

EMERGENCY WARNING MESSAGES: DO COLOURS AND ICONS IMPROVE COMMUNITY READINESS TO ACT?

ABOUT THIS PROJECT

This is the third of three concurrent *Hazard Notes* for the Bushfire and Natural Hazards CRC project, [Creating effective multi-channel communication during disaster response and recovery](#), conducted as part of the Communication and Warnings cluster. This research adopts a multi-hazards approach to examine the effectiveness of response and recovery communication in communities affected by natural hazards. It applies well-established risk communications and psychological theory of human behaviour to determine whether existing emergency messages could be revised to improve comprehension.

This *Hazard Note* explores whether colours and icons help to encourage action during emergencies. *Hazard Note 79* outlines opportunities for emergency services to

improve their communication and messaging. *Hazard Note 80* details which types of specific messages encourage community readiness.

AUTHORS

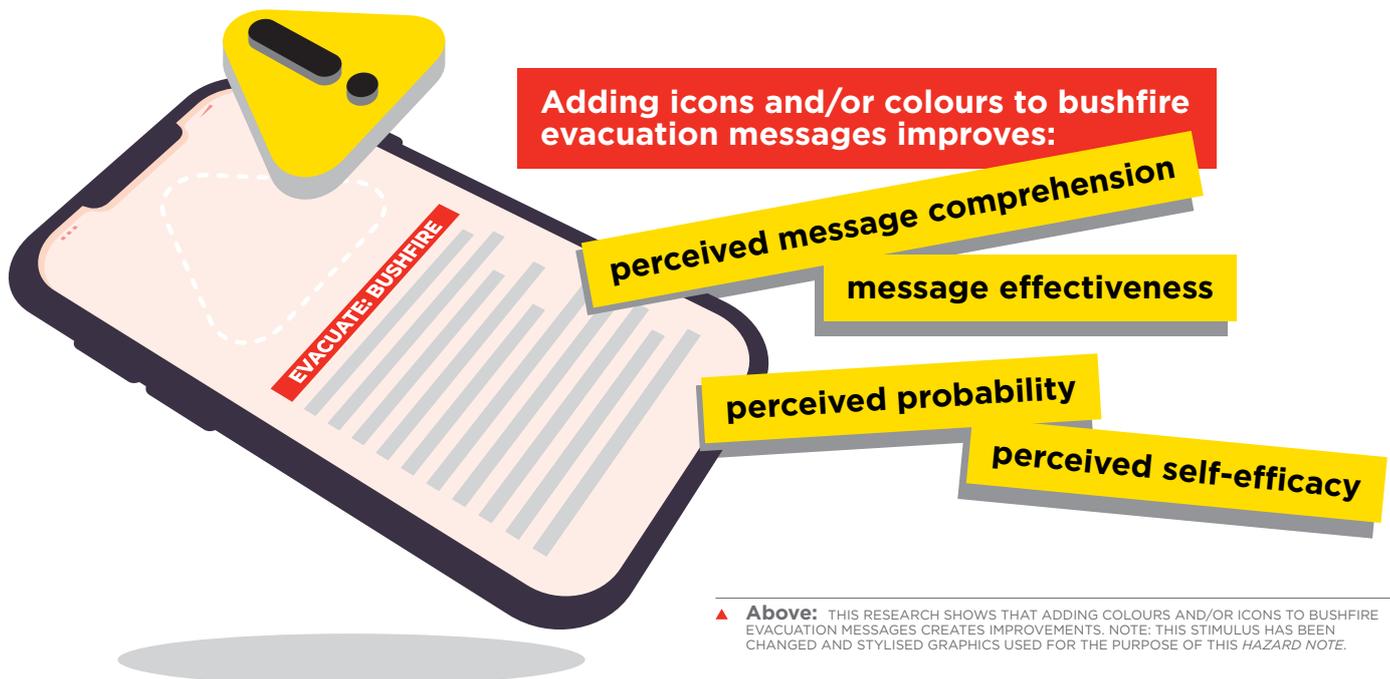
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SUMMARY

Current Australian emergency warning messages, that have been refined to match evidence-based practice, strongly encourage community members' readiness to act on emergency instructions (see *Hazard Note 80*). Assuming that the written elements of warning messages are already optimised to encourage readiness to act, this research draws on a socio-psychological model of

precautionary adaption to examine the effect of adding icons and/or colours to official warnings for bushfire and flood.

The results show that adding colours and/or icons to a bushfire evacuation message creates improvements, albeit small ones, in perceived message comprehension, message effectiveness, perceived probability and perceived self-efficacy. Messages for riverine floods, as well as preparatory bushfire messages, showed no change in message comprehension, effectiveness, threat appraisal, or coping appraisal as a result of adding colours and/or icons. However, as these message design elements increase rapid recognition of a hazard warning and encourage protective action, these redundant message elements may aid interpretation of more poorly worded emergency warning messages in times of stress.



CONTEXT

Since 2014, emergency service agencies across Australia have adopted a range of evidence-based practice when constructing emergency warning messages. As the written elements of warning messages are working well to encourage readiness to act (Greer et al. 2019; see *Hazard Note 80*), this research examines the effect of adding colour and/or icons to official warning messages.

BACKGROUND

Emergency warning messages aim to capture attention, aid understanding and communicate risk. Both national and international bodies (e.g. the International Organization for Standardization; ISO) have developed generic warning design guidelines that incorporate elements such as colour (e.g. red, orange), icons (e.g. pictures) and signal words (e.g. WARNING) to increase the salience of a warning (Wogalter et al. 2015; Wogalter et al. 2006). These design elements are intended to improve community safety through rapid recognition of the hazard warning (Wogalter et al. 2015; Wogalter et al. 2006) and encourage appropriate protective actions to be taken (Braun & Silver 1995).

Examining the impact of adding colours and/or icons to Australian warning messages for natural hazards is critical because these design elements are (i) ubiquitous in society, (ii) powerful ways to communicate and aid the interpretation of warning information, and (iii) may be proposed as part of a national multi-hazard warning system in Australia.

This research draws on a socio-psychological model of precautionary adaption (Grothmann & Reusswig 2006) underpinned by Protective Motivation Theory (PMT; Rogers 1975, 1983; Rogers & Prentice-

Dunn 1997) to investigate whether adding colours and/or icons to emergency warning messages encourages even higher levels of readiness to act on emergency instructions.

BUSHFIRE AND NATURAL HAZARDS CRC RESEARCH

To examine whether current emergency warning messages can be further optimised with colours and/or icons to encourage community members' readiness to act on emergency instructions, researchers conducted a survey of 2,482 Australians living across all states and territories during November 2019. Participants read one of 16 mock emergency warnings (see Figure 2, page four), about either a bushfire or a riverine flood, that were variously presented without icons, with icons, in greyscale and in colour (see Figure 1, page three).

The 16 mock emergency warnings comprised variations of a *Prepare to Evacuate (Bushfire)* message, a *Prepare to Evacuate (Flood)* message, an *Evacuate Now (Bushfire)* message, and an *Evacuate Now (Flood)* message. Messages contained either a grey header strip only, a coloured header strip only, a grey header strip and hazard icon, or a coloured header strip and hazard icon. The *Prepare to Evacuate* messages contained orange header strips and icons, while the *Evacuate Now* messages contained red header strips and icons. The icons, which depicted a flame or flooded house, were developed for this research.

Mock emergency warnings not attributed to any particular emergency service were developed using examples of real emergency warnings issued by emergency services to improve realism and maximise the usefulness of the findings. Sample warnings were provided by Country Fire Service (SA), Department of Fire and Emergency Services

(WA), Metropolitan Fire Brigade (VIC, now Fire and Rescue Victoria), Metropolitan Fire Service (SA), NSW State Emergency Service (SES), Tasmania SES, Victoria SES, and Queensland Fire and Emergency Services.

The survey captured each participant's demographic characteristics, message comprehension and effectiveness, threat appraisal (i.e. perceived probability and severity of event) and coping appraisal (i.e. perceived self-efficacy, protective response efficacy and protective response cost). Data were analysed using two-way between-groups analyses of variance (ANOVAs).

RESEARCH FINDINGS

The results show that adding colours and/or icons to the *Evacuate Now (Bushfire)* message creates small improvements in perceived message comprehension, perceived message effectiveness, perceived probability and perceived self-efficacy. This is perhaps unsurprising given that this message is likely considered the most 'threatening' of the set. While these improvements are small from a statistical standpoint, the effect small changes can have at a population level are likely impactful, especially when message improvements can save lives, properties and reduce harm. The other three types of messages [*Prepare to Evacuate (Bushfire)*, *Prepare to Evacuate (Flood)* and *Evacuate Now (Flood)*] showed no change in message comprehension, effectiveness, threat appraisal or coping appraisal as a result of adding colours and/or icons.

The results highlight three key findings:

First, they demonstrate that a red header serves as a significant cue to assist community members to perceive, interpret and respond to warning messages appropriately. The red header increases the perceived probability that the recipient will be exposed to the hazard, but also increases their perception of their own ability to cope with the event. This finding aligns with previous research that shows that red-danger pairings obtain the highest hazard risk ratings (e.g. Braun & Silver 1995; Chapanis 1994; Ng & Chan, 2018). Interestingly, adding orange headers to the *Prepare to Evacuate (Flood or Bushfire)* messages does not result in any significant change in message comprehension, effectiveness, threat appraisal or coping appraisal. This may be because the colour is a redundant cue at this level of threat.

Second, the results demonstrate that the communicative role of icons in warning

END-USER STATEMENT

"As QFES implements evidence-based emergency warning message design, it is important to understand how community members perceive and respond to updated warning messages. This research by Greer, Dootson, Miller and Tippett provides several findings that affirm our current practice and provide some direction for the future.

"Firstly, it is useful to know that warning messages similar to ours are perceived to be highly comprehensible and effective. We will continue to include instructions to the community that they perceive to be easily undertaken, protective, and low in cost (i.e., time, money and effort).

"Secondly, it is valuable to understand the impact of warning colours and icons on how community members interpret warning messages. Looking ahead, QFES will draw on this research and use colour more prominently to enforce warning levels and severity. Our messages will continue to be reviewed in light of these findings to continue encouraging protective action in the community."

Hayley Gillespie (Executive Manager, Media), Queensland Fire and Emergency Services

messages is less clear. Although icons can be used to clarify, illustrate and supplement written information, they did not appear to create any significant change in message comprehension, effectiveness, threat appraisal or coping appraisal, with one exception. In the *Evacuate Now (Bushfire)* message, risk probability was perceived differently when colour and icons were combined. When this message was presented in greyscale, the addition of an icon reduced the perceived probability that the recipient would be affected by the event. This result suggests that deeper investigation is needed into the role that icons play in signalling risk probability when they are not presented in colour.

Finally, these research findings highlight an interesting future research opportunity to investigate the impact of colour and/or icons on less optimised messages. Although colour and/or icons appear to have little impact on optimal warning messages, they might be more useful to aid interpretation of more poorly worded emergency warning messages if they reduce uncertainty. In conclusion, the results show that adding colours and coloured icons to a bushfire evacuation message creates improvements, albeit small ones, in perceived message

comprehension, message effectiveness, perceived probability and perceived self-efficacy. However, messages for riverine floods, as well as preparatory bushfire messages, showed no change in message comprehension, effectiveness, threat appraisal or coping appraisal as a result of adding colours and/or icons. However, as these message design elements increase rapid recognition of a hazard warning and encourage protective action, these redundant message elements may aid interpretation of more poorly worded emergency warning messages in times of stress.

HOW IS THE RESEARCH BEING USED?

By adopting current evidence-based practice, Australian emergency service agencies have created effective emergency warnings that encourage readiness to act and may be incrementally improved with colour and icons. This research complements the increasing industry interest in developing a national multi-hazard warning system, including colours and icons, that can promote clear understanding of warnings and appropriate protective action across Australia.

PREPARE TO EVACUATE



▲ Figure 1: EXAMPLE MOCK WARNING GRAPHICS, IN COLOUR.

FURTHER READING

Dootson P, Greer D, Tippett V & Miller S (2020) Addressing conflicting cues during natural hazards: lessons from emergency agencies, *Hazard Note 72*, Bushfire and Natural Hazards CRC, Melbourne, available at www.bnhcrc.com.au/hazardnotes/72

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Emergency Management Victoria (2014) National review of warnings and information: final report, Victorian Government, Melbourne, Cube Group, available at knowledge.aidr.org.au/media/5659/national-review-warnings-information-final-report-anzemc-endorsed.pdf

Greer DA, Dootson P, Miller SA & Tippett V (2019) Do current emergency warning messages encourage readiness to act?, poster, Bushfire and Natural Hazards CRC, Melbourne.

Greer D, Dootson P, Mehta A & Tippett V (2020) Emergency warning messages: how do community members comprehend them?, *Hazard Note 79*, Bushfire and Natural Hazards CRC, Melbourne, available at www.bnhcrc.com.au/hazardnotes/79.

Greer D, Dootson P, Miller S & Tippett V (2020) Emergency warnings messages: encouraging community readiness to act, *Hazard Note 80*, Bushfire and Natural Hazards CRC, Melbourne, available at www.bnhcrc.com.au/hazardnotes/80.

Grothmann T & Reusswig F (2006) People at risk of flooding: why some residents take precautionary action while others do not, *Natural Hazards*, 38, pp.101-120, DOI: 10.1007/s11069-005-8604-6.

Prentice-Dunn S & Rogers RW (1986) Protection Motivation Theory and preventive health: beyond the Health Belief Model, *Health Education Research: Theory and Practice*, 1(3), pp.153-161.

Rogers, RW (1983) Cognitive and physiological process in fear appeals and attitude change: a revised theory of protective motivation. In Cacioppo BL & Petty LL (Eds.) *Social Psychophysiology: A Sourcebook* (pp. 153-176), London, UK: Guilford.



EVACUATE NOW

Fire services advise there is a bushfire approaching your local area.

Follow your bushfire survival plan now. If you do not have a plan, your safest option is to **leave immediately** if it is clear to do so. If you cannot leave, **identify where you will seek shelter** from the bushfire. If you are not in the area, **do not return**, as conditions are too dangerous.

Fire crews are working to contain the fire but firefighters may not be able to protect every property. You should not expect a firefighter at your door. Power, water, and mobile phone service may be lost.

People in the area will be affected by smoke, which will reduce visibility and air quality.

An evacuation centre has been opened at the local community centre.

Call Triple Zero (000) immediately if you believe you are under threat.

How to Evacuate:

- If the way is clear, leave now for a safer place.
- Check for road closures and then advise family and friends of your intended travel route.
- Put on protective clothing (e.g., a long-sleeved cotton shirt, boots with thick soles).
- Take the items you need to be away from home for three days. Include clothing, medications, important documents (e.g., passports, birth certificates), food and water, and personal care essentials like nappies.
- Secure your pets for safe transport.
- Drive with caution in low-visibility conditions.
- Drink plenty of water to stay hydrated.
- Listen to your local radio station or visit the Rural Fire Service (RFS) website for regular updates.
- If you cannot leave, you need to get ready to shelter in your home and actively defend it.
- If your home catches on fire and the conditions inside become unbearable, you need to get out and go to an area that has already been burnt.

Keep up to Date:

- Following EMS on Facebook (@EmergencyManagementService) and Twitter (@AusEMS)
- Staying tuned to your local radio station. Find your local ABC radio station at <https://radio.abc.net.au/help/offline> and your local commercial radio station at <http://www.commercialradio.com.au/find-a-station/queensland>
- Visiting the EMS website at www.emsfire.gov.au/maps
- For bushfire preparation tips, visit the EMS website at www.emsfire.gov.au/bushfiresafety
- For information about road closures, call 13 55 77 or visit www.traffic.gov.au

▲ **Figure 2:** ONE OF THE MOCK EMERGENCY WARNINGS GIVEN TO PARTICIPANTS. THIS IS THE EVACUATE NOW - BUSHFIRE WARNING.

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Hazard Notes are prepared from available research at the time of publication to encourage discussion and debate. The contents of *Hazard Notes* do not necessarily represent the views, policies, practises or positions of any of the individual agencies or organisations who are stakeholders of the Bushfire and Natural Hazards CRC.

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