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Abstract

Introduction Research suggests that post-traumatic stress (PTS) symptoms are common after the experience of bushfire. However, the ways in which individuals cope with, positively grow from, and find benefit in the adverse circumstances of bushfire in Australia has not been adequately explored. The main objective of this study is to assess the relationship between PTS, coping strategies and post-traumatic growth, in a sample of Australian community members affected by a bushfire event. **Methods** Sixty-five participants (mean age 40.66 years, SD=13.57), who had previously experienced a bushfire event in Australia, responded to an anonymous online survey. **Results** Results indicated that greater PTS was associated with the use of all coping strategies, as well as higher levels of post-traumatic growth. The use of coping strategies was associated with higher levels of post-traumatic growth. Hierarchical regression analyses found that post-traumatic growth and avoidant coping explained significant amounts of unique variance in PTS, whereas PTS and emotion-focussed coping explained significant amounts of unique variance in post-traumatic growth. **Conclusion** In communities that are seasonally threatened by bushfires, our findings suggest that not only are post-disaster stress reduction interventions required, but so too are preparedness programs that include strategies for promoting growth and positive adaptation. It is suggested further research should address implications for strength-based preparedness and recovery programs in bushfire prone areas.

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Research

Life after bushfire: Post-traumatic stress, coping and post-traumatic growth

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Abstract

Introduction

Research suggests that post-traumatic stress (PTS) symptoms are common after the experience of bushfire. However, the ways in which individuals cope with, positively grow from, and find benefit in the adverse circumstances of bushfire in Australia has not been adequately explored. The main objective of this study is to assess the relationship between PTS, coping strategies and post-traumatic growth, in a sample of Australian community members affected by a bushfire event.

Methods

Sixty-five participants (mean age 40.66 years, SD=13.57), who had previously experienced a bushfire event in Australia, responded to an anonymous online survey.

Results

Results indicated that greater PTS was associated with the use of all coping strategies, as well as higher levels of post-traumatic growth. The use of coping strategies was associated with higher levels of post-traumatic growth. Hierarchical regression analyses found that post-traumatic growth and avoidant coping explained significant amounts of unique variance in PTS, whereas PTS and emotion-focussed coping explained significant amounts of unique variance in post-traumatic growth.

Conclusion

In communities that are seasonally threatened by bushfires, our findings suggest that not only are post-disaster stress reduction interventions required, but so too are preparedness programs that include strategies for promoting growth and positive adaptation. It is suggested further research should address implications for strength-based preparedness and recovery programs in bushfire prone areas.

Keywords:

post-traumatic stress; coping; post-traumatic growth; bushfires

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Introduction

The incidence of bushfires in Australia is reportedly increasing (1), with data indicating a 40% increase in events from 2008 to 2013. This information, which blends National Aeronautics and Space Administration (NASA) satellite data on bushfires with other environmental data, indicates areas most prone to bushfires in Australia are in tropical and subtropical areas in Queensland and northern New South Wales. Knowing which communities may be at most risk provides an opportunity for psychological preparation, early intervention and prevention of mental health problems. This is particularly important, as the psychosocial impacts on community members, who are the survivors of severe natural disasters, are often profound and multifaceted (2).

An extensive body of literature on natural disasters such as bushfires, describes a myriad of potential negative psychological consequences, including post-traumatic stress (PTS) (3). However, while the literature has recently been expanded through the release of a comprehensive report following the 2009 bushfires in Australia (4), few studies have documented the ways in which individuals cope psychologically, grow from, and find meaning over time, after experiencing a bushfire event in Australia (5).

Post-traumatic stress

Living in bushfire-prone areas is inherently stressful. Each summer, thousands of Australians face the threat of bushfire. For those directly affected, the potential psychological ramifications of dealing with the immediate fire threat, sustained losses and the substantial clean up after the fire has passed, can be complex (6). For some, the effects of a natural disaster may resolve once normal activities are resumed, for others there may be serious continuing consequences (7).

Stress responses associated with surviving a natural disaster may range from low to moderate levels of distress, through to severe PTS (8). Post-traumatic stress disorder (PTSD), a prolonged and severe psychological response to trauma, is characterised by significant physical, social, occupational, emotional or cognitive impairment (4). Approximately 8% of the general population experience symptoms of PTS during their lives. Women are twice as likely as men to be diagnosed (9). The incidence of PTSD in persons directly affected by the experience of natural disaster, such as bushfire, is significantly higher than that of the general population (7). As such, it is suggested that 23–42% of individuals impacted by bushfire experience PTSD-related symptoms in the months following a bushfire event (7,10).

Coping strategies

Coping is typically conceptualised as a process that assists an individual to manage their levels of psychological stress

(12). Negative emotions, developed in response to situations perceived as being harmful or threatening, generally serve to mobilise specific coping strategies (12). The lived-experience of a bushfire is a threatening event, which could initiate coping strategies in response to negative emotions elicited by the bushfire event (5). The ability to identify and employ suitable coping strategies could subsequently influence a person's quality of life (13) and PTS symptoms. The adoption of specific coping strategies may also be a predictor of psychological adjustment, after the initial threat has passed (5).

The literature typically differentiates between different coping strategies in order to recognise the most effective mechanisms for psychological adjustment in adverse situations (13). Three distinct categories have emerged: problem-focussed, emotion-focussed and avoidant coping strategies (14). According to the Transactional Model of Stress and Coping (15), if a situation is perceived as controllable or changeable, problem-focussed coping strategies will be employed. However, if the situation is perceived as being largely uncontrollable, emotion-focussed or avoidant coping strategies will be mobilised (13). Therefore, it seems that an understanding of how coping strategies are utilised is imperative in assessing an individual's current levels of psychological functioning.

Coping strategies that allow an individual to initiate change in their environment are typically described as active or problem-focussed in nature and associated with a rational, task-orientated approach (14). Subtypes of problem-focussed coping strategies include active coping, planning and instrumental support and acceptance (16). These strategies typically focus on proactively transforming the nature of the stressor and any negative associated thoughts (13); and have been associated with increased psychological adjustment (17). Higher levels of self-efficacy, lower levels of depression, functional impairment and stress have also been attributed to the utilisation of problem-focussed coping strategies (18). Emotion-focussed coping strategies are typically employed when a stressful situation is perceived as something that has to be endured, rather than something that can be changed (19). Previous studies have highlighted various behaviours that represent emotion-focussed coping strategies, including venting, humour, emotional support and positive reframing (16). The utilisation of emotion-focussed coping strategies over extended periods of time has been associated with reduced quality of life and wellbeing (13). Avoidant coping strategies, on the other hand, are typically associated with passivity and characterised by the use of escape mechanisms, allowing disengagement from emotional consequences of stressful situations (19). Substance use, self-distraction, self-blame, denial and behavioural disengagement are examples of avoidant coping strategies (13,14), which are associated with higher levels of depression, increased impairment and reduced health-related quality of life (5,17,20).

Following exposure to a natural disaster, problem-focussed, emotion-focussed and avoidant coping strategies have been shown to be associated with the presence, rather than absence, of PTS symptoms (5). In a study of northwest Australian cyclone-prone communities, avoidant coping predicted greater levels of stress while stress and emotional coping were predictive of psychological adjustment in the form of post-traumatic growth (21).

Conversely, Armstrong et al (5) found that in Australian fire fighters, problem-focussed coping strategies predicted post-traumatic growth. Cognitive reappraisal, a form of emotion-focussed coping, predicted increased stress. In contrast, a Chinese study of fire fighters involved in earthquake rescue work found that problem-focussed coping strategies predicted psychiatric morbidity, and avoidant and emotion-focussed coping strategies were predictive of PTS symptoms (22). Presently there is no clear consensus regarding effectiveness of one specific coping strategy over another in alleviating distress and promoting psychological adjustment (22). Moreover, cultural and social differences could influence coping (23).

Psychological adjustment, post-traumatic growth and benefit finding

Levels of PTS, and the subsequent use of specific coping strategies, may have consequences in terms of an individual's ability to adjust psychologically or to find benefit after the disaster experience (5). Psychological adjustment is defined as the degree to which people must adapt or change psychologically in response to difficult circumstances (24). Examining adjustment response to stresses or challenges of living through a bushfire event is vital in understanding the psychosocial experience of affected individuals (25).

Post-traumatic growth, also known as benefit finding (26), is a specific facet of adjustment, expressly concerned with individual capacity to derive positive psychological outcomes from an adverse event. The ability to find benefit, or undergo personal growth, in response to traumatic or stressful conditions can promote positive adjustment (12), and has been observed in persons who have experienced natural disasters (27), including bushfires (25).

Models of benefit finding do not deny the adverse effects of difficult circumstances; rather they acknowledge that negative stress resulting from personal struggle must occur before growth is possible (12). Distress associated with adverse life situations, according to models of benefit finding, acts as a catalyst for beneficial adjustment and growth (28). Positive psychological growth results from psychological acceptance of the central role that trauma, significant distress or loss has played in the life story of the individual; and only after the individual recognises that such experiences promote valued growth (12). Benefit finding promotes a sense of positive wellbeing and reduces an individual's risk of developing

unfavourable psychological outcomes, such as depression and PTS-type symptoms (29).

Personal growth, as a fundamental element of post-traumatic growth or benefit finding, comprises concepts such as enriched interpersonal relationships, insight into new life possibilities, greater understanding of personal strength, spiritual change and improved appreciation of life (30). Enriched interpersonal relationships may include an enhanced desire to help others and improved empathetic skills and openness to understanding human interplay (31). Similarly, insight into new possibilities may be associated with decisions to change personal behaviours or attitudes, eliminate perceived negative experiences through cultivation of positive encounters and fostering of self-respect (31). Additionally, greater understanding of personal strength may reflect a premise that difficult circumstances result in a renewed sense of self-efficacy as well as a sense of having successfully coped with, and survived, the stressful event(s) (31). Spiritual change may arise from the experience of traumatic events through improved understanding of spiritual matters, or strengthening of religious beliefs (30). Furthermore, an improved appreciation for life may encompass an appreciation for the 'little things', the value of life itself and/or an ability to consciously recognise the positive aspects of life in general, while placing less emphasis on more negative aspects of life (30).

Conceptually, post-traumatic growth has been attributed to a variety of frameworks (29,32). Cognitive Adaptation Theory theorises that post-traumatic growth is a result of cognitively reappraising difficult circumstances in a positive way, motivated by a desire to avoid negative consequences (32). Individuals therefore attempt to alter their emotional experience by way of exchanging negative thoughts or interpretations associated with stressful situations for more positive thoughts. The perceived severity of the threat of a traumatic event is thought to be a catalyst, with higher degrees more likely to elicit benefit finding (29). In contrast, the Assumptive Worlds Theory suggests that adverse events, such as natural disasters (33), may force individuals to question their fundamental assumptions about the meaning of their lives and the world around them (34).

Relationships between PTS, coping strategies, psychological adjustment and growth

Assessment of the relationships between PTS, coping and psychological adjustment and growth suggests that higher levels of post-traumatic growth, or benefit finding, are associated with higher levels of stress (21). Problem-focussed (36) and emotion-focussed coping strategies are associated with higher levels of post-traumatic growth (21) as are beliefs about competency (ie. active coping appraisal and controllability) (27). Challenging an individual's core beliefs through the experience of a highly stressful situation may lead to an intense period of psychological distress. This in turn may increase the risk of developing conditions such as depression (35).

Conversely, homeostatic mechanisms unique to the individual may result in an attempt to regain a state of psychological equilibrium by finding benefit in the situation. In this way, the person is able to re-establish meaning in their life (34). Research further suggests that problem solving, optimistic and fatalistic coping strategies are all significant predictors of post-traumatic growth (37). Post-traumatic stress and coping strategies have been found to only account for a small percentage of the variance in post-traumatic growth in disaster-affected individuals (21). However, no previous study has specifically assessed the relationships among PTS, coping strategies and post-traumatic growth in Australian populations affected by a bushfire event.

Current study

Building on these concepts, the aim of this study was to assess the relationships between PTS and coping strategies, and post-traumatic growth in adults who had previously witnessed or experienced an Australian bushfire event. Consistent with previous natural disaster-related research, we hypothesised that: (1) problem-focussed coping strategies would be associated with lower levels of PTS; and (2) emotional and avoidant coping strategies would be associated with higher levels of PTS; (3) post-traumatic growth, problem-focussed, emotion-focussed and avoidant coping strategies would significantly predict PTS; and (4) PTS, problem-focussed, emotion-focussed and avoidant coping strategies would significantly predict post-traumatic growth.

Method

Participants

Seventy-eight participants responded to the survey. One participant was not included in the study as they had not previously had experience with a bushfire event in Australia. Twelve participants failed to answer any questions relating to their psychosocial experience of bushfire, and thus were not included in the study.

All analyses were conducted on a final sample of 65 participants aged 19–65 years ($M=40.66$, $SD=13.57$, 72.3% women) who had experienced one or more Australian bushfire events. A large proportion of participants had completed a university qualification (61.6%); and most were either employed or engaged in home duties (78.4%). The majority were married or partnered (78.5%). More than half (67.7%) had experienced more than one bushfire event; and time since most recent bushfire experience ranged from 0 to 13 years ($M=3.20$, $SD=3.89$). Over one-third (35.4%) of participants had lived in a house or property directly impacted by bushfire; and 58.5% reported that they, their friends or family, had been evacuated from a primary place of residence. Participants were predominately from rural and remote areas (60%); 40% were from urban areas, and 50.8% had experienced a bushfire event

in Victoria. Other participants came from New South Wales (21.5%); Australian Capital Territory (13.8%); Tasmania (6.2%); South Australia (4.6%) and Western Australia (3.1%).

Measures

Post-traumatic stress associated with the bushfire experience was measured using the Impact of Events Scale (IES-R) (38); which utilises a five-point Likert scale to rate 22 stress-related statements of distress during the past seven days. The IES-R has consistently demonstrated good internal consistency (38), with Cronbach's alphas ranging from 0.79–0.92 (20). The internal consistency for the full scale in this study was 0.96.

Coping strategies were measured using the Brief COPE (Coping Orientations to Problems Experienced) Inventory (14), a short-form version of the original COPE Inventory (19). This utilises a four-point Likert scale to rate 28 coping strategy items on 14 differentiable subscales. Subscale scores are then further divided into three main coping strategies: problem-focussed coping (active coping, planning, instrumental support), emotion-focussed coping (venting, positive reframing, humour, emotional support, acceptance, turning to religion) and avoidant coping (self-distraction, denial, self-blame and substance use, behavioural disengagement) (17). Previous studies have demonstrated adequate internal reliability, with subscale Cronbach's alphas ranging 0.50–0.90, and a factor structure that is generally consistent with the original COPE Inventory (14,19). In our study, the subscale alphas ranged 0.85–0.92.

Positive psychological adjustment in the form of post-traumatic growth was measured using the Posttraumatic Growth Inventory (PTGI). This uses a six-point Likert scale across 21 statements of adjustment (12), rating how life and outlook has changed as a result of the (bushfire) experience(s). Previous studies demonstrate good internal consistency, with Cronbach's alpha of 0.90 for the full scale. The internal consistency of PTGI in the present study was 0.97.

Procedure

Following ethics approval from the Institutional Human Research Ethics Committee, an invitation to participate in the study and details of informed consent were distributed to bushfire affected communities across Australia. Participants were primarily recruited via social media and voluntarily completed the anonymous online survey. Participants were eligible to take part if they were aged more than 18 years and had experienced one or more Australian bushfire events in their lifetime. The experience of bushfire may have included living in a house, property or community that was directly impacted by a bushfire; having close friends or first degree relatives whose primary place of residence was directly impacted by a bushfire; or had been evacuated from a primary place of residence during a bushfire event. The study took place over a four-month period from July 2014.

Results

Data were screened and analysed using SPSS Version 21 (40), at a critical alpha level of .05. Before conducting the main analyses all variables were examined for relevant assumption violations of normality and were evident for PTS and post-traumatic growth as well as all three coping strategies. Univariate outliers were detected but retained as outliers were found to have little effect on the outcome of the analyses. Transforming the data did not significantly affect skew or outliers, hence untransformed data were retained. Descriptive statistics are presented in Table 1.

Bivariate relationships between PTS, coping strategies and post-traumatic growth were investigated using Pearson's correlation coefficients. Despite normality assumption violations, parametric and non-parametric equivalent correlations were similar, therefore parametric correlations were reported (40). As noted in Table 1, PTS positively correlated with all the three types of coping strategies (problem-focussed, emotion-focussed and avoidant). All three coping strategies were also positively correlated with post-traumatic growth.

We also computed bivariate correlations between age, gender, having experienced more than one bushfire event, time since most recent bushfire experience and rural versus urban residence with key study variables. Results revealed that older individuals reported significantly greater use of both problem-focussed ($r=0.33, p=0.007$) and emotion-focussed ($r=0.26, p=0.03$) coping strategies; respondents who had recently experienced bushfire event also reported significantly more PTS ($r=-0.30, p=0.02$). However, there were no significant relationships between age and post-traumatic growth, avoidant coping strategy and PTS; between gender and post-traumatic growth, all three coping strategies and PTS; between having experienced more than one bushfire event and post-traumatic growth, all three coping strategies and PTS; between time since most recent bushfire experience and post-traumatic growth and all three coping strategies and between area of

residence (rural vs. urban) and post-traumatic growth, three coping strategies and PTS (all $p>0.05$). Given significant relationships between age and time since most recent bushfire experience with two of the coping strategies (problem-focussed and emotion-focussed) and PTS, we statistically controlled for these two demographic variables in our subsequent hierarchical regression analyses.

To examine which variables were the best predictors of PTS (the dependent variable) after the experience of bushfire, a hierarchical regression was conducted. In Step 1, age and time since most recent bushfire experience were entered. In Step 2, post-traumatic growth was entered followed by three coping variables in Step 3. Relevant test assumptions were met and the sample size was considered adequate (43). Results, summarised in Table 2, revealed that post-traumatic growth (in Step 2) accounted for a significant amount of variance in PTS, $F(1, 61)=8.50, p=0.005$ ($R^2_{\text{Adjusted}}=0.16$) and coping strategies as a set (in Step 3) further explained significant amount of variance in PTS, $F(3, 58)=13.99, p<0.001$ ($R^2_{\text{Adjusted}}=0.49$). Specifically, both post-traumatic growth (11%) and avoidant coping (12%) explained significant amounts of unique variance in PTS, with an overall variance of 54% explained by this model. Problem-focussed and emotion-focussed coping were significantly correlated with PTS, but did not explain significant amounts of unique variance after controlling for other predictors in the regression model. Of the two covariates entered in Step 1, age was not significantly associated with PTS. On the other hand, as expected, respondents who had recently experienced a bushfire event also reported significantly more PTS, a finding similar to the correlational analysis.

Finally, to examine which variables were the best predictors of post-traumatic growth (the DV) after the experience of bushfire, a second hierarchical regression analysis was conducted. In Step 1, age and time since most recent bushfire experience were entered. In Step 2, PTS was entered followed by three coping variables in Step 3. Relevant test assumptions were met.

Table 1. Pearson's correlation coefficients, means and standard deviations (SD) of key study variables

Variables	1	2	3	4	5
1. Post-traumatic stress	-	0.56**	0.56**	0.64**	0.38**
2. Problem-focussed coping		-	0.76**	0.50**	0.47**
3. Emotion-focussed coping			-	0.55**	0.66**
4. Avoidant coping				-	0.30*
5. Post-traumatic growth					-
Mean	36.58	10.69	21.52	12.89	60.49
(SD)	(17.00)	(5.15)	(7.93)	(4.13)	(27.86)

* $p<0.05$ (two tailed) ** $p<0.01$ (two tailed)

Table 2. Summary of hierarchical regression analysis: examining post-traumatic growth and coping strategies as predictors of PTS

Variables	R	R ²	B [95% CI]	β	sr ²
Step 1	0.30	0.09			
Age			0.05 [-0.25, 0.36]	0.04	<0.01
Time since most recent bushfire experience			-1.32 [-2.39, -0.26]	-0.30*	0.09
Step 2	0.45**	0.11**			
Post-traumatic growth			0.21 [0.07, 0.35]	0.34**	0.11
Step 3	0.73***	0.34***			
Problem-focussed coping			0.90 [-0.04, 1.83]	0.27	0.03
Emotion-focussed coping			0.21 [-0.53, 0.95]	0.10	<0.01
Avoidant coping			1.76 [0.85, 2.67]	0.43***	0.12

Note: R = multiple correlation, B = unstandardised beta coefficients, β = standardised beta coefficients, sr² = squared semi-partial correlation (amount of unique variance in the dependent variable [DV] explained by a predictor after controlling for the other predictors in the model), DV = post-traumatic stress, *p<0.05, **p<0.01, ***p<0.001

Table 3. Summary of hierarchical regression analysis: examining PTS and coping strategies as predictors of post-traumatic growth

Variables	R	R ²	B [95% CI]	β	sr ²
Step 1	0.18	0.03			
Age			0.10 [-0.42, 0.61]	0.05	<0.01
Time since most recent bushfire experience			-1.30 [-3.10, .49]	-0.18	0.03
Step 2	0.39*	0.12**			
Post-traumatic growth			0.59 [0.19, 1.00]	0.36**	0.12
Step 3	0.69**	0.32***			
Problem-focussed coping			-0.16 [-1.85, 1.53]	-0.03	<0.01
Emotion-focussed coping			2.67 [1.58, 3.76]	0.76**	0.22
Avoidant coping			-0.92 [-2.68, 0.85]	-0.14	<0.01

Note: R = multiple correlation, B = unstandardised beta coefficients, β = standardised beta coefficients, sr² = squared semi-partial correlation (amount of unique variance in the DV explained by a predictor after controlling for the other predictors in the model), DV = post-traumatic growth, *p<0.05, **p<0.01, ***p<0.001

Results, summarised in Table 3, revealed that the overall model explained significant amount of variance of 47%, with PTS (in Step 2) accounted for a significant amount of variance in post-traumatic growth, $F(1, 61)=8.50, p=0.005$ ($R^2_{\text{Adjusted}}=0.11$) and coping strategies as a set (entered in Step 3) further explained significant amount of variance in post-traumatic growth, $F(3, 58)=11.75, p<0.001$ ($R^2_{\text{Adjusted}}=0.42$). Specifically, both PTS (12%) and emotion-focussed coping

(22%) explained significant amounts of unique variance in post-traumatic growth. Problem-focussed and avoidant coping were significantly correlated with post-traumatic growth, but did not explain significant amounts of unique variance after controlling for other predictors in the regression model. Of the two covariates entered in Step 1, both age and time since most recent bushfire experience were not significantly associated post-traumatic growth.

Discussion

The present study aimed to assess the relationships among PTS, coping strategies and post-traumatic growth in Australian community members who had experienced a bushfire event. Bivariate correlations revealed that PTS was associated with increased use of all three coping strategies and post-traumatic growth, and that post-traumatic growth was associated with greater use of all three coping strategies.

Our findings did not support the first hypothesis that problem-focussed coping would be associated with lower levels of PTS. However, we found support for the second hypothesis that emotion-focussed and avoidant coping strategies would be associated with higher levels of PTS. Contrary to our predictions, hierarchical regression analyses revealed that post-traumatic growth and only avoidant coping significantly predicted higher levels of PTS, whereas PTS and only emotion-focussed coping significantly predicted greater post-traumatic growth. The following sections provide an explanation of the obtained results, limitations, future research directions and implications of the present findings.

Exploring post-traumatic stress and coping

The finding that problem-focussed, emotion-focussed, and avoidant coping strategies were strongly correlated with PTS following exposure to a bushfire event was consistent with previous disaster-related research (22). Given that coping is conceptualised as a process of stress management (12), and therefore stress must be present for coping strategies to be mobilised, this relationship has a theoretical basis. Additionally, an explanation for these findings may be found in the Transactional Model of Stress and Coping (15) that states that should an individual perceive a situation as being controllable, problem-focussed coping strategies will be employed. Similarly, if an individual perceives a situation as being uncontrollable, emotion-focussed and avoidant coping strategies will be utilised (13).

Although bushfires are unpredictable and unique in nature, it is nevertheless possible that the experience of bushfires in Australia is perceived as controllable by some individuals, and uncontrollable by others (44). Hence, as we have found, all types of coping strategies are associated with bushfire-related stress. Moreover, it is possible that as trauma exposure increases, so too does the likelihood that individuals will employ additional coping mechanisms. Many Australians are faced with the prospect of dealing with multiple bushfire events throughout their lifetimes, increasing the likelihood for utilisation of numerous coping strategies.

Coping strategies as predictors of post-traumatic stress Avoidant-focussed coping

The use of avoidant coping strategies after exposure to potentially stressful situations, including natural disaster,

is predictive of PTS symptoms (22). Our study supported these findings even after controlling for other predictors in the regression model. As PTS is itself characterised by avoidance, it is not surprising that the use of avoidant coping strategies, allowing an individual to disengage from emotional consequences of a stressful event (19), are predictive of higher levels of stress.

Problem-focussed coping

We found that problem-focussed coping was not predictive of reduced PTS after statistically controlling for other predictors in the regression model, which is contrary to previous research suggesting that active, problem or task-focussed coping is related to lower levels of stress (22). However, Pooley et al (21) found that active problem-focussed coping did not predict lower levels of stress in disaster-affected populations in Australia. Therefore, in line with this research, it may be that differences in coping strategies are context-based and culturally or socially influenced.

Emotion-focussed coping

Inconsistent with previous research (5,22), we found emotion-focussed coping was not significantly predictive of higher levels of PTS, after statistically controlling for other predictors in the regression model. Previous research postulates that higher levels of stress may be due to a perceived lack of control, thereby increasing the adoption of emotion-focussed coping (5,22). However, our findings suggest that individuals who possessed a tendency to utilise emotion-focussed coping strategies did so for reasons other than perceived lack of control. After the experience of bushfire, it is plausible that emotion-focussed coping was used as a means of transforming stress and, therefore, emotion-focussed coping was not found to be predictive of PTS.

Exploring post-traumatic growth and post-traumatic stress

Consistent with previous studies, we found that higher levels of PTS were associated with greater post-traumatic growth (21). This finding gives credence to the idea that the perceived severity of the threat presented by a traumatic event acts as a catalyst, with higher degrees of perceived threat more likely to elicit post-traumatic growth (29). Similarly, this study confirms that PTS and post-traumatic growth occur concurrently. Furthermore, our results showed that both PTS and emotion-focussed coping explained significant amounts of unique variance in post-traumatic growth.

Exploring coping and post-traumatic growth

Consistent with previous research, as the utilisation of coping strategies increased, so too did post-traumatic growth (5,20,21). The relationship between these variables may in part be explained by Cognitive Adaptation Theory, which suggests that post-traumatic growth results from a desire to mediate negative consequences, through positive cognitive reappraisal of difficult circumstances (25,32).

Thus, without a desire to reappraise difficulties or cope in this way, post-traumatic growth may not be possible, suggesting a noteworthy relationship between coping strategies and post-traumatic growth.

In our study, results showed all coping strategies were significantly correlated with post-traumatic growth, with emotion-focussed coping showing the strongest effect. This coping style typically includes behaviours such as venting, humour, seeking emotional support and positive reframing. Interestingly, previous studies relating to the employment of emotion-focussed strategies in chronic health disorders have shown this coping style to be associated with lower quality of life and wellbeing (13). It is therefore suggested that in this circumstance, even though the bushfire event may appear uncontrollable, there remains an opportunity for growth, change and hope for the future, different perhaps to the experience of a chronic illness. It is also possible that differences in the degree of exposure to the bushfire itself and other factors, such as individually experienced losses, might determine individuals' sense of control and, as a consequence, their preferred coping strategies.

Coping strategies and PTS as predictors of post-traumatic growth

Emotion-focussed coping

Consistent with previous research, emotion-focussed coping was an important predictor of post-traumatic growth (21), suggesting post-traumatic growth may be conceptualised as the ability to find meaning in the experience of an adverse event, as opposed to changing the experience (12). Similarly, emotion-focussed coping is usually mobilised when an individual perceives that a situation must be endured, rather than changed (19). It is therefore possible that in situations that are perceived as unchangeable, such as various aspects of the bushfire experience, emotion-focussed coping is utilised as a means of reducing stress. In turn, the very nature of emotion-focussed coping encourages individuals to emotionally reflect on, and find benefit in, their circumstances. The two concepts appear to display a significant degree of theoretical overlap.

Problem-focussed and avoidant coping

In contrast to previous studies, we did not find either problem-focussed coping (3) or avoidant coping (22) as significant predictors of post-traumatic growth after statistically controlling for other predictors in the regression model. Possibly these coping styles do not encourage individuals to contemplate and, therefore, emotionally find benefit from, their adverse experience of bushfire, in the same way as the more reflective process of emotion-focussed coping.

A further consideration relates to the coping model itself, which is derived from a cognitive-relational theory of emotion. Trauma is typically associated with a distortion in previously held beliefs as well as profound changes in how individuals make meaning of their experience. Therefore, the model may not always apply to traumatised individuals. Also, the efficiency of coping styles

might differ across various stages of recovery, eg. emotion-focussed coping has been found to be associated with reduced quality of life and wellbeing over the long term, but may help in the short-term. So too, avoidant coping might initially be helpful for people who are faced with unfathomable loss.

Post-traumatic stress

In line with previous studies that have suggested that stress accounts for a significant amount of the variance in post-traumatic growth (21), our results showed a strong and positive correlation between PTS and post-traumatic growth, and between PTS and all three coping strategies. This is an important and positive finding, since the majority of our sample had experienced more than one bushfire event in their lives. It suggests the employment of all types of coping strategies in the process of psychological adjustment and growth and increased capacity among individuals to derive positive psychological outcomes. These results are also supported by Gibbs et al (4), who found that positive post-traumatic growth was more likely to be reported by people from medium-high affected bushfire communities and those experiencing more PTS. This study also found that women were more likely to report positive post-traumatic growth and that positive change in mental health was evident over time. However, for others, there was a delayed onset of mental health problems such as PTSD (4).

Limitations and future research

Although the sample size was deemed adequate (44), generalisability of results may be limited (41). Factors influencing this include the fact that more than 70% of respondents were female, and over 60% were tertiary qualified. Larger scale studies are therefore required to verify the findings of this study and to explore how other individual difference characteristics may contribute to the development of PTS and growth. Furthermore, a significant limitation of the present study was that it consisted of a retrospective snapshot of an experience of bushfires in Australia. Future studies involving longitudinal designs would greatly enhance the understanding of the bushfire experience, given the seasonal nature of bushfires in Australia. Similarly, longitudinal designs could take into account other variables that may impact PTS and post-traumatic growth, such as pre-fire levels of psychiatric morbidity as well as changes in psychological reactions to bushfire over time.

Implications

This study has implications for psychological and mental health interventions which focus on resilience building or treatment following bushfire. It has long been argued in the literature that a strengths-based approach aids in recovery (30). In communities that are seasonally threatened by bushfires, the strengths-based approach would indicate that not only are post-disaster stress reduction interventions required, but so too are preparedness programs that include strategies for promoting growth and positive adaptation (45).

Similarly, although emotion-focussed critical incident stress debriefing has been criticised (47), the findings of this study highlight the need to continue to educate communities about potential emotional responses to bushfire, in terms of not only PTSD, but also post-traumatic growth and coping strategies. Providing information about how different coping styles may alleviate the risk of PTSD, or conversely increase the likelihood of positive psychological growth, following the experience of bushfire may serve to increase resilience in vulnerable communities.

Conclusion

No previous study has sought to explore the relationships between PTSD, coping and post-traumatic growth in Australians who have experienced a bushfire event. The present study therefore provides a valuable contribution to the literature in highlighting the unique ways in which individual and disaster-related variables interact within this population.

Our findings show that both PTSD and post-traumatic growth are concurrently possible following the experience of bushfire in Australia. As PTSD symptoms increase, so too does the experience of growth. It is therefore important that when working with bushfire-affected individuals to acknowledge both PTSD as well as the ability to grow or find benefit in adverse circumstances.

Another major finding of our study was that bushfire-affected community members appear to utilise a variety of coping strategies. Avoidant coping positively predicted PTSD and emotion-focussed coping positively predicted post-traumatic growth. This knowledge may enable clinicians to identify at risk individuals and assist bushfire affected persons to improve psychological adjustment in the future.

Conflict of interest

The authors declare no competing interests. The authors of this paper have completed the ICMJE conflict of interest statement.

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