattended or placing flammable material too close to the heater), which puts them at greater risk of being involved in a fire. It has also been indicated that younger and older persons especially lack sufficient fire safety knowledge and act in ways which puts them at greater risk of fire-related burns and deaths (CFA & MFB, 1999). This has eventuated in these individuals having a higher fatality rate than other age groups (National Safety Council, 2002). These age groups could have a greater risk because of their reduced ability to respond accurately in the event of a fire which could be because of their limited cognitive capacity, information processing ability, and ability to conceptualise information correctly (Kose, 1999; Satyen, Sosa, & Barnett, 2003; Sternberg, 2001). This risk further accentuates the importance and effectiveness of fire safety training.

The effectiveness of different fire safety training methods has been demonstrated by previous research. For example, studies by McConnel, Leeming and Dwyer (1996) and Satyen *et al.* (2003) showed that fire safety training programs such as the 'Kid Safe' (conducted by the Oklahoma City Fire Department) and 'Fire Ed' (conducted by the MFB, in Melbourne, Australia) are effective in providing important fire safety information and skills to young children. The effectiveness of fire safety training is also evident through a dramatic decline in deaths occurring from fires in US homes as a result of increased public safety education and more wide spread use of smoke alarms (NFPA, 2000, 2002).

## Response in a fire

Apart from knowledge, the behaviour of people also needs to be modified to prevent and help them prepare to deal with a fire. It is clear that fire emergencies are stressful events as they initiate suddenly, are intense, and require an immediate response (Driskell & Salas, 1996). Investigations of people's response to a fire have revealed that people determine whether to fight or flee from the fire based on their perception of the emergency (Canter, 1985). According to Proulx (2001, 2003), factors such as personality and leadership abilities, decision-making styles, and the amount of previous fire safety training are major determinants of how an individual would respond to a fire. In addition, the building's characteristics, whether it is a house or shopping centre, and the characteristics of the fire also influence an individual's response time and evacuation. Thus an adequate level of fire safety knowledge and preparedness is essential to reduce the time delay to start evacuation (Proulx, 2001) and it is necessary to inform people about the importance of immediate evacuation from the building of fire origin. Fire safety drills could be an effective and valuable method of providing a means to transfer

people's training into practice (Proulx, 2000; Robotham, 2001) so that they are able to respond more accurately during a fire.

There are a range of explanations for peoples' behaviour in a fire. According to the "naturalistic decision making" theory, during a threat situation such as a fire, people do not make decisions but instead choose the first course of action that seems to be appropriate given the seriousness of the situation (Driskell & Salas, 1996). Therefore an individual's decision is dependent upon how well the individual interprets the information present in the environment.

People could also have delayed threat recognition due to the concept of avoidance, according to which people prefer to feel protected and believe they can protect themselves psychologically by denying unpleasant situations (Cluster & Meacham, 1997). Thus, during a fire, fire cues such as smoke may not be recognised due to psychological denial, where people may find reassuring alternative explanations for the fire cues (Cluster & Meacham, 1997) resulting in a greater risk of becoming a casualty. Indeed, if individuals are provided with adequate fire safety training, they have a better chance of recognising important fire cues sooner and responding appropriately to avoid the risk (Proulx, 2001).

Research has thus established that fire-related accidents cause injuries and sometimes death, and that this can largely be prevented through the provision of fire safety training. However, the extent to which training is provided and the level of fire safety knowledge within the community is unclear. This is important to assess in order to estimate the amount of training required by the community and their level of preparedness in terms of knowledge, equipment, and response to deal with a fire. In addition, research has revealed that young adults and the elderly are at a higher risk of fire related accidents and injuries than middle aged adults. Hence specialised fire safety training programs relevant for all age groups must be developed. However, the extent to which this need is present within the community is not clear. Therefore the aims of the present study were to: (a) assess the level of fire safety knowledge based on the level of fire safety training, (b) explore the manner in which people would respond to a fire based on the level of prior fire safety training, and (c) examine any age differences in the level of fire safety knowledge and response to a fire. It was hypothesised that: a) an increased level of fire safety training is related to a greater level of fire safety knowledge, b) an increased level of fire safety training is related to a greater accuracy of response in a fire, and c) the level of fire safety knowledge and response to a fire will be different among people of different age groups.

## Method

### Participants

One hundred and fifty eight (46 male, 112 female) participants between the ages of 18 and 80 years were recruited from a range of organizations, including youth services, senior citizens clubs and university campuses across Melbourne, Australia. Participants were selected on the basis that they had not been previously involved in a fire. This was done as people who had previously been involved in a fire might respond differently to the questions compared to those who had previously not been involved in a fire (Brennan, 1999; Proulx, 2001, 2003).

### Apparatus

The 'Fire Safety Knowledge and Response to Fire' questionnaire developed by the authors (Appendix A) was used to measure participants' level of fire safety knowledge and their probable response to a fire. The questionnaire was developed based on factors extracted from previous research (Canter, 1980; Canter, 1985; Cluster & Meacham, 1997; MMFB, 2001; Quarantelli, 1978; Sime, 1984) and from four existing surveys (Barnett & Satyen, 2003; Canter, Powell, & Booker, 1985; Curmi, Gosney, Inkret, Muntz, Nilsson, & Tempini, & Satyen, 2003; Dowd, 2002).

The questionnaire consisted of a total of 41 questions and comprised three parts: (1) Demographic information (such as age, involvement in fire safety training etc), (2) Level of Fire Safety Knowledge ('do you change batteries in your smoke alarm?', 'how often do you change the batteries?', 'do you have a fire blanket in your home?' etc), and (3) Response to Fire ('if your clothes catch fire, you should...', 'if there was a fire in the room, where can you breathe easily?', 'when you hear your smoke alarm go off, you would....' etc). In order to test the feasibility of the questionnaire, a small-scale pilot study was conducted. Minor alterations (e.g., Q11) were made to the questionnaire to make it more applicable for all participants.

### Procedure

Participants individually completed the 'Fire Safety Knowledge and Response to Fire' questionnaire. When some older persons had difficulties in reading the questionnaire clearly, the researcher read the question aloud to them and marked the appropriate option they chose. Once all the data was obtained, the questionnaires were coded and scored. The total number of correct responses was tallied and this was then converted to a percentage. The statistical program SPSS version 11.0 was used for the statistical analysis of the data.

## Results

A Multivariate Analysis of Variance (MANOVA) with alpha set at 0.05 was conducted to determine any difference in (a) the level of fire safety knowledge, and (b) response to fire, based on the level of fire safety training, and also (c) to examine any age differences in the level of fire safety knowledge and accuracy of response to a fire.

Measure	Result	df	P
Fire safety knowledge	7.419	2, 157	0.001**
Response to a fire	14.945	2, 157	0.001**

\*\* Note: Significant at the .01 level

Results in Table 1 show a statistically significant main effect of fire safety training on the level of fire safety knowledge,  $F(2, 157) = 7.419$ ,  $MSE = 1372.790$ ,  $p = 0.001$ . Specifically, people who had been involved in fire safety training presented a higher level of knowledge in relation to fire safety ( $M = 76.80$ ,  $SD = 12.19$ ) than those who had not been involved in such training ( $M = 68.41$ ,  $SD = 14.45$ ).

The MANOVA results in Table 1 also show a statistically significant main effect of training on people's response to a fire,  $F(2, 157) = 14.945$ ,  $MSE = 41418.578$ ,  $p = 0.001$ . Specifically, people who had been involved in fire safety training would respond more accurately to a fire ( $M = 84.72$ ,  $SD = 13.13$ ) compared to those people who had not been involved in any fire safety training ( $M = 76.39$ ,  $SD = 19.50$ ).

Fire safety equipment	Proportion
Ownership of smoke alarm	89.9
Ownership of fire blanket	13.9
Ownership of fire extinguisher	20.9

Table 2 shows the proportion of households that own different types of fire safety equipment. The table illustrates that most people own a smoke alarm while only small proportions of people own a fire blanket or a fire extinguisher.

Measure	Result	df	P
Fire safety knowledge	0.816	3, 157	0.487
Response to a fire	6.826	3, 157	0.001**

\*\* Note: significant at the .01 level

The MANOVA results in Table 3 show that the main effect of age was not statistically significant on the level of fire safety knowledge,  $F(3, 157) = 0.816$ ,  $MSE = 163.936$ ,  $p = 0.487$ , but that it was statistically

significant on the accuracy of response in a fire,  $F(3, 157) = 6.826$ ,  $MSE = 2287.519$ ,  $p = 0.001$ . Scheffe Post hoc tests showed that people in the 35–54 years age group would respond to fire more accurately ( $M = 90.33$ ,  $SD = 10.12$ ) than people in the 18–24 years age group ( $M = 77.62$ ,  $SD = 16.26$ ) and the 55–65+ years age group ( $M = 68.24$ ,  $SD = 24.66$ ).

## Discussion

The findings show that fire safety training is necessary for improved fire safety knowledge and accuracy of response in a fire, thus supporting the first and second hypotheses. The findings also reveal that there are age differences in relation to accuracy of response in a fire but that no such differences exist with regard to fire safety knowledge, thus showing partial support for the third hypothesis. These findings are further explained in the following sections.

In relation to the first hypothesis, the findings demonstrate that the level of fire safety knowledge is higher among individuals who had been exposed to fire safety training compared to those who had not been exposed to any fire safety training. This was the case even when individuals had been exposed to a minimal amount of training which suggests that any amount of fire safety training is beneficial to enhance the level of fire safety knowledge. This finding is similar to that of DiGuseppi *et al.* (2002), Mallonee *et al.* (1996) and the NFPA (2000, 2002) reports that also indicated that fire safety training enables individuals to take more precautions to prevent a fire.

The present findings also demonstrate that individuals with a higher level of fire safety knowledge were more aware of fire safety precautionary measures such as the importance of smoke alarm installation and maintenance in the home. Similarly, McConnel *et al.* (1996) and Satyen *et al.* (2003) found that an increased level of fire safety knowledge enables individuals to be more cautious about unsafe behaviours and more aware of the importance of the use of fire blankets and fire extinguishers.

In relation to owning fire safety equipment, the present findings show that while almost 90 per cent of households owned a smoke alarm, only 21 per cent of households owned a fire extinguisher and 14 per cent owned a fire blanket. These findings suggest that people are not aware of the importance of possessing important life saving equipment. The study also found that people were not aware of the importance of using multiple fire safety equipment especially fire extinguishers and fire blankets. This finding elucidates the importance of making people aware of the importance of owning fire safety equipment and also training them to appropriately use them. An MMFB (2001) report also found that even when people owned multiple fire safety equipment, they were not

confident in using them during a fire. Overall, the present findings suggest that provision of fire safety training would be beneficial in improving a range of fire safe behaviours.

The findings in relation to the second hypothesis showed that people who had been exposed to fire safety training would respond more accurately to a fire: that is., they would make more rational and appropriate decisions at a time of urgency and danger. This finding is similar to that of Brennan (1999) and the NCIPC (1998) report, which also demonstrated that fire safety training is necessary to respond safely to a fire. The present study also found that people who had previously been exposed to fire safety training were more likely to warn others and evacuate the burning building during a fire incident. This finding could be explained through the naturalistic decision making theory which states that being exposed to fire safety training enables individuals to better assess the situation and accurately interpret the information in the environment (Driskell & Salas, 1996). Thus exposure to fire safety training would enable individuals to accurately assess a fire situation and choose appropriate responses such as warning others or immediately evacuating from the burning building.

The findings of the present study provided partial support to the third hypothesis as they demonstrate age differences in the accuracy of response to a fire but no such differences in their level of fire safety knowledge. People from all age groups were well informed about the causes of a fire and how it could be prevented – for example, through a smoke alarm installation. Similarly, people from all age groups were aware of the emergency phone number and the safest and most efficient path to exit from the third floor of a building in a fire situation. These findings suggest that young, middle-aged, and older people have a similar level of fire safety knowledge, which are in contrast with previous research showing younger and older individuals to have a decreased knowledge about fire safety compared to their middle-aged counterparts (Brennan, 1999; CFA & MFB, 1999; NCIPC, 1998; NFPA, 2000). However, the present findings could be interpreted in light of the improved training programs that are currently conducted by the fire authorities (for example, the MMFB) to educate people of all age groups, especially the younger and older people through the ‘Fire Ed’ program for children and the ‘Retire Ed’ program for elderly individuals. The finding suggests that proactive action could be a strong influential factor in improving the community’s level of fire safety knowledge.

The findings of the present study demonstrated that younger and older people were less able to respond accurately to a fire. For example, younger and older adults were less aware of the actions to be taken, that is, to stop, drop, and roll, if their clothes caught on fire. These findings are consistent with earlier studies (Brennan, 1999; NCIPC, 1998) that showed that



younger and older adults are less capable of responding appropriately as opposed to middle-aged adults. The findings suggest that in spite of having a good level of fire safety knowledge, younger and older people have a reduced ability to respond accurately in the event of a fire, which could be due to their limited cognitive capacity, information processing ability, and ability to conceptualise information correctly (Kose, 1999; Satyen *et al.*, 2003; Sternberg, 2001). Furthermore, certain characteristics of elderly individuals such as a reduction in their activity levels may impact on their ability to safely escape from a fire (Kose, 1999).

The present study was confined only to participants who had not been involved in a fire and their responses to the questions could be different to people who had actually been involved in a fire. Thus caution should be maintained in interpreting the findings as people may believe they would respond in a particular way, however, their actual response in a fire might be different. However, this limitation does not preclude the finding in relation to the importance of fire safety training to assist people to deal with a fire more accurately. Thus, any proactive action taken by the fire and other authorities could improve the community's preparedness to deal with a fire more accurately, ultimately minimising the number of fire-related injuries and deaths.

Overall, the present findings suggest that provision of fire safety training would be beneficial in improving a range of fire safe behaviours. They also indicate that exposure to fire safety training would enable individuals to accurately evaluate a fire situation and choose an appropriate course of action. The findings in relation to older age groups not being able to accurately respond during a fire imply that special fire safety training programs matched with their cognitive and physical capabilities need to be developed for this part of the population so that information can be more effectively imparted.

It is recommended that fire safety training be incorporated as part of health improvement programs. Future studies could investigate the relationship between fire safety knowledge and peoples' actual response in a fire. Furthermore, the whole area of fire safety in general and the application of such research to public safety needs to be advanced. Ultimately, the public needs to be educated about the importance of fire safety so that they could prevent a fire or respond appropriately if a fire were to occur.

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