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Predicting delay in residents' decisions on defending *v.* evacuating through antecedents of decision avoidance

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Abstract. In the event of a wildfire, Australian residents of wildfire-prone areas have a choice to defend their home or evacuate early. However, rather than deciding on and preparing for one of these fire-responses ahead of time, most residents delay deciding on defending *v.* evacuating (e.g. they wait and see instead). Recent research has shown that delaying this decision is associated with reduced levels of preparedness for both responses and on the day of a fire, an increased risk to life and property. The current study empirically examined what predicts this decision delay regarding one's fire-response by measuring two personality traits and several decision-related factors. A longitudinal survey study of residents of multiple wildfire-prone areas in Western Australia showed that the strongest predictor of delaying their decision to defend *v.* evacuate was a lack of difference in perceived values of defending *v.* evacuating. These findings have important implications for the design of interventions to reduce the risks associated with such delay. For one, agencies could utilise residents' value base to reduce decision delay. Alternatively, they could focus on the formation of proper contingency plans and stress the necessity to prepare well for both defending and evacuating.

Additional keywords: bushfire, community safety, decision making, delay, indecision, natural hazards, procrastination, risk mitigation, survival, wildfire.

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Introduction

Wildfires (or bushfires) are the most common natural disaster associated with Australia. They have substantial economic costs (e.g. average annual cost between 1967 and 1999 has been estimated as AU$77 million; BTE 2001). Since 1901, 552 civilians have been reported to have lost their lives in Australian bushfires (Haynes *et al.* 2010) and 173 more Victorians died in the Black Saturday bushfires of 2009 (Teague *et al.* 2010). To reduce the risk of deaths and damage during a wildfire, fire and emergency services provide support and assistance wherever possible. However, the extent to which their assistance is effective is influenced by how adequately residents have prepared themselves and their property (Llewellyn 2012). Motivating individuals in at-risk areas to prepare for wildfires is therefore an integral component in the protection of lives and property.

Australian residents of wildfire-prone areas have the choice to defend their property or evacuate in response to a fire[A] (Tibbits and Whittaker 2007; Tibbits *et al.* 2008; Llewellyn 2012). To increase successful execution of these two possible wildfire responses, Australian fire agencies encourage residents of fire-prone areas to determine, ahead of the fire season, whether they will defend or evacuate, and to properly prepare for this intended response. However, when residents are asked how they will respond to a wildfire, many indicate a delay in deciding whether to defend or evacuate until the day of the fire (Whittaker *et al.* 2010; Dunlop *et al.* 2012). This decision delay is problematic for several reasons. First, a previous study found that people who delay this decision tend to carry out fewer preparations both for defending and for evacuating compared with people who have decided on one of these concrete actions (Dunlop *et al.* 2012). Second, people who delay this decision *ahead of time* will need to spend more time deciding what to do *during* the fire. This may then lead to late evacuation. Finally, the decision is more likely to be made under duress, which is in turn linked to poorer decision quality (McLennan *et al.* 2011*a*; McLennan *et al.* 2012). Given these findings, why do so many people delay deciding on one of the two concrete fire-responses?

[A]There are some differences in Australian and North American policies about residents' response options. More specific, in certain parts of North America, residents have the option to shelter in place or evacuate, where the former conflates passive shelter and active defence (Cova *et al.* 2009).

Although past research has provided some insights on factors related to the course of action people will take *during* a fire (McLennan *et al.* 2011*b*, 2012), there has been considerably less focus on what influences people in their response decisions *before the fire event*. Further, the limited research in this area has generally relied on participants' subjective accounts of their decisions. This research has shown that people often report 'a desire for more information' as the main reason for their delay (McNeill *et al.* 2011; Dunlop *et al.* 2012). However, there are reasons to be sceptical of this explanation, because past research has found that providing more information may not solve the problem as information requests are often a symptom of decision delay rather than an actual cause of it (Rassin *et al.* 2007). Even though people are generally able to rationalise their decisions afterwards, research has shown they are not always equally capable of determining what *actually* influenced their decisions (Nisbett and Wilson 1977). Pinpointing the *actual* (as opposed to reported) causes of delay is important as different causes require different strategies to reduce delay.

Predicting decision avoidance

Past research on decision avoidance (of which delay is a subtype) has identified multiple factors that influence the likelihood of it occurring, including personality traits (e.g. Frost and Shows 1993; Bouckenooghe *et al.* 2007) and situational factors related to the decision at hand (for an overview, see Anderson 2003). Although not all factors will be applicable to all decisions, they have been shown to be capable of causing decision avoidance in many areas, including career (Osipow 1999; Germeijs and De Boeck 2003) and health choices (Harries *et al.* 2007; DeVon *et al.* 2010). In the present study, we explore five potential causes of delaying the decision on whether to defend or evacuate. Two of the five are personality factors that have been linked to both decision avoidance and a need for information, namely need for cognition (Bouckenooghe *et al.* 2007) and compulsive indecisiveness (Frost and Shows 1993). The remaining three factors are decision related and include decision relevance, selection difficulty resulting from a lack of difference in perceived values of the options (henceforth, we refer to this phenomenon as 'distinctiveness'), and responsibility avoidance (Anderson 2003). Each factor is described below.

Need for cognition

Need for cognition (NFC) is a personality trait that was first defined by Cacioppo and Petty (1982) as the tendency of an individual to engage in and enjoy thinking. Intuitively, one could expect that in situations where there is a genuine absence of information, people who are high in NFC will be more decision avoidant than people low in NFC as they cannot engage in a decision task in their preferred manner. Indeed, Bouckenooghe *et al.* (2007) developed a study to test the hypothesis that people high in NFC would procrastinate their decisions more often than those low in NFC. Unexpectedly, they found that the *high* NFC scorers were better at making decisions and procrastinated less. The authors surmised that people high in NFC are perhaps more practised at finding information they need and using this information while making decisions. Given that there are logical reasons supporting both negative and positive relationships between NFC and decision avoidance, we expected a relationship, but treated its direction as exploratory, hence:

H1. NFC is related to delaying one's decision on defending v. *evacuating*

Indecisiveness

Indecisiveness refers to the stable personality trait characterised by a general difficulty with making decisions. It is important to separate this trait from the concept of indecision, a situational concept that refers to the inability to make a specific decision or decisions within a specific domain. Although the two constructs are somewhat related (i.e. indecisive people tend to experience indecision more often), they should be treated in a distinct manner (Germeijs and De Boeck 2002). People who are high on Indecisiveness tend to worry more about making mistakes, and have lower perceptions of self-efficacy with regard to making sound decisions (Frost and Shows 1993; Rassin *et al.* 2007). They also tend to show a desire to seek out more information, yet any additional information obtained appears to be used by these individuals to confirm that they are making the right choice, rather than contributing to the decision itself (Reed 1985; Ferrari and Dovidio 2000; Rassin 2007). The decision delay might thus be the result of high Indecisiveness:

H2. Being higher in Indecisiveness increases the likelihood of delaying one's decision on defending v. *evacuating*

Decision relevance

As people have limited resources such as time and energy available to them, it makes sense to dedicate these resources only to decisions that are perceived as relevant to the decision maker, that is, the topic or outcome of the decision has value for the decision maker. If the expected value is too low, then there will be no motivation to spend resources on the decision, resulting in avoidance (Anderson 2003). In applying this logic to the selection of a fire response, one would expect that people for whom the decision on wildfire response seems less relevant will be more likely to delay it. In particular, people who do not regard wildfires as a threat would not be motivated to expend effort in any decisions related to the occurrence of a wildfire, including the decision regarding whether to defend or evacuate:

H3. A lower perceived risk of wildfire threat increases the likelihood of delaying one's decision on defending v. *evacuating*

Distinctiveness

Another decision-related factor shown to lead to decision avoidance is a lack of distinctiveness in the value attached to the preferred options (Bockenholt *et al.* 1991; Dhar 1997; Tyszka 1998; Dhar *et al.* 1999). People need to be able to justify their decision in order to feel comfortable with it (Shafir *et al.* 1993; Zeelenberg and Pieters 2007). When two options are equally attractive (i.e. they lack distinctiveness) but mutually exclusive, it becomes difficult to exclusively justify either option, thereby increasing selection difficulty and decision avoidance. Put into the context of fire-response decisions, it could well be that people delay their decision on defending *v.* evacuating because

the value they expect to receive from defending is approximately the same as the value they expect to receive from evacuating:

H4. As the difference in value that one attaches to defending v. *evacuating (i.e. distinctiveness) approaches zero, the likelihood of delaying one's decision on defending* v. *evacuating increases*

Responsibility avoidance

A third decision-related factor that has been tied to decision avoidance is responsibility avoidance. People feel more responsible for a decision's outcome if they selected the option that led to that outcome. This sense of responsibility will result in increased feelings of regret or blame if the outcome is negative. Although one might rationally argue that decision avoidance is also a choice, people tend to decouple it from responsibility for outcomes, making avoidance an effective way to reduce potential feelings of regret or blame (Kahneman and Tversky 1982; Landman 1987; Ritov and Baron 1992; Gilovich *et al.* 1995; Zeelenberg and Pieters 2007). In decisions where bad outcomes are easy to imagine (e.g. wildfires), people may thus be reluctant to commit to an option so as to avoid feeling responsible for the bad outcome. If responsibility avoidance is a motivator for delaying the decision on defending *v.* evacuating, then people who delay this decision should anticipate feeling less responsible for bad outcomes than people who anticipate responding decisively.

H5. Delaying one's decision on defending v. *evacuating is related to lower anticipated responsibility for bad outcomes resulting from a fire than committing to one or the other*

To test whether any (combinations) of these factors predict delaying the decision whether to defend or evacuate, we conducted a field study in which we measured the above predictors and asked people to indicate what they thought they would do in response to a wildfire.

Method

Procedure

Data were collected in several wildfire-prone communities in Western Australia over two time points by mail-out surveys. The main study areas were all within 180 km of the state's capital city (Perth) and represented a mix of high-density urban, medium-density peri-urban and low-density rural communities. Specifically, study areas included Gelorup, Stratham, College Grove (all to the south-west of Perth), Gidgegannup, Brigadoon, Red Hill (north-east of Perth), Roleystone and Kelmscott (south-east of Perth). The first time point (T1) was just before the fire season (October 2011), and the second (T2) was towards the end of the fire season (March 2012). We measured all variables at T1, except for Anticipated Responsibility, which was measured at T2, and Intended Fire Response, which was measured at both T1 and T2.

Participants

Researchers acquired a list of potential participants primarily from two sources. First, local government bodies in the areas south-west of Perth provided ~1350 names and addresses to the researchers. Second, 350 names and addresses were obtained through expressions of interest that were solicited following two recent fires that attracted significant media attention. Out of 1700 surveys sent out at T1, we received 350 completed responses (equalling a response rate of 20.6%), within six weeks of the initial mail out. Of the 350 participants asked to participate at T2, a total of 189 provided completed responses within six weeks of that mail out (equalling a response rate of 54%). Three of the eight fire response categories contained less than 3% of participants ($n < 5$) at both T1 and T2 (these were Responses 6–8; see Table 1) and these were excluded in subsequent analyses. The remaining 182 participants consisted of 98 males and 84 females, with an average age of 54.0 years (s.d. = 12.83, Median = 55). The majority of respondents owned the property or were in the process of buying it (95.6% at T1), 40.7% lived in a house or unit on a residential block, 56.6% on a hobby farm or small acreage, and 2.7% on a large farm or property.

Table 1. Percentage of people selecting different fire-responses

	n (%) T1	*n* (%) T2
Response 1. Stay and try to protect your property throughout the fire.	43 (22.9%)	43 (22.8%)
Response 2. Do as much as possible to protect your property but leave if the fire directly threatens it/reaches your property.	77 (41.0%)	89 (47.1%)
Response 3. Wait to see what the fire is like before deciding whether to stay and defend or leave.	36 (19.1%)	22 (11.6%)
Response 4. Wait for police, fire or other emergency services to tell you what to do on the day.	15 (8.0%)	16 (8.5%)
Response 5. Leave as soon as you know there is a fire threatening your town or suburb.	11 (5.9%)	12 (6.3%)
Response 6. You would not be at home because you intend to leave your property and stay somewhere else on days of extreme and catastrophic fire danger.	0 (0%)	2 (1.1%)
Response 7. Haven't thought about it.	4 (2.1%)	1 (0.5%)
Response 8. Other (please specify): …	2 (1.1%)	4 (2.1%)

To determine whether our sampling method yielded a representative study sample, we compared the demographic information we collected to those collected from the same suburbs by the Australian Bureau of Statistics (ABS) during the 2011 Australian Census (ABS 2011). In the more rural districts, we generally found that our study sample captured a similar age range to that portrayed by the census. In the urbanised districts, our study sample tended to be somewhat older than what would be expected if participation were truly random. Further, in all areas, our study sample captured a higher proportion of homeowners (as opposed to renters). Although the discrepancies between the demographics of our study sample and those from the census may be a sign of responder bias, it should be noted that it is common for this type of research conducted in Australia to attract an older demographic, and one that under-represents renters (e.g. Paton *et al.* 2006; Whittaker *et al.* 2010; McNeill *et al.* 2013). This is likely explained by the fact that renters, who tend to be younger than homeowners, do not have as much vested interest in protecting their homes from wildfires as do homeowners, and also may not be in a position to undertake certain preparations (e.g. installing sprinkler systems).

Measures of trait variables

Need for cognition (NFC)

The 18-item Need for Cognition scale (Cacioppo *et al.* 1984) measures individual differences in engagement and enjoyment of 'effortful cognitive endeavours'. Example items are 'I find satisfaction in deliberating hard and for long hours' and 'Thinking is not my idea of fun (R)' (1 = very strongly disagree, 9 = very strongly agree, (R) = reversed score, Cronbach's $\alpha = 0.83$).

Indecisiveness

The 15-item Indecisiveness questionnaire (Frost and Shows 1993) measures the extent to which individuals experience a general tendency to be indecisive, and negative affective reactions to decision making. Example items are 'I find it easy to make decisions (R)' and 'I become anxious when making a decision' (1 = very strongly disagree, 9 = very strongly agree, (R) = reversed score, Cronbach's $\alpha = 0.90$).

Measures of decision variables

Decision relevance

We measured the extent to which deciding on a wildfire response would be considered relevant by measuring participants' perceived likelihood and severity of a wildfire threat to their community with three items, including 'How likely is it that a fire will threaten your town or suburb in the next fire season?' (1 = definitely won't happen, 7 = definitely will happen) and 'How significant do you think the threat of bushfires is to life and property in your town or suburb?' (1 = extremely insignificant, 7 = extremely significant, Cronbach's $\alpha = 0.76$).

Distinctiveness

To measure distinctiveness, we calculated the difference in perceived value of defending *v.* leaving early. We measured the total value of defending and the total value of leaving early as follows: we provided participants with 18 different positive fire outcomes (e.g. 'Your house survives the fire', 'Your children don't get harmed at all', 'Your working equipment doesn't get damaged at all') that were based on a mixed methods study that extracted the different positive outcomes householders may aim to achieve when dealing with bushfires (McNeill *et al.* 2011). Participants were asked to rate the importance of each outcome to them (termed x_i) in the event of a wildfire in the area, using sliders with 25 notches resulting in a score that ranged from 1 (not important at all) to 7 (extremely important), with 0.25 points increments per notch. A 'not applicable' option was available for each outcome. We then asked participants to rate the perceived chances, p_{ij} and p_{ik}, of achieving each of these outcomes by defending (j) and, separately, by leaving early (k), from 1 (definitely not) to 7 (definitely). The Distinctiveness score was then calculated for each participant by subtracting the value of leaving early from the value of staying and defending, as depicted in the formula:

$$\text{Distinctiveness} = \sum\nolimits_j (x_i \times p_{ij}) - \sum\nolimits_k (x_i \times p_{ik})$$

where x_i is the value of outcome i, p_{ij} is the perceived chance of achieving outcome i under fire response j; response j is stay and defend, and response k is leave early. The Distinctiveness score thus had a potential range from −882 to +882. Note that both the sign and magnitude of the distinctiveness score are important. If Distinctiveness is greater than zero, then it means the value of 'stay and defend' is greater than the value of 'leave early' (and *vice versa* if Distinctiveness <0). As Distinctiveness approaches zero it becomes more difficult to identify which option is more attractive, and hence (we hypothesised) the more difficult the selection will be (see H4).

Anticipated responsibility

To test whether the delay of deciding whether to defend or evacuate is a tactic to avoid feeling responsible for bad outcomes, we measured the extent to which participants expected to feel responsible for bad outcomes in case of a fire with by asking: 'If a fire threatened your community, who would ultimately be responsible for saving (1) your life/lives, and (2) your house?' (1 = 'The government would be fully responsible. I/my family would carry no blame for bad outcomes', 5 = 'I/my family would be fully responsible. The government would carry no blame for bad outcomes', Cronbach's $\alpha = 0.65$).

Measure of intended fire response

For the measurement of our main dependent variable, namely intended fire response, we asked people 'Which of the following do you think you will most likely do if a bushfire occurs in your town or suburb?' (from Whittaker *et al.* 2010). Table 1 shows a list of all possible fire responses. Responses 2, 3, 4, and 7 were marked as those that delay the decision to defend *v.* evacuate. Response 1 was marked as the defence response, and responses 5 and 6 were marked as the evacuation responses. Intended fire response was measured at both T1 and T2, which allowed us to explore (1) to what extent people remained stable in their intended fire response, and (2) to what extent any significant predictors of intended response measured at T1 would remain a predictor a few months later. This would be especially relevant if a significant number of people *were* to change their intended response over time.

Results

Initial analyses

Upon examining the correlations amongst the predictor variables, we found that NFC was positively correlated with decision relevance as measured by perceived wildfire risk ($r = 0.17$, $P < 0.05$), suggesting that people higher in NFC are perhaps more inclined to seek out (accurate) information about wildfire risk, thereby increasing their awareness of the risk. Also, NFC was negatively correlated with indecisiveness ($r = -0.46$, $P < 0.001$). There were no other significant correlations between the predictor variables, which all had $|r| < 0.11$ (see Table 2 for an overview of descriptive statistics and correlations of all predictor variables).

Upon comparing respondents' intended response at T1 *v.* T2, we found that 34.6% of respondents changed their response category. A closer examination showed that of those changing from one of the 'delay' responses at T1, 28% switched to a more decisive response at T2. Of those switching from a more decisive response (i.e. defending or evacuating) at T1, 100% switched to a 'delay' response at T2.

Table 2. Means, standard deviations (s.d.) and inter-correlations (rij) amongst predictor variables

Probabilities are significant at: *, $P < 0.05$; **, $P < 0.001$. Pairwise N was 182

	Mean	s.d.	2	3	4	5
1. Need for cognition	5.63	0.92	−0.46**	0.17*	−0.07	−0.02
2. Indecisiveness	3.54	1.11	–	−0.08	−0.10	−0.05
3. Decision relevance	5.05	0.95		–	−0.11	−0.03
4. Distinctiveness	−17.11	104.79			–	0.10
5. Anticipated responsibility	3.54	1.11				–

Predicting intended fire response

To test our hypotheses, we conducted two multinomial logistic regressions. In both regressions, we entered the standardised scores of the predictor variables 'NFC', 'Indecisiveness', 'Decision Relevance', 'Distinctiveness' and 'Anticipated Responsibility' as covariates and 'Intended Fire Response' as the dependent variable (measured at T1 *v.* T2). We nominated the most popular delay category (Response 2 – 'Do as much as possible to protect your property but leave if the fire directly threatens it/reaches your property.') to be the reference category. To find the best predictor(s) of Intended Fire Response, the statistical models were set to forward entering of predictors. Forward entering selects the best significant predictor in Step 1, and in each following step, it selects the next predictor that will account for the largest increase in prediction accuracy vis-à-vis the previous step, and so on, until no new predictor significantly increases the total prediction accuracy.

The likelihood ratio tests showed that the final model outperformed a null model for Intended Fire Response both at T1 ($\chi^2(4) = 57.01$, $P < 0.001$) and T2 ($\chi^2(4) = 63.09$, $P < 0.001$), meaning it was better at predicting the selected response category than chance. Both final models contained the same single significant predictor, namely Distinctiveness, yielding a Nagelkerke *pseudo-*R^2 of 0.29 (T1) and 0.32 (T2).

Table 3 shows the odds ratios and Wald statistics for the multinomial logistic models with Distinctiveness as the predictor, and it contains three noteworthy features. First, Distinctiveness was a significant determinant of selecting Response 1 (i.e. stay and defend) over the reference category (i.e. do as much as possible but leave when threatened) (T1 Wald(1) = 23.16, $P < 0.001$; T2 Wald(1) = 25.74, $P < 0.001$). The odds ratios indicated that for every standard deviation increase in the relative value of defending (compared with the value of evacuating as reflected by a *higher* Distinctiveness score), a household would be 4.22 at T1 (and 5.23 at T2) times more likely to intend to defend their property throughout the fire, as opposed to doing as much as possible until the property is threatened. Second, Distinctiveness was also a significant determinant of selecting Response 5 (i.e. leaving as soon as a fire threatens your community) over the reference category (T1 Wald(1) = 10.97, $P < 0.01$; T2 Wald(1) = 10.86, $P < 0.01$). The odds ratios indicated that for every standard deviation increase in the relative value of evacuating (compared with the value of defending as reflected by a *lower* Distinctiveness score), a household would be 4.00 at T1 (and 3.57 at T2) times more likely to intend evacuating at the first sign of a fire threatening the community, as opposed to doing as much as possible until the property is threatened (note that these odds ratios are the respective inverses of 0.25 and 0.28). Third and importantly, the odds of selecting Response 2 *v.* 3, or 2 *v.* 4 did not vary significantly as a function of Distinctiveness, as reflected by non-significant Wald statistics. These analyses therefore show that selection difficulty, as measured by Distinctiveness, is a substantive determinant of selecting a response that delays the decision on whether to defend or evacuate, supporting H4.

Table 3. Predicting choice of Responses 1, 3, 4 and 5 compared with Response 2 based on distinctiveness

Probabilities are significant at: *, $P < 0.01$; **, $P < 0.001$. Response 1, 'Stay and try to protect your property throughout the fire'; Response 2 (reference category), 'Do as much as possible to protect your property but leave if the fire directly threatens it/reaches your property'; Response 3, 'Wait to see what the fire is like before deciding whether to stay and defend or leave'; Response 4, 'Wait for police, fire or other emergency services to tell you what to do on the day'; Response 5, 'Leave as soon as you know there is a fire threatening your town or suburb'.

	Response 1 Exp (B) Wald (d.f.)	Response 3 Exp (B) Wald (d.f.)	Response 4 Exp (B) Wald (d.f.)	Response 5 Exp (B) Wald (d.f.)
Distinctiveness (T1)	4.22**	1.64	1.13	0.25*
	23.16 (1)	3.70 (1)	0.12 (1)	10.97 (1)
Distinctiveness (T2)	5.23**	1.74	1.09	0.28**
	25.74 (1)	3.10 (1)	0.06 (1)	10.86 (1)

Although the above analyses are consistent with H4, this hypothesis also predicts that a tendency to select a delay category is associated with a Distinctiveness score that is close to zero. Therefore, we also undertook one-sample *t*-tests to determine if the average Distinctiveness scores (un-standardised) were significantly different from zero in each of the response categories, with the results reported in Table 4. The average Distinctiveness scores for two out of the three delay categories (Responses 3 and 4) were not significantly different from zero, whereas the average Distinctiveness scores of both defending and evacuating (Responses 1 and 5) were. The average score of the third delay category (Response 2) *was* significantly different from zero, albeit with relatively small effect sizes (Cohen's $d = 0.43/0.49$ at T1/T2 compared with $d = 0.68/0.83$ for Response 1, and $d = 1.29/1.81$ for Response 5). Importantly, the average Distinctiveness scores of the delay categories were not significantly different from each other (Response 2 *v.* 3 and Response 3 *v.* 4), whereas those of the defence and evacuation responses were significantly different from the delay categories (Response 1 *v.* 2, and Response 4 *v.* 5). All in all, these findings lend further support to the validity of our measure of selection difficulty and its predicting abilities when it comes to predicting the selection of a category in which deciding on defence *v.* evacuation is delayed.

Accuracy in prediction

Finally, we were interested in testing the accuracy of the Distinctiveness score in predicting the different intended fire responses. Table 5 shows the category predictions and accuracies. As can be seen, Distinctiveness is reasonably good at

Table 4. Comparing distinctiveness means to '0' and to means of the next fire plan

Probabilities are significant at: *, $P < 0.01$; **, $P < 0.001$. Response 1, 'Stay and try to protect your property throughout the fire'; Response 2, 'Do as much as possible to protect your property but leave if the fire directly threatens it/reaches your property'; Response 3, 'Wait to see what the fire is like before deciding whether to stay and defend or leave'; Response 4, 'Wait for police, fire or other emergency services to tell you what to do on the day'; Response 5, 'Leave as soon as you know there is a fire threatening your town or suburb'

	Response 1 *M* (s.d.), *t* (d.f.)	Response 2 *M* (s.d.), *t* (d.f.)	Response 3 *M* (s.d.), *t* (d.f.)	Response 4 *M* (s.d.), *t* (d.f.)	Response 5 *M* (s.d.), *t* (d.f.)
Distinctiveness (T1)	59.90 (88.57), 4.44 (42)**	−41.16 (96.74), −3.73 (76)**	−7.08 (69.65), −0.61 (35)	−32.60 (77.31), −1.63 (14)	−161.43 (125.45), −4.27 (10)*
Distinctiveness (T2)	67.62 (81.27), 5.46 (42)**	−40.30 (82.59), −4.60 (88)**	−4.20 (70.12), −0.28 (21)	−34.56 (154.45), −0.90 (15)	−149.08 (82.38), −6.27 (11)**
	Δ*M* Response 1–2 (s.e.)	Δ*M* Response 2–3 (s.e.)	Δ*M* Response 3–4 (s.e.)	Δ*M* Response 4–5 (s.e.)	
Distinctiveness (T1)	101.06** (17.24)	−34.08 (18.28)	25.52 (27.83)	128.83** (35.95)	
Distinctiveness (T2)	107.92** (16.60)	−36.10 (21.28)	30.36 (29.36)	114.52* (34.12)	

categorising those who intend to defend (Response 1, 48.8% and 44.2% correct) and very good at categorising those who intend to do as much as possible until the fire reaches their property (Response 2, 90.9% and 92.1% correct). Distinctiveness was somewhat less accurate at predicting the intention of evacuation (Response 5, 18.2% and 8.3% correct). Finally, the variable appears to classify the selectors of the other delay categories (Responses 3 and 4) as selectors of the main delay category (at least 75% of Responses 3 and 4 are classified as Response 2 – see numbers in between parentheses in Table 5). The Distinctiveness score therefore appears to be better at discriminating between intended defenders *v.* decision delayers and intended evacuators *v.* decision delayers, rather than discriminating amongst the different delay categories.

Discussion

Of the five hypotheses, only Hypothesis 4 was supported by the results. More specifically, the single unique predictor of intended fire response was selection difficulty as measured by the difference in attractiveness of the two concrete fire responses: defending *v.* evacuating. In other words, when defending and evacuating become closer to being perceived as equally attractive, the chances of delaying one's decision to defend *v.* evacuate increase (in line with Hypothesis 4). Further, the measure of distinctiveness was able to accurately predict who would select one of the delay categories in a vast majority of the cases. By contrast, none of the other predictors, which are all theoretically plausible explanations for decision delay (i.e. NFC, indecisiveness, decision relevance as measured through risk perception, and responsibility avoidance), were able to substantially improve the prediction of intended fire responses above and beyond the distinctiveness score. These findings have important implications for the development of communication strategies that aim to reduce the delay of this decision.

Before turning to the implications of the above findings, we would like to point out several limitations of the current study and suggest directions for future research. First, even though the distinctiveness score was very accurate at predicting who would select a delay category, it was less accurate at predicting who would select evacuation, with 18% accuracy at T1 and 8% at T2. All but one of the miscategorised individuals were classified by the model as belonging to the main delay category. One likely explanation is that relatively few people in the sample (~6%) selected evacuation, and thus statistical models would struggle to identify these 'exceptional' cases. Also, it could be that the distinctiveness variable is better at predicting actual behaviour during a fire for these intended evacuators, than predicting their intentions. Indeed, research has shown that many intended 'early evacuators' show signs of decision delay during actual fires and end up leaving late (e.g. 71% in McLennan *et al.* 2012).

Another limitation is that our measure of intended fire response did not distinguish individuals who were delaying their decision on defending *v.* evacuating from individuals who had a solid contingency plan (e.g. a plan stating under what conditions they would defend *v.* evacuate). Past research has shown that those selecting a delay category tend to be less prepared than intended defenders or evacuators, and that very few of them form a detailed contingency plan (Dunlop *et al.* 2012). Nonetheless, future research could improve precision in the measurement of

Table 5. Classification table and accuracy of classification based on distinctiveness
Note: percentages in parentheses are the percentage of category 3 and 4 responses correctly classified as a delay response

Predicted:	Response 1	Response 2	Response 3	Response 4	Response 5	Accuracy
T1 (Actual)						
Response 1	21	22	0	0	0	48.8%
Response 2	7	70	0	0	0	90.9%
Response 3	6	30	0	0	0	0% (83.3%)
Response 4	1	14	0	0	0	0% (93.3%)
Response 5	1	8	0	0	2	18.2%
T2 (Actual)						
Response 1	19	24	0	0	0	44.2%
Response 2	7	82	0	0	0	92.1%
Response 3	3	19	0	0	0	0% (86.4%)
Response 4	3	12	0	0	1	0% (75.0%)
Response 5	0	11	0	0	1	8.3%

intended fire responses and focus on predicting differences in the quality of the contingency plans and related preparedness.

Finally, there might be other predictors of intended fire responses that were not tested in the current study. For example, the current study focussed on individuals and did not take into account that some households may delay their decision due to conflict amongst the adult members therein (e.g. Handmer *et al.* 2010). Still, the accuracy of predicting delay was very high, so even though household conflict could have been an additional cause, it could have increased accuracy only by ~10%. However, as the current study focussed exclusively on factors causing delay, future research could focus on increasing our understanding of what drove those *not* delaying (i.e. intending to defend or evacuate) to do so.

Conclusions

If fire agencies are to effectively deal with the problems associated with delaying one's decision on defending *v.* evacuating, it is important they understand *why* people are delaying this decision. The current study was the first to shed light on this issue in an empirical manner. It appears that the biggest cause for delay is selection difficulty resulting from a lack of distinctiveness in attractiveness between defending and evacuating, rather than a lack of perceived wildfire risk, avoidance of responsibility or more stable personality traits. In other words, it appears that residents that are aware that they are living in an area at risk of wildfire and know they should be planning their response to a wildfire threat feel stuck between two competing responses that serve competing highly valued outcomes (e.g. they do not want to lose their property or livestock, but they also want to keep themselves and their loved ones safe). This has important implications for the effectiveness of different strategies aimed to reduce the delay of deciding on whether to defend or evacuate. For example, because decision relevance as measured by risk perception was unrelated to people's intended fire response, the results shown here suggest that trying to decrease decision delay by increasing awareness of the risk associated with doing so is unlikely to be effective. Although it might be tempting to conclude that forcing people into selecting a more decisive fire response will be effective, research has shown that reducing people's experienced freedom of choice (e.g. by not giving them a no-choice option) actually reduces the commitment they experience to the chosen option through a process called reactance (Brehm 1966; Wicklund 1970). Thus, forcing people to select either defending or evacuating as an intended response may increase the number of people 'ticking the box', but the resultant reduction in their commitment to their chosen option may simply lead to problems similar to the ones already experienced with the delay of this decision.

One way to reduce the number of people delaying their decision on defending *v.* evacuating would be to increase the value of defending or evacuating *relative to the competing option*. To a certain extent, agencies in Australia have already adopted this strategy by stressing that leaving early is *always* the safest option (Llewellyn 2012). However, in doing so they have assumed that safety is the only key factor of value in the decision. Agencies might benefit from determining upon which factors the values attached to defending *v.* evacuating are actually based, and adjust their campaigns accordingly. Another strategy to reduce the problems associated with delaying one's commitment to defending *v.* evacuating would be to help people transform their decision delay into a clear contingency plan in which they decide ahead of time under which circumstances they would defend *v.* evacuate, and write down their crucial triggers for this decision (in line with recommendations by McLennan *et al.* 2012). In fact, delaying one's commitment to one option over the other is not necessarily a bad thing, and it could potentially lead to better outcomes under certain circumstances (Janis and Mann 1977; Partnoy 2012). For example, defending might be appropriate under certain Fire Danger Ratings, but not all, and only if particular members of the household were present. However, it would be important for households to decide on what constitutes 'the right circumstances' for each response before the fire season. This would, of course, need to be combined with an increased awareness of the need to prepare well for both defending and evacuating. An added benefit of this approach would be that by transforming the decision delay into contingency plans, rather than eliminating the delay option altogether, fire agencies are better able to educate residents about the way they could best prepare for their contingency plans. In conclusion, with the current paper,

we hope to have made a significant first step in reducing the problems associated with delaying the decision to defend *v.* evacuate.

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References

Anderson CJ (2003) The psychology of doing nothing: forms of decision avoidance result from reason and emotion. *Psychological Bulletin* **129**, 139–167. doi:10.1037/0033-2909.129.1.139

ABS (2011) Community Profiles. Available at http://www.abs.gov.au/websitedbs/censushome.nsf/home/communityprofiles [Verified 24 April 2013]

Bockenholt U, Albert D, Aschenbrenner M, Schmalhofer F (1991) The effects of attractiveness, dominance, and attribute differences on information acquisition in multiattribute binary choice. *Organizational Behavior and Human Decision Processes* **49**, 258–281. doi:10.1016/0749-5978(91)90051-T

Bouckenooghe D, Vanderheyden K, Mestdagh S, Van Laethem S (2007) Cognitive motivation correlates of coping style in decisional conflict. *The Journal of Psychology* **141**, 605–625. doi:10.3200/JRLP.141.6.605-626

Brehm JW (1966) 'A Theory of Psychological Reactance.' (Academic Press: New York).

BTE (2001) Economic Costs of Natural Disasters in Australia. Available from http://www.bitre.gov.au/publications/2001/report_103.aspx) [Verified 24 April 2013]

Cacioppo JT, Petty RE (1982) The need for cognition. *Journal of Personality and Social Psychology* **42**, 116–131. doi:10.1037/0022-3514.42.1.116

Cacioppo JT, Petty RE, Kao CE (1984) The efficient assessment of need for cognition. *Journal of Personality Assessment* **48**, 306–307. doi:10.1207/S15327752JPA4803_13

Cova TJ, Drews FA, Siebeneck LK, Musters A (2009) Protective actions in wildfires: evacuate or shelter in place? *Natural Hazards Review* **10**(4), 151–162. doi:10.1061/(ASCE)1527-6988(2009)10:4(151)

DeVon HA, Hogan N, Ochs A, Shapiro M (2010) Time to treatment for acute coronary syndromes. The cost of indecision. *The Journal of Cardiovascular Nursing* **25**, 106–114. doi:10.1097/JCN.0B013E3181BB14A0

Dhar R (1997) Consumer preference for a no-choice option. *The Journal of Consumer Research* **24**, 215–231. doi:10.1086/209506

Dhar R, Nowlis SM, Sherman SJ (1999) Comparison effects on preference construction. *The Journal of Consumer Research* **26**, 293–306. doi:10.1086/209564

Dunlop PD, McNeill IM, Skinner TC, Morrison DL (2012) Brief report on the University of Western Australia and Bushfire CRC pilot study. (University of Western Australia, Bushfire Cooperative Research Centre: Perth, WA)

Ferrari JR, Dovidio JF (2000) Examining behavioral processes in indecision: decisional procrastination and decision-making style. *Journal of Research in Personality* **34**, 127–137. doi:10.1006/JRPE.1999.2247

Frost RO, Shows DL (1993) The nature and measurement of compulsive indecisiveness. *Behaviour Research and Therapy* **31**, 683–692. doi:10.1016/0005-7967(93)90121-A

Germeijs V, De Boeck P (2002) Measurement scale for indecisiveness and its relationship to career indecision and other types of indecision. *European Journal of Psychological Assessment* **18**, 113–122. doi:10.1027//1015-5759.18.2.113

Germeijs V, De Boeck P (2003) Career indecision: three factors from decision theory. *Journal of Vocational Behavior* **62**, 11–25. doi:10.1016/S0001-8791(02)00055-6

Gilovich T, Medvec VH, Chen S (1995) Commission, omission, and dissonance reduction: coping with regret in the 'Monty Hall' problem. *Personality and Social Psychology Bulletin* **21**, 182–190. doi:10.1177/0146167295212008

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) Available at http://www.bushfirecrc.com/managed/resource/review-fatalities-february-7.pdf [Verified 24 April 2013]

Harries J, Orner P, Gabriel M, Mitchell E (2007) Delays in seeking an abortion until the second trimester: a qualitative study in South Africa. *Reproductive Health* **4**, 7. doi:10.1186/1742-4755-4-7

Haynes K, Handmer J, McAneney J, Tibbits A, Coates L (2010) Australian bushfire fatalities 1900–2008: exploring trends in relation to the 'Prepare, stay and defend or leave early' policy. *Environmental Science & Policy* **13**, 185–194. doi:10.1016/J.ENVSCI.2010.03.002

Janis I, Mann L (1977) 'Decision Making: a Psychological Analysis of Conflict, Choice and Commitment.' (Free Press: New York)

Kahneman D, Tversky A (1982) The psychology of preferences. *Scientific American* **246**, 160–173. doi:10.1038/SCIENTIFICAMERICAN0182-160

Landman J (1987) Regret and elation following action and inaction: affective responses to positive versus negative outcomes. *Personality and Social Psychology Bulletin* **13**, 524–536. doi:10.1177/0146167287134009

Llewellyn R (2012) Bushfire and Community Safety: AFAC Position Version 5.0. (AFAC: Victoria) Available at http://knowledgeweb.afac.com.au/positions/documents/AFAC_Bushfires_and_Community_Safety_Position.pdf [Verified 24 April 2013]

McLennan J, Elliot G, Omodei M, McNeill I, Dunlop P, Suss J (2011*a*) Bushfire survival-related decision making: what the stress and performance research literature tells us. In 'Proceedings of Bushfire CRC & AFAC 2011 Conference Science Day', 1 September 2011, Sydney, Australia. (Ed. RP Thornton) pp. 307–319. (Bushfire CRC) Available at http://knowledgeweb.afac.com.au/research/hr/decisions/factors/all/Bushfire_Survival-related_Decision_Making_What_stress_and_performance_research_literature_tells_us [Verified 24 April 2013]

McLennan J, Omodei M, Elliot G, Holgate A (2011*b*) 'Deep survival': experiences of some who lived when they might have died in the 7 February 2009 bushfires. *The Australian Journal of Emergency Management* **26**, 41–46.

McLennan J, Elliot G, Omodei M (2012) Householder decision-making under imminent wildfire threat: stay and defend or leave. *International Journal of Wildland Fire* **21**, 915–925. doi:10.1071/WF11061

McNeill IM, Dunlop PD, Morrison DL, Skinner TC (2011) Why I'd Stay, and What I've Done to Prepare for it: The Role of Goals and Worries in Bushfire Preparedness. Available at http://www.bushfirecrc.com/sites/default/files/managed/resource/2011_poster_illy_mcneil_patrick_dunlop_david_morrison_timothy_skinner.pdf [Verified 8 January 2014]

McNeill IM, Dunlop PD, Skinner TC, Heath J, Morrison DL (2013) Expecting the unexpected: predicting physiological and psychological wildfire preparedness from perceived risk, responsibility, and obstacles. *Risk Analysis* **33**, 1829–1843. doi:10.1111/RISA.12037

Nisbett RE, Wilson TD (1977) Telling more than we can know: verbal reports on mental processes. *Psychological Review* **43**, 87–131. doi:10.1037/0033-295X.84.3.231

Osipow SH (1999) Assessing career indecision. *Journal of Vocational Behavior* **55**, 147–154. doi:10.1006/JVBE.1999.1704

Partnoy F (2012)' Wait: the Useful Art of Procrastination'. (Profile Books: London)

Paton D, Kelly G, Buergelt PT, Doherty M (2006) Preparing for bushfires: understanding intentions. *Disaster Prevention and Management* **15**, 566–575. doi:10.1108/09653560610685893

Rassin E (2007) A psychological model of indecisiveness. *Netherlands Journal of Psychology* **63**, 1–11. doi:10.1007/BF03061056

Rassin E, Muris P, Franken I, Smit M, Wong M (2007) Measuring general indecisiveness. *Journal of Psychopathology and Behavioral Assessment* **29**, 61–68. doi:10.1007/S10862-006-9023-Z

Reed GF (1985) 'Obsessional Experience and Compulsive Behavior: A Cognitive-Structural Approach.' (Academic Press: New York)

Ritov I, Baron J (1992) Status-quo and omission biases. *Journal of Risk and Uncertainty* **5**, 49–61. doi:10.1007/BF00208786

Shafir E, Simonson I, Tversky A (1993) Reason-based choice. *Cognition* **49**, 11–36. doi:10.1016/0010-0277(93)90034-S

Teague B, McLeod R, Pascoe S (2010). 2009 Victorian Bushfires Royal Commission final report. (State Government of Victoria: Melbourne) Available at http://www.royalcommission.vic.gov.au/Commission-Reports/Final-Report [Verified 9 October 2013]

Tibbits A, Whittaker J (2007) Stay and defend or leave early: policy, problems and experiences during the 2003 Victorian bushfires. *Environmental Hazards* **7**, 283–290. doi:10.1016/J.ENVHAZ.2007.08.001

Tibbits A, Handmer J, Haynes K, Lowe T, Whittaker J (2008) Prepare, stay and defend or leave early. In 'Community Bushfire Safety'. (Eds J Handmer, K Haynes) pp. 59–71 (CSIRO Publishing: Melbourne)

Tyszka T (1998) Two pairs of conflicting motives in decision making. *Organizational Behavior and Human Decision Processes* **74**, 189–211. doi:10.1006/OBHD.1998.2775

Whittaker J, Haynes K, McLennan J, Handmer J, Towers B (2010) Victorian 2009 Bushfire Research Response: Household Mail Survey. (Bushfire Cooperative Research Centre: Melbourne) Available at http://www.bushfirecrc.com/managed/resource/bushfire-crc-housholder-mail-survey-executive-summary-10-1-10.pdf [Verified 24 April 2013]

Wicklund A (1970) Prechoice preference reversal as a result of threat to decision freedom. *Journal of Personality and Social Psychology* **14**, 8–17. doi:10.1037/H0028619

Zeelenberg M, Pieters R (2007) A theory of regret regulation 1.0. *Journal of Consumer Psychology* **17**, 3–18. doi:10.1207/S15327663JCP1701_3