"Deep Survival": Experiences of some who lived when they might have died in the 7 February 2009 bushfires.

Jim McLennan, Mary Omodei, Glenn Elliott, & Alina Holgate examine how and why some people survived extreme conditions during the Black Saturday Victorian bushfires.

ABSTRACT

As a result of the 7 February 2009 ('Black Saturday') bushfires, 173 Victorians perished in Australia's worst bushfire disaster to date. In the aftermath, attention has been focused largely on these fatalities. We argue that important lessons can also be learned from the experiences of those who did not perish, but lived despite being on the margin of survivability during the extreme conditions. Transcripts of 301 interviews with survivors, conducted by members of the Bushfire CRC Taskforce for the 2009 Victorian Bushfires Royal Commission, were re-examined. It was judged that 33 of those interviewed survived conditions so adverse that they might well have died. It was concluded, tentatively, that the major contributor to "deep survival" by the majority of these interviewees was that they were able to maintain their mental focus on acting in such a way as to maximize their chances of surviving the extreme environment. Analysis of the interview transcripts suggests that in spite of physical distress and the pressing danger of their situation, they: (a) retained control over fear; and (b) maintained their attentional focus on the major threats to life and the implications of these threats for actions. Ⓡ

Introduction

Historically, Australian communities have proved vulnerable to four kinds of natural disasters: tropical cyclones, severe storms, floods, and bushfires. Of these, bushfires have accounted for the most fatalities (Ellis, Kanowski, & Whelan, 2004). From 1900 to 2008, bushfires caused 552 recorded civilian deaths (Haynes, Tibbits, Coates, Ganewatta, Handmer, & McAneney, 2008).

On 7 February 2009, 'Black Saturday', several large fires broke out across Victoria. Weather conditions on the day were extreme, with temperatures above 45 degrees Celsius, very low relative humidities ($\leftarrow$10%), and very strong winds ($\rightarrow$100 kph in many locations). These conditions followed an extended period of high temperatures, and a decade of drought.

A total of 173 people died as a result of the fires, and more than 2,000 homes were destroyed. Three fires were especially destructive (2009 Victorian Bushfires Royal Commission, 2009): the Kilmore East Fire (119 fatalities), the Murrindindi Fire (40 fatalities), and the Churchill Fire (11 fatalities). In their review of fatalities from the February 7 2009 bushfires for the Victorian Bushfires Royal Commission, Handmer, O'Neil, and Killalea (2010) concluded that:

> ...30% of fatalities showed some evidence of fire fighting defence in the lead up to their deaths (5% active defence, 25% some or questionable defence)....There is also evidence...that many of the fatalities were 'waiting and seeing' before deciding what to do. From the evidence, it appears that at least 26% of fatalities fall into this category, waiting for a trigger – although it is rarely clear what this trigger might be – before making a decision and taking action. This delay meant that their options became very limited....A majority of fatalities were sheltering and not undertaking defensive action at the time of, and possibly in the lead up to, their deaths. There is evidence that 69% of fatalities were sheltering. Shelter was sought in a variety of locations.

> ... There was considerable evidence of sheltering in bathrooms as that was the location of 27% of fatalities...In some cases, this was a last minute decision as the fire encroached, but in others it appeared to form part of their intentions and in a few cases, of a fire plan. (pp. 23, 25)

The analysis reported by Handmer et al. (2010) sheds light on the circumstances of fatalities. However, we propose that in order to form a comprehensive understanding of bushfire survival-related decision making and actions (including those of the aforementioned fatalities), it is also necessary to

examine the circumstances in which many people survived despite exposure to potentially lethal environments.

There is rich anecdotal material on surviving disasters—both natural and man-made—including a popular 2006 BBC Discovery Channel TV series, *Surviving Disaster*, which featured interviews with survivors of several late-20th century disasters. However, there is little by way of systematic investigation, with the exception of Leach's (1994) *Survival Psychology*. Gonzales' (2004) book *Deep survival: Who lives, who dies, and why* presents numerous accounts of survival, and endeavours to link the lessons from these with emerging knowledge about brain functioning, thinking and feeling. While he offers several lessons and principles for avoiding trouble in the first place (pp. 263-269), and surviving it when it comes (pp. 270-274), he gives central place to the role—both positive and negative—of **fear**, and its **control**. Similar themes are discussed in two other recent popular books about surviving extreme hazards: by Ripley (2008) and Wise (2009). Following the 'Black Saturday' fires, initial media reports of survivors' experiences resembled in many ways the accounts of survival described by Gonzales, Ripley, and Wise.

We decided to investigate systematically the reported experiences of a group of survivors of the 'Black Saturday' fires to see if we could identify specific aspects of their psychological processes and actions which contributed to surviving the potentially lethal environments generated by that extreme bushfire event. We were guided in our investigation by previous findings reported in the extensive stress and human performance research literature, including reviews by Kavanagh (2005), Leach (2004), and Staal (2004).

Immediately following 7 February 2009, the Bushfire Cooperative Research Centre commissioned a Task Force to investigate the fires. An important aspect of this was interviewing a cross-section of survivors. Overall, more than 600 interviews were conducted. Because of the damage to infrastructure and the large number of people who were displaced it was not possible to construct a random sample of residents to interview. Interviews were conducted at properties where people were present on those days in which Task Force teams were in the area. However, the total interview sample covered a range of locations, communities, property types, household compositions, fire intensities, and outcomes. The interviews were recorded digitally, and subsequently transcribed. A detailed description of procedures is in Whittaker, McLennan, Elliott, Gilbert, Handmer, Haynes and Cowlishaw (2009). A sample of 301 transcripts was selected by a Task Force analysis group, covering all the major fires on Black Saturday. These were analysed using the NVivo8 text analysis software program to investigate survivors' bushfire planning, preparation, intentions, warnings received, and actions, as a basis for a report to the Victorian Bushfires Royal Commission (Whittaker et al., 2009).

For the present study, the transcripts were re-examined, and a subset of 33 identified in which the interviewees had survived a potentially fatal situation. These transcripts were then re-analysed to investigate interviewees' survival-related experiences, judgements, decisions, and actions. In the remainder of the paper, we summarise the analysis procedures, describe the findings, and discuss implications.

Method

Participants

Those whose transcripts were selected for re-analysis were 29 men (88%) and 4 women (12%). Their mean age was 46 years, and ages ranged from 34 to 68 years. Twenty three survived the Kilmore East Fire, six survived the Murrindindi Fire, and four survived the Churchill Fire. The participants included more men in comparison with the larger sample of 301 survivors (men, 67%; women 33%). This is probably because women were more likely to have left safely (often with children) before impact of the fire, while men were more likely to choose to stay and defend their property (see McLennan & Elliott, 2010). The average age of participants was considerably less than that of the larger sample of survivors (61 years) from which they selected.

Materials and procedure

A Bushfire Threat Rating Scale was developed to assess the level of danger experienced by interviewees. The scale has eight levels: none (0); minimal (1); low (2); moderate (3); significant (4); serious (5); severe (6); extreme (7). Each level has a behavioural description: for example, severe = 'Interviewee (and companions) were not injured (or only minor) but: the house they were defending was damaged or destroyed and they had to shelter at some stage; or the vehicle in which they were escaping/sheltering sustained fire related damage or other impact damage'; extreme = 'Interviewee injured or otherwise seriously affected physically; or companion(s) in the incident perished or were injured or were otherwise seriously affected physically'. The scale has been found to generate reliable threat ratings, with an inter-rater reliability of r = .89 (McLennan & Elliott, 2010).

The 301 transcripts used in the original analysis described in the Introduction were assessed using the Bushfire Threat Rating Scale and 33 were identified by two independent raters as involving either extreme, or severe threat. These transcripts were then re-analysed using the NVivo8 text management software to examine interviewees' survival-related experiences, with particular attention given to how interviewees managed their feelings as they responded to the unfolding threats.

A preliminary analysis of six randomly selected transcripts suggested that seven aspects of the interviewees' experiences were associated with their survival in a potentially lethal bushfire environment. These experience categories are described in Table 1.

Table 1. Survival-related Experiences of the 33 Survivors.		
Experience Category	Number & % reporting	Examples
Expectations negated	33; 100%	"A wall of darkness and hot embers at a thousand mile an hour came rushing at us"
Focus on personal survival	29; 88%	"I just put my head down and my arse up and started filling buckets"
Awareness of threat plus fear regulation	31; 94%	"I just felt that the situation I was in I had a good chance; even if I didn't save the place, that I'd still survive the fire"
Controlled attentional focus	31; 94%	" I had about 30 small fires happening and they were all happening at the same time, so I was sort of working-out which ones were the most important to put out, prioritise which fire was more important because they were getting bigger, getting harder to put out"
Actions knowledge-driven	30; 91%	"And I know what it takes, you have got to be very level-headed and you have got to be very conservative in your energy. You just keep going, don't run, don't do anything silly"
Actions systematic	27; 82%	"By this stage we've abandoned the kitchen, we're retreating to these two bedrooms. We had no idea what was (happening) in that room over there, and that door (there) we knew was our last escape, right."
Adapted actions to changed situation	31; 94%	"B_____ was sort of collapsed on the couch and saying 'I can't do anything'. And I said 'Yes you can, just stay here and tell me if you see or hear a window break or if you see smoke (coming) under a door. Just tell me and we'll deal with it'".

A coding guide was constructed, and all 33 transcripts were then assessed by two independent coders.

A coding system developed by McLennan and Elliott (2010) and used in their analysis of the impact of the Murrindindi Fire on residents of Marysville, Narbethong, Buxton, and environs was used by the coders to also assess interviewees' levels of preparation and alertness on the day. In the original interviews, survivors were asked to describe the nature of their preparation for either property defence or for safe early evacuation, and to describe the steps they took on the day to monitor possible threat from a bushfire. The coders used behavioural criteria to assign a rating (0-5) for level of preparation and for level of alertness. For example, preparation Level 4 = ' at least four substantial preparation actions, which must include both a power source and a water supply independent of mains'; alertness Level 4 = ' frequent regular monitoring and checking of at least two official information sources, and for visual signs of fire, plus active searching for current information such as use of the telephone or the internet'. The decision-wise agreement rate for all the nine coding categories across the 33 transcripts was high: 286/297 = 96%. Disagreements were resolved by joint re-examination of the transcripts in question, and discussion to reach agreement.

Results and discussion

Nine (27%) of the interviewees survived extreme threats; the remaining 24 (73%) survived severe threats. Most (29, 88%) planned to defend their home, though the apparent strength of commitment to such a plan varied, with some (4, 12%) intending to 'wait and see' before committing definitely. Three (9%) planned to leave if threatened, but the speed of advance of the fire, coupled with the absence of warnings, meant that they found themselves unable to leave safely and were forced to defend their house as a means of protecting their lives. All but one interviewee said that the speed of advance of the fire, coupled with the absence of warnings, compromised last minute preparations to defend, or to leave. Thirty two (97%) made at least an initial attempt to defend their property: 22 (67%) were successful, 10 (30%) were unsuccessful and had to seek last resort shelter either on the site or elsewhere. Table 1 summarises interviewees' survival-related experiences.

The majority of the interviewees (22, 67%) were well prepared (Level 4); 5 (15%) were moderately well prepared (Level 3); and 6 (18%) had undertaken little or no preparation. Most (25, 76%) were very alert (Level 4) for danger on the day; 5 (15%) were reasonably alert (Level 3); and 3 (9%) evidenced a low level of alertness. Overall, the levels of preparation and alertness

by these survivors appeared to be higher than the levels evidenced by the majority of those whose transcripts were analysed by Whittaker et al. (2009), when interview transcripts were selected randomly regardless of threat level: Whittaker et al. describe a very wide spread of preparation actions and checking on bushfire threat. This supports a conclusion (albeit tentative) that should the current sample not have engaged in such greater preparation and alertness some may have succumbed to the threats.

All described an experience of having their expectations dramatically negated: for 21 (64%) it was the intensity and speed of the fire's impact; for 10 (30%) it was the sudden failure of vital firefighting equipment (e.g., a petrol-driven pump stopping) or a failure of an aspect of the house construction (e.g., a portion of the roof being blown off by the wind); one person's escape route was blocked by a fallen tree; another was devastated when his companion collapsed—he thought she was about to die. For most, the experience resembled the 'collapse of sensemaking' described by Weick (1993, p. 637): "...the process of a cosmology episode, an interlude in which the orderliness of the universe is called into question because both understanding and procedures for sensemaking collapse altogether". Four interviewees gave no indication that they focussed rationally on personal survival: two simply fled in vehicles when their homes were dramatically engulfed in flames; one left his home precipitately just after the fire struck, drove around aimlessly in hazardous conditions, and returned to successfully defend his house; another focussed so intensely on saving his house that he had to be dissuaded by others from continuing to put his life in jeopardy.

For most of these interviewees, down-regulating fear and controlling attentional focus so that their actions were linked closely to surviving in a potentially lethal environment were associated with their survival. In practice, this meant that they behaved so as to minimize their exposure to radiant heat and embers, and they did not remain in smoke-logged buildings to perish because of toxic gases (such as carbon monoxide), in spite of the evident danger and physical discomfort or psychological distress. Almost all (31, 94%) reported having to change their intended actions in response to a dramatic deterioration in their circumstances (equipment failure; failure of an aspect of house construction; injury or incapacitation of a member of the household). About one third (12, 36%) described a link between fear regulation and attentional control: "We just got stuck into what we had to do. So when I opened the door I thought 'This is probably dangerous, because there is only one (other) door further around to get out again', but it had to be done". This resembles Koole's (2009) proposed goal-oriented effortful distraction emotion-regulation strategy. The mental mechanisms through which inadequately regulated fear degrades survival-related judgements are not well understood, although the stress and human performance literature suggests that under conditions of very high stress: (a) individuals may narrow their field of attention so that important environmental cues are not noticed (Staal, 2004); (b) working memory

Two of the four interviewees simply fled when their homes were engulfed in flames saying they did not focus rationally on personal survival.

Photo: Alina Holgate

capacity can be reduced and retrieval of rule-based survival enhancing knowledge can be impaired (Leach & Ansell, 2008; Leach & Griffith, 2008); (c) physical tasks may take longer to complete and mistakes may become more likely (Idzikowski & Baddeley, 1983); and (d) judgement and decision making may become rigid and narrow, resulting in failure to adapt to changing circumstances (Keinan, 1987).

Concluding discussion

Before discussing possible implications, limitations of the study need to be acknowledged. The findings should be regarded as suggestive, because the study was largely descriptive: there was insufficient information available at the time of writing to enable meaningful comparative analyses to be undertaken. It should also be remembered that peoples' perceptions and recollections were the source of the data. Bushfire threat and survival depend on many factors, including fire intensity, wind direction and strength, fuel load, vegetation, slope, and building construction characteristics. These were taken into account only indirectly through participants' reports. Undoubtedly, chance and luck also play a role.

When read in conjunction with Handmer et al.'s (2010) report about fatalities resulting from the 7 February 2009 fires, four tentative conclusions about bushfire survival can be drawn from the above findings. The first is that more attention needs to be given to developing effective approaches to psychological preparation, alongside physical preparation of properties, to assist those who choose to prepare and defend their home against bushfire attack. In this regard, the Australian Psychological Society's Disasters resource kit provides useful information (APS, 2010). Second, households who may, for whatever reason, end-up having to defend their home against a bushfire, whether as planned or not, need more effective instruction about vulnerabilities: how firefighting equipment can fail; how building structures can fail; and how human effort can fail—because of panic, distraction, fatigue, injury or incapacitation. Third, there is probably value in more effectively educating members of at-risk communities, as well as the public at large, about the specifics of the hazardous nature of bushfires—especially the reason most individuals actually die as a consequence of a bushfire: namely, through rapid rise in core body temperature (hyperthermia) as a result of the impact of radiant heat on the body; or poisoning by toxic gases in rooms and other confined spaces. Finally, more effective community education about general preparation of a property for bushfires may have secondary benefits, namely sensitizing households in at-risk communities to important issues involved in surviving the impact of a bushfire, should they have to do so.

The final report of the Bushfires Royal Commission (2009 Victorian Bushfires Royal Commission, 2010) has stimulated much discussion among members of the fire and emergency services sector about possible policy changes in relation to community bushfire safety: namely, introducing some version of targeted community warning and evacuation procedures so that the primary strategy for community protection becomes one of removing people from threatened locations. Any such blanket approach may have unintended negative consequences. Notably, reducing the overall level of community knowledge and understanding about how to survive bushfires if entrapped, as a consequence of a possible over-emphasis on simply being somewhere else when a bushfire occurs—there seems an uncomfortable similarity to a 'just say no' approach to sex education! Fire and emergency services agencies may be at-risk of promising, inadvertently, more safety than they can deliver: it is unlikely that any warning or evacuation system will work perfectly during every future extreme bushfire under conditions similar to those of 7 February 2009.

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References

2009 Victorian Bushfires Royal Commission, 2009, *2009 Victorian Bushfires Royal Commission interim report. Government Printer for the State of Victoria, Melbourne.*

2009 Victorian Bushfires Royal Commission, 2010, *2009 Victorian Bushfires Royal Commission final report. Government Printer for the State of Victoria, Melbourne.*

APS (2010). *Disasters - Bushfire psychological preparation and recovery: http://www.psychology.org.au/community/ topics/bushfire/*

Ellis, S., Kanowski, P., and Whelan, R., 2004, *National inquiry into bushfire mitigation and management. Council of Australian Governments, Commonwealth of Australia, Canberra.*

Gonzales, L., 2004, *Deep survival: Who lives, who dies, and why. W. W. Norton & Company, New York.*

Handmer, J., O'Neil, S., & Killalea, D., 2010, *Review of fatalities in the February 7, 2009, bushfires. Centre For Risk and Community Safety, RMIT University and Bushfire CRC, Melbourne.*

Haynes, K., Tibbits, A., Coates, L., Ganewatta, G., Handmer, J., & McAneney, J., 2008, *100 years of Australian civilian bushfire fatalities: Exploring the trends in relation to 'stay or go' policy. Report for the Bushfire CRC. Risk Frontiers, Macquarie University, and Centre for Risk and Community Safety, RMIT University, Melbourne.*

Idzikowski, C. & Badderley, A. D., 1983, *Fear and dangerous environments. In R. Hockey (Ed.) Stress and Fatigue in Human Performance (pp. 123-144). Wiley, Chichester, NY.*

Kavanagh, J., 2005, *Stress and performance: A review of the literature and its applicability to the military. Technical Report 192. RAND Corporation, Santa Monica, CA.*

Keinan, G., 1987, *Decision making under stress; Scanning of alternatives under controllable and uncontrollable threats. Journal of Personality and Social Psychology, Vol.52, No. 3, pp. 639-644.*

Koole, S. L., 2009, *The psychology of emotion regulation: An integrative review. Cognition and Emotion, Vol. 23, No. 1, pp. 4-41.*

Leach, J., 1994, *Survival Psychology. Macmillan Press, London.*

Leach, J., 2004, *Why people freeze in an emergency: Temporal and cognitive constraints on survival responses. Aviation, Space, and Emergency Medicine, Vol. 75, No. 6, pp. 539-542.*

Leach, J. & Ansell, L., 2008, *Impairment in attentional processing in a field environment. Applied Cognitive Psychology, Vol. 22, No. 5,pp. 643-652.*

Leach, J. & Griffith, R., 2008, *Restrictions in working memory capacity during parachuting: A possible cause of 'no pull' fatalities. Applied Cognitive Psychology, Vol. 22, No. 2, pp. 147-157.*

McLennan, J., & Elliott, G., 2010, *Community members' decision making under the stress of imminent bushfire threat – Murrindindi Fire. Bushfire CRC Extension Community Decision Making Under Stress Project. School of Psychological Science, La Trobe University, Melbourne. (available from j.mclennan@latrobe.edu.au)*

Ripley, A., 2008, *The unthinkable: Who survives when disaster strikes and why. Crown Publishers, New York.*

Staal, M., 2004, *Stress, cognition, and human performance: A literature review and conceptual framework. NASA/TM—2004—212824, Ames Research Centre, Moffett Field, CA.*

Weick, K. E., 1993, *The collapse of sensemaking in organisations: The Mann Gulch disaster. Administrative Science Quarterly, Vol. 38, No. 4 ,pp. 628-652.*

Whittaker, J. , McLennan, J., Elliott, G., Gilbert, J., Handmer, J., Haynes, K., & Cowlishaw, S., 2009, *Human behaviour and community safety. Victorian 2009 Bushfire Research Response Final Report October 2009, Melbourne: Bushfire Cooperative Research Centre.*

Wise, J., 2009, *Extreme fear: The science of your mind in danger. Palgrave Macmillan, New York.*

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