

Evaluating the effectiveness of psychological preparedness advice in community cyclone preparedness materials

Morrissey & Reser explore whether psychological preparedness information helps individuals to prepare for the onset of cyclones.

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This paper addresses the case of tropical cyclone warnings in Northern Australia and briefly outlines the nature, logic, and findings of a psychological preparedness intervention trialed in Cairns, Queensland, during the 1996/1997 cyclone season. The aim of the research was to trial, evaluate and refine an innovative natural disaster public education and warning communication intervention focusing on tropical cyclone preparedness and response. This risk communication intervention involved the dissemination of selected psychological information designed to enable individuals to better cope with themselves and others in an increasingly threatening situation. The psycho-educational content material incorporated was derived from 'Stress Inoculation Theory' (Meichenbaum, 1985; 1994; Meichenbaum & Deffenbacher, 1988). The research found that the pre-cyclone season period is a critically important time and venue for prevention and mitigation, and that psychological factors and processes during this threat period are of singular importance to effective coping and adaptive responding. The research also clearly indicated that there are a substantial number of residents in cyclone-prone communities for whom chronic anxiety, avoidant coping styles, and prior traumatic experience constitute both a substantial vulnerability factor and a genuine impediment to psychological and physical preparedness.

The nature and effectiveness of natural disaster warning messages and community education and preparedness initiatives and materials constitute areas of surprising research neglect in an era in which considerable investment is being made in disaster reduction and mitigation. Likewise, pre-impact psychological

intervention has been an area of surprising omission in multidisciplinary writings about human response to natural disaster, with Australian bushfire preparedness work being a noteworthy exception (e.g., Rohrmann, 1998, 2000). This is not to say that there does not exist an extensive literature on human response to natural and man-made hazards, but much of this discourse relates to either post impact stress and coping issues or organizational preparedness and response. The literatures which seemingly focus more directly on individual risk perception and human response to threatening events are typically not psychological (e.g., Douglas & Wildavsky, 1982; Freudenburg & Pastor, 1992; Mileti & Sorensen, 1990; Saarinen, 1982; Turner, Nigg & Paz, 1986) and do not tend to address the individual experience of a threatening and potentially cataclysmic event. While this says more about interdisciplinary fragmentation than any reality, it is surprisingly the case that there has been very little research done at the individual response level as distinct from collective community and organizational impact (e.g. Baum, 1987, 1991; Bell, Greene, Fisher, & Baum, 2000; Earle & Cvetkovich, 1990).

While the clear priorities and research agenda of the recent United Nations declared International Decade of Natural Disaster Reduction were 'to reduce natural disasters through prevention, mitigation and preparedness measures' (United Nations resolution, 1994), these objectives are far from being realised, one year from the close of the decade, in terms of any focused research on the human and psychological side of risk communication or preparedness. Of particular neglect are *psychological* preparedness and the nature of human response to natural disaster *warnings* as distinct from actual impact (e.g., Reser, 1996). The vast proportion of natural disaster research is focused on either the physical event itself, or post impact recovery. Yet from a preventive and mitigation perspective, preparedness and human response to risk communication and threat appraisal are a critical concern. It is noteworthy, indeed remarkable, that so little research has focused on the psychological processes

underlying threat appraisal and coping with natural disaster warning messages, and that no research to date has explored the utility of a stress inoculation, emotion management procedure such as that described in this paper.

This paper addresses the case of tropical cyclone warnings in Northern Australia and briefly outlines the nature, logic, and findings of a psychological preparedness intervention trialed in Cairns, Queensland, during the 1996/1997 cyclone season. The intervention constituted a modified stress inoculation procedure based on the work of Meichenbaum (1977, 1985). The occurrence of Cyclone Justin in the 1996/1997 season allowed for a pre and post event evaluation of a spectrum of psychological variables and preparedness measures.

Aim of the research

The aim of the research was to trial, evaluate and refine an innovative natural disaster public education and warning communication intervention focusing on tropical cyclone preparedness and response. This risk communication intervention involved the dissemination of selected psychological information designed to enable individuals to better cope with themselves and others in an increasingly threatening situation. This information was designed to complement conventional public education materials independently distributed and made available through the Cairns City Council, the Bureau of Meteorology, and other regional authorities. The psycho-educational content material incorporated was derived from 'Stress Inoculation Theory' (Meichenbaum, 1985; 1994; Meichenbaum & Deffenbacher, 1988). Stress Inoculation Theory (SIT) is a well-researched emotion management strategy and cognitive behavioural procedure, which enhances individuals' ability to anticipate, identify, and cope with stressful situations and stress-induced emotional responses. The intervention was intended to address the well-documented non-preparedness of Northern Australian coastal communities vulnerable to tropical cyclones. The logic for employing such a procedure was premised on the arguments that anxiety in the face of an impending natural disaster threat 'gets in the way' of adequate preparedness, and that being able to anticipate, recognise and manage such anxiety and other emotional responses to natural disaster threat will enhance successful coping, promote more adequate preparedness, and ensure that preparedness measures are reinforced by experienced stress reduction and competence in an emergency situation (e.g., Reser, 1980, 1996; Reser & Morrissey, 1995; Morrissey & Reser, 2001). The intervention is also viewed as having substantial preventive value in reducing post-traumatic stress.



Coming to terms with the aftermath

Methodology

The study was an evaluation or outcome study, involving a naturally occurring variable/event (a severe cyclone warning) as well as the presence or absence of an earlier psychological intervention. The methodology of the study conformed to what is known as a 'pre-test – post-test control group design' (e.g., Campbell & Stanley, 1963; Singleton & Straits, 1999). See Table 1. Essentially this is a study in which measures are taken both before and after an experimental procedure or a trialed intervention. In this research the methodology also included a second or 'hanging' control group, which was only surveyed following the cyclone warning to independently assess the effect of the pre-season survey itself. The research can also be considered an evaluation study in that a primary objective was to evaluate the effectiveness of a planned intervention (e.g., Lipsey & Cordray, 2000; Posavac & Carey, 1997; Rossi, Freeman & Lipsey, 1999). The study employed an experimental design and survey methodology which involved 440 residents completing two sequential questionnaires, each of which was approximately nine pages in length, depending on research condition and pre or post-event version, with a further 200 residents completing a post-event only version (Reser & Morrissey, 2000).

Participant households were selected using a stratified street and house sampling procedure, and were randomly assigned to each of the three research conditions. The Cairns suburbs included in the study were essentially from Trinity Park north, including the suburbs of Trinity Park, Smithfield, Trinity Beach, Kewarra Beach, Clifton Beach, and Palm Cove. These

Table 1: Research design.

	Pre-Season Survey Only	Psychological Preparedness Intervention	Severe Cyclone Warning Situation	Post-Event Survey
Group 1 Intervention	O ₁	X ₁	X ₂	O ₂
Group 2 Control	O ₁		X ₂	O ₂
Group 3 Hanging Control			X ₂	O ₂

O₁ = pre-season survey, X₁ = psychological guide, X₂ = Justin warnings and threat situation, O₂ = post-event survey

suburbs were selected for logistical reasons, as well as the fact that they were particularly ‘vulnerable’ to cyclonic winds and storm surge threat. The sampled area included some areas of relative safety and elevated ground, extending to the hills on the western side of Captain Cook Highway, and representative strata of socio-economic circumstances. A return rate of 72 per cent and attrition rate of only 28 per cent were surprisingly good for a survey-based study, reflecting a drop-off/pick-up procedure and careful nonreturn follow-up, as well as impressive co-operation and interest on the part of residents of these Northern Beach communities.

The 1996/1997 cyclone season in Cairns

The initiating of the pre-season community survey was delayed by a late funding decision in December of 1996. The survey was nonetheless undertaken between the 14th and the 21st of December, 1996, in Cairns, North Queensland. While the original research intention was to collect pre-event data in both Cairns and Townsville, thereby maximising the opportunity of encountering a threat situation, ultimate funding and timing did not allow for this more comprehensive undertaking. One half of the 440 households surveyed at this point in time, the treatment and pre-test control groups, received a copy of the psychological preparedness guide. The objective was to re-administer a post-event version of the survey following a severe cyclone warning situation. While a number of cyclone warning situations did include the Cairns region over January of 1997, none were of a magnitude or proximity to justify implementing the post-event survey until the Cyclone Justin warning situation occurred on 7 March, as an extensive system being experienced over most of the Coral Sea. This system intensified to a severe category 3 cyclone off the coast of southeast Papua New Guinea on 17 March. The difficult decision was when to administer the post-event survey in this situation, given the extended duration of the warning period and the erratic nature of Cyclone Justin. (See Figure 1). An important concern was that a too immediate distribution of the



Courtesy of Bureau of Meteorology Queensland

Wave action and seaspray along the foreshore near Cairns

survey following a physical impact would be intrusive, insensitive, and counterproductive. A decision was finally made to administer the post-event survey on the 13th of March, following Met Bureau advice that the cyclone was moving out to sea and towards Papua New Guinea. It was also felt that the severity of an imminent and threatening category 3 cyclone impacting on the Cairns region was more than adequate to evaluate the effectiveness of the psychological preparedness guide, and the judgement was made that the integrity of the study would have been compromised if much more time had elapsed while waiting for a final resolution of Cyclone Justin's course. What must, of course, be factored into the results is the fact that Cairns residents were theoretically still in a cyclone threat situation when completing the post-event questionnaires, and, in fact, Cyclone Justin did return to pass right over Cairns, albeit at diminished strength, on the 22nd of March. Respondents therefore completed their post-event questionnaire approximately three months after the pre-season survey, and following six days of a very large cyclone system sitting off the coast of Cairns, with attendant watches and warnings.



Figure 1: The story of Cyclone Justin

Findings

The meaningfulness of the results of a study such as this depends in part on the comparability of the treatment and control groups prior to an investigated event or intervention. The research groups did differ significantly with respect to gender and education. This was particularly the case for the hanging control group, which was characterised by a higher proportion of female respondents (61 per cent vs 51 per cent and 53 per cent) and residents with secondary education (61 per cent vs 55 per cent and 45 per cent) as contrasted with the intervention and control groups. As subsequent ANOVA tests evidenced no significant differences between the education groups in cyclone preparedness or response, it was considered that the variance in education profile did not materially influence other comparisons in the reported analyses. Gender differences are a concern, however, as gender features as an important variable in subsequent analyses, for example, with respect to reported prior traumatic experience. No significant differences were found between intervention, control and hanging control groups with respect to age, cyclone experience, years lived in Cairns or North Queensland, pre-cyclone season physical preparedness, or with respect to the personality trait of anxiety. Notwithstanding this absence of statistically significant differences, a further noteworthy difference between the intervention and control groups was that whereas 52 per cent of the intervention group had prior direct experience with cyclones, 62 per cent of the control group reported such prior experience. As well the pre-cyclone physical preparedness score of

the intervention group was slightly better than that for the control group (14.7 vs 13.2), a matter addressed later by a consideration of relative changes in physical preparedness for each group. The chance but consequential differences in the hanging control group with respect to the relative proportion of male and female respondents were substantial enough to warrant its non-inclusion in group comparisons relating to the effectiveness of the psychological preparedness intervention in the following analyses and discussion.

Intervention and control group comparisons

Several initial and important questions in the pre-season questionnaire related to how concerned residents were at the beginning of the cyclone season. More specifically, residents were asked to indicate how *concerned*, *confident*, *frightened*, *anxious*, and *helpless* they felt via standard six-point semantic differential rating scales. They were also asked these questions immediately after the Cyclone Justin warning situation. Answers to these initial survey questions allowed the researchers to document what has been an area of guesswork rather than fact, i.e., how people are feeling and thinking coming into the cyclone season (in this instance toward the end of December), and to compare that with their feelings and thoughts immediately after the cyclone warning situation. There does exist some comparative data from Cyclone Joy for the Cairns region, where survey results following Joy indicated that 36 per cent of

Courtesy of Bureau of Meteorology Queensland.

Table 2: Mean rated emotional states at the beginning of the cyclone season and after Cyclone Justin.

Intervention Group (n=137)							
	Mean Pre-season Rating	Mean Post-event Rating	Mean Change	Standard Error	Cohen's 'd'	t	p
Anxiety	3.05	2.69	-.36	.14	.44	2.52	.013
Fear	2.54	2.13	-.40	.12	.58	3.31	.001
Concern	3.25	3.25	0	.16	.01	.05	ns
Confidence	3.84	4.60	+.75	.13	-.86	-5.8	.000
Helpless	2.43	1.81	-.62	.13	.83	4.8	.000
Control Group (n = 138-140)							
Anxiety	3.05	2.63	-.42	.14	.25	2.88	.005
Fear	2.58	2.16	-.41	.13	.26	3.05	.003
Concern	3.16	3.63	+.47	.16	-.24	-3.01	.003
Confidence	3.79	4.15	+.36	.15	-.23	-2.45	.016
Helpless	2.40	1.81	-.57	.13	.38	4.37	.000

Note: Cohen's 'd' provides an index of effect size independent of sample size or differing units of measure (e.g., Cohen, 1988; Shaughnessy et al., 2000).

respondents had been 'very worried' and 31 per cent 'somewhat worried' about Joy (Smithson, 1991).

The results of the pre-season and post-Justin survey responses to the above items are presented in Table 2. These findings tell us that the majority of residents in both the intervention and control groups were moderately concerned and anxious at the beginning of the cyclone season, but reported feeling somewhat less frightened and helpless at this point in time, and their rated confidence was at least modest.

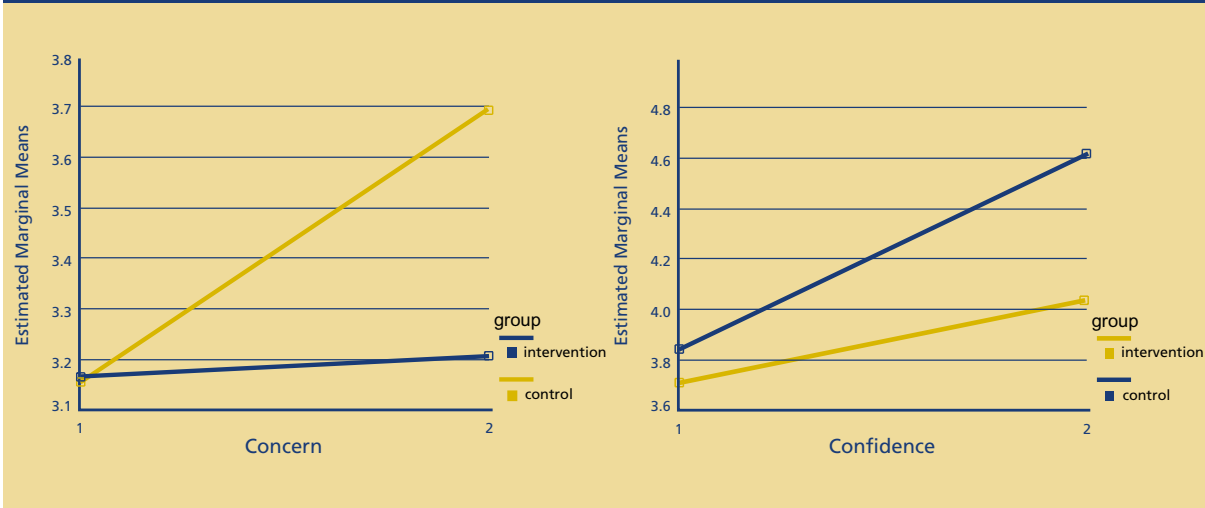
It is clear that these feelings were appreciably heightened during the Cyclone Justin warning situation. The data also tells us that there were considerable individual differences here, with some individuals evidencing high levels of anxiety and helplessness both at the beginning of the cyclone season and during Cyclone Justin. Significant differences in changed emotional state were found for concern and confidence during the cyclone warning period, with those individuals using the guide expressing less concern overall and greater confidence.

All of the changes shown in Table 2 were significant, with the exception of intervention group concern level, which remained stable. These changes were largely as expected and in a logical direction, with anxiety and fear dropping with the actual occurrence of an anticipated event that was relatively benign and supposedly over. As well, there is some evidence that the pre-season survey constituted a modest intervention in itself for the control group. What is of particular importance, however, is that the relative magnitude of change

between intervention and control groups was significantly and substantially different for reported levels of *concern* and *confidence*, with control respondents reporting a significant increase in concern, and intervention respondents showing steady but not increasing levels of concern as well as an increase in confidence which was more than twice that for the control group. See Figures 2 and 3. This provides strong support for the effectiveness of the psychological preparedness guide.

What was of particular relevance to the research was whether those individuals who received and used the psychological guide were able to manage their feelings better during the Cyclone Justin situation. The stress inoculation training intervention is essentially an emotion management training technique. If we compare the intervention group with the control group on these measures, taken immediately after the more acute warning period of Cyclone Justin, it is clear that the use of the guide was effective in managing levels of concern and in increasing levels of confidence. While the changes in levels of reported anxiety, fear, and helplessness do not differ appreciably between the control and the intervention group, it is important to remember that the objective of the psychological preparedness intervention was to enhance the *anticipation, identification, and management of* emotional responses. It was not intended to reduce the anxiety and apprehension which are normal and adaptive human responses to a threatening emergency situation. As well, the air of emergency at the time of post-event survey was substantially reduced, as there was a palpable sense

Figures 2 and 3: Mean change scores in rated concern and confidence from pre-season survey to post-Justin survey.



of relief in the community with the issuing of Met Bureau bulletins to the effect that the cyclone was heading out to sea.

Another straightforward and pragmatic set of questions had to do with whether respondents were reasonably *prepared* with respect to physical preparations at the beginning of the cyclone season, and whether those respondents who received and used the psychological guide were better prepared than the control group at the time of the post-Justin survey. One of the arguments being explored was that anxiety and fear could be getting in the way of physical preparedness, and that poor physical preparedness also reflected the use of a variety of maladaptive defence mechanisms and distorting beliefs for dealing with anxieties and concerns

(e.g., Reser, 1980; Reser & Morrissey, 1995). Physical preparedness items are shown in Table 3.

These physical preparedness measures were similar to measures used by many other researchers in this area, but included more specificity with respect to whether the item needed attention, whether some actual preparedness activity had taken place, or whether the preparedness measure was completed. The items allowed for a reasonably sensitive composite index of physical preparedness which could be calculated for the beginning of the cyclone season and at the time of the post-event survey (score range was 0–24). The mean physical preparedness score for the intervention and the control group were 14.70 and 13.23 at the beginning of the cyclone season, and 18.85 and 15.00, respectively, at the time of the post-Justin survey.

Table 3: Preparedness activity checklist.

Cyclone preparedness activity	Need attention	Begun attending to this	Completed this activity
Cleaned the yard			
Purchased new batteries			
Purchased emergency food supplies			
Checked or purchased first aid kit			
Checked battery function of radio			
Checked for containers of water			
Filled a spare petrol can			
Checked for candles			
Checked gas cylinder			
Carefully read through cyclone preparedness pamphlet			
Checked emergency numbers			
Checked radio frequencies			

Table 4: Physical preparedness at the beginning of the cyclone season and following Cyclone Justin.

	Pre-season Score	Post Justin Score	Change	Std Error	Cohen's d	t	p
Intervention group (n = 131)	14.70	18.85	4.15	.43	1.95	-8.64	.000
Control group (n = 141)	13.23	15.00	1.77	.53	.70	-3.05	.003

It is clear that respondents were reasonably prepared at the beginning of the cyclone season, and that residents in the intervention group reported a modestly higher level of physical preparedness than those in the control group at the beginning of the cyclone season. This relatively high level of physical preparedness contrasts with media statements during this 1996/1997 season that the Cairns community was, once again, poorly prepared for the cyclone season. It is also clear that levels of preparedness were significantly improved at the time of the post-event survey for both groups. See Figure 4.

These improvements are not surprising in that Cyclone Justin would have motivated many, if not most, residents to get serious about preparedness. Changes between the pre and post-event scores for the intervention group as compared with the control group are, however, of particular interest. The appreciable and significant difference found between intervention group improvement and control group improvement, a score change of 4.15 versus 1.77 ($p < .000$), provides strong support for the effectiveness of the psychological guide. This is a particularly strong finding given the relatively high level of reported physical preparedness at the beginning of the cyclone season, which created, arguably, something of a ceiling effect. Across both groups, the improvement in physical preparedness was

significantly less for those respondents reporting prior traumatic cyclone experience.

An interesting comparison was the difference between the physical preparedness scores of the intervention group and the hanging control group at the time of the post-event survey, as this control group had no exposure to our pre-season survey, which arguably could have constituted an influential intervention in itself. The preparedness score for the hanging control group was 16.43, which was significantly lower than the intervention group but actually higher than the pre-test control group, i.e., the hanging control group reported being somewhat better prepared than the pre-test control group (at the time of the post-Justin survey). This could suggest that the heightening of threat salience and provision of preparedness information, in this case through the completion of the pre-season survey, but without psychological advice, might have actually diminished ultimate preparedness.

Of related interest was whether respondents felt *psychologically prepared* for the cyclone season and the specific warning situation of Justin. The discussion earlier examined levels of reported concern, anxiety and confidence, and how these changed for the intervention and control groups between the time of the pre-season survey and the post-Justin survey. In addition, respondents were asked, at the time of the post-Justin survey, how confident they felt about *being able to cope* with another serious cyclone situation and whether they thought it was *possible to exercise any personal control* over the impact of a cyclone on themselves or their families. The findings in Table 5 again suggest strong support for the effectiveness of the psychological guide. Intervention respondents reported feeling significantly more confident about being able to cope with another serious cyclone situation, they reported that they felt it was more possible to exercise personal control over the impact of a cyclone (although this difference did not achieve significance), and they reported experiencing less concern about the threat of another cyclone.

An additional set of survey questions explored psychological preparedness with respect to a number of specific predictions relating to the psychological guide. The rationale for the stress inoculation training intervention that was provided was that it should enable

Figure 4: Mean change in physical preparedness from pre-season to post-Justin.

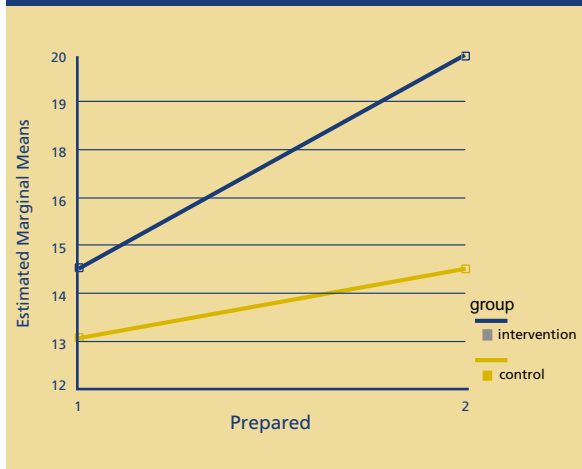


Table 5: Rated confidence, personal control, and concern with respect to another serious cyclone event this season.

	Intervention Group n = 140	Control Group n = 137	Std error	Cohen's 'd'	t	p
How confident at being able to cope	5.07	4.54	.146	.39	3.63	.000
How possible to exercise personal control	4.83	4.61	.161	.15	1.42	.156
How concerned about another threat	3.05	3.47	.195	-.26	-2.18	.003

Table 6: Reported effectiveness ratings of stress inoculation on specific components of stress inoculation.

	Intervention Group n = 138-141	Control Group n = 135-137	Std error	Cohen's 'd'	t	p
Anticipate feelings	4.08	3.23	.21	.65	4.06	.000
Identify feelings	4.08	3.24	.22	.62	3.76	.000
Manage feelings	5.05	4.81	.16	.21	1.50	.135

participants to better *anticipate* their feelings in a cyclone warning situation, to better *identify* particular feelings, and to better *manage* these feelings. All respondents were asked these questions at the time of the post-event survey, directly following their experience with Cyclone Justin. The results for both the intervention and the control groups are presented in Table 6.

The results are very clear. Respondents who used the guide reported being better able to anticipate how they would feel and that they were better able to identify particular feelings. While the intervention group also reported being able to manage their feelings better, this effect was not as marked. There are several points that should be kept in mind in interpreting this latter finding. Such evaluative and reflective self-report items are reasonably different in nature than simpler descriptive self-report items. This makes it somewhat more difficult to interpret and evaluate these statements. Are individuals, for example, able to judge accurately a modest and diffuse improvement in 'emotion management' abilities?

A further set of questions directly asked intervention respondents about their use of the psychological guide and its relative effectiveness and utility. The results are presented in Table 7.

It is clear that 74 per cent of intervention group respondents felt that the guide was useful, with over one third of respondents finding it 'very useful'.

Intervention participants were also asked whether the guide made them feel more or less anxious during the recent cyclone. This item was measured using a 6-point Likert-type scale where '1' indicated less anxiety and '6' indicates greater anxiety. More than 60% of respondents reported feeling less anxious (scoring 1, 2 or 3 on the scale), 14 per cent scored a '4' on the scale, and only 4 per cent indicated a '5' on the scale, with none of the participants reporting greater anxiety ('6' on the scale).

Clearly the above findings relate to self-report items that must be interpreted with caution, but they do reflect the considered judgement of all of those respondents who trialed the psychological guide during an eventful cyclone season. These questions also provide additional

Table 7: Reported utility of psychological preparedness guide.

	n	%	(%) Missing
Not at all useful	10	7%	18%
Somewhat useful	60	40%	
Very useful	48	34%	
Didn't provide any new strategies	29	20%	19.4%
Provided some new strategies	62	44%	
Provided many new strategies	25	17.5%	

and convergent support for the findings examined earlier. They indicate that intervention respondents used the guide during the cyclone season, that such use made them *feel* less anxious, and that the guide provided them with new and helpful strategies for managing their feelings during the Cyclone Justin warning situation.

The post-Justin survey for the intervention group included two items asking whether the psychological preparedness guide provided them with any new strategies for managing their feelings during the cyclone warning situation, and to describe these new strategies. The mean rating for this first item, going from 'not at all' to 'a great deal' suggests that respondents did learn a number of new coping strategies. The kinds of written responses received included repeated reference to self-talk and calming exercises, as well as normalising one's feelings. These responses are very congruent with the nature of the psychological advice and strategies included in the preparedness guide.

"We talked a lot more about our feelings"

"I talked to myself and others about what we could do to stay safe"

"Felt good knowing that being anxious is ok"

"The guide made my feelings feel normal. I don't feel so isolated"

"Talked about the feelings that occurred instead of pretending they were not there"

"Think things through – don't panic"

While it is questionable that these were entirely 'new strategies', e.g., many respondents may have simply learned how to better anticipate and identify particular feelings, it seems clear that the guide facilitated respondents actually using these procedures and feeling better about doing so.

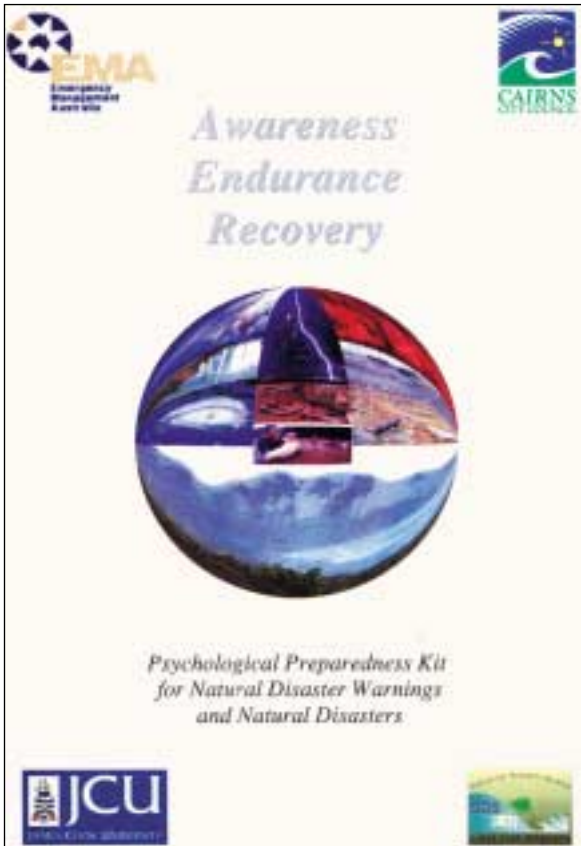
Did the psychological guide help some people more than others?

An important aspect of this research concerned whether the psychological preparedness guide was differentially effective for different types of individuals. There are multiple theoretical reasons for expecting that the stress inoculation and management components of the psychological preparedness material might be less effective for individuals characterised by moderate to high chronic anxiety and/or prior and traumatic cyclone or other natural disaster experience (e.g., Gibbs, 1989; Gist & Lubin, 1989; Lazarus, 1991; Myers, 1994; NAMHC, 1996; Russell, Goltz & Bourrque, 1995; Watson & Clark, 1984). Briefly, these theoretical arguments relate to the fact that chronically anxious or previously traumatised individuals might well need more assistance than that which a brief self-instruction guide on managing emotions might be able to provide. As well it was possible that the stress induction component of an SIT intervention might have

heightened anxiety for those 'normally high anxious' respondents to an extent that self-directed cognitive behavioural management techniques might not have been sufficient. It was also the case that the overall level of preparedness for more highly anxious individuals or those with prior traumatic cyclone experience might be expected to be relatively low, possibly reflecting selective avoidance strategies and an escalating experience of anticipatory stress and panic.

Variables of particular note that were examined in this study included the *demographic* variables of age, education and gender; the '*personality*' variables of trait anxiety, coping style, optimism-pessimism, and self-efficacy; and the *situational* variables of knowledge, prior cyclone experience, threat appraisal, and perceived control. The two variables of particular relevance to the differential efficacy of the intervention, and to the hypothesised vulnerability of particular residents were the personality variable of *trait anxiety* and the person-situation variable of *prior experience*. Previous research has shown that trait anxiety is positively associated with experienced stress in an emergency situation and inversely related to physical preparedness (e.g., De Man & Simpson-Housley, 1987, 1988; Dooley et al., 1992). Research which has examined the role of prior experience in disaster preparedness and response (e.g., Baker, 1989; Faupel & Stiles, 1993; Nielson & Lidstone, 1998; Riad & Norris, 1998; Sattler, Adams & Watts, 1995; Smithson, 1991) has reported very mixed findings, suggesting that experience contributes to better preparedness under some circumstances and conditions, but not in others. The previous findings for Cairns and Townsville residents were that prior experience did not appear to be related to preparedness (Smithson, 1991). This aspect of the current study particularly addressed whether the psychological preparedness guide was less helpful for those residents who normally experienced moderate to high anxiety and for those individuals who had prior but very stressful experience with cyclone situations (Walsh, 1999).

The focus of the data analyses relating to whether the psychological preparedness guide worked better for some residents than others was the intervention group. Some information on this group is helpful. It is noteworthy that 65 individuals in the intervention group (44.5 per cent) reported no prior cyclone experience. Respondents were asked, "Have you personally experienced a severe cyclone warning situation?", and then asked, "Have you personally experienced a cyclone event?", with a description of the event requested. This made it possible to establish which respondents had actually been in more than a warning situation. Seventy-two percent of the intervention group (105 individuals) reported having experienced a severe cyclone warning situation previously. Fifty-five percent reported that they had more direct experience with a 'cyclone event'. Of those 81 intervention group respondents reporting prior



Psychological Preparedness Kit for Natural Disaster Warnings and Natural Disasters following from Cyclone Justin research project

cyclone experience, one half (40) indicated that this experience was highly stressful, i.e., they gave a rating of either '5' or '6' on a six point impact of event scale going from '1' (not at all stressful) to '6' (very stressful). These figures provide an interesting profile of an unbiased sample of northern beach community Cairns residents with respect to anxiety and experience. What is clear is that many residents had no prior experience of an actual 'cyclone event', and of those who did, at least half reported the experience to have been very stressful and possibly traumatic.

None of the *demographic variables* explored were significantly related to physical or psychological preparedness, the principal measures of intervention effectiveness, with the exception of gender, with women reporting that they experienced more stress during the Cyclone Justin warning, while men reported feeling more psychologically prepared. In these individual difference analyses psychological preparedness was measured by a composite 'psychological preparedness' score utilising the summed individual self-ratings of concern, confidence, anxiety, helplessness, and fear (see Walsh, 1999).

An examination of the *personality variables* measured identified 20.6 per cent residents in the intervention group as 'highly anxious'. The personality measure

employed was the PANAS scale (Watson & Clark, 1984, Watson, Clark & Tellegen, 1988) and respondents were classified as falling into three anxiety groups depending upon whether their scores fell into the upper quartile, mid quartiles, or lower quartile of the trait negative affect scores (with score range of 10–28). The number of individuals falling into the lower quartile, 'low-anxiety' group was 41(28.1 per cent), the number categorised as 'moderately anxious' was 75 (51.3 per cent), and the number labelled as highly anxious was 30 (20.6 per cent). These respondents classified as being highly anxious with respect to trait anxiety had scores greater than 18.

All personality variables explored, trait anxiety, coping style and prior cyclone experience, were found to significantly influence physical preparedness and psychological preparedness. The results confirm that lower physical preparedness scores were found for highly anxious individuals, for those who often use avoidant coping strategies, and for those with prior and traumatic cyclone experience. The results also confirm that anxiety level and prior experience interact, with high anxious individuals with prior traumatic experience evidencing the lowest physical preparedness levels. These results were very similar for psychological preparedness, with the highest psychological preparedness scores being those for the low anxious, active coping, and no prior experience groups, whereas the lowest psychological preparedness scores were found for the high anxious group, high users of avoidance, and prior traumatic experience groups. Again anxiousness, avoidant coping, and prior traumatic experience were found to significantly interact with each other, with the lowest psychological preparedness scores being evidenced by those highly anxious individuals with prior traumatic experience and an avoidant coping style (see Walsh, 1999 for more details).

Psychological preparedness and vulnerability

There has been a strong consensus among clinical and counselling psychologists and other mental health professionals for many years to the effect that adequate information and preparation for recurrent natural disasters can empower individuals and assist in the prevention of physical and psychological devastation and distress (e.g., Dudley-Grant et al., 2000; Gist & Lubin, 1989; Gist & Stolz, 1982; Lindell & Perry, 1992; Myers, 1994). This consensus is mirrored in the sociological risk communication literature (e.g., Covello, McCallum & Pavlova, 1989; Drabek, 1986; Mileti & Sorensen, 1990; Tierney, 1993). An extensive theoretical and research literature addresses the value of such 'critical incident stress training' for emergency workers, both before and after disaster relief and recovery involvement (e.g., Dyregrov, 1989; Mitchell, 1983; Mitchell & Bray, 1990). Nonetheless there have



Cyclones can be particularly distressing for children

been very few published discussions of what this actually means in practice for those who are not emergency workers, or how psychological preparedness might be operationalised and enhanced in a community preparedness and preventive context. There have also been very few published research findings relating to psychological intervention outcome studies particularly focused on natural disaster public education or warning situations. This may reflect, in part, the overwhelming weight of evidence and professional experience and judgement in other areas with respect to the preventive value of stress inoculation and general emotion management knowledge in emergency situations. It also reflects the difficulty of undertaking intervention-focused outcome studies in the context of unpredictable natural hazards.

A core construct and parameter in natural disaster prevention and mitigation considerations is vulnerability (e.g., Blaikie et al., 1994; Briere, 1995; Buckle, Mars, & Smale, 2000; Cutter, 1993; King & MacGregor, 2000; Salter, 1997). Indeed, this notion has taken on new meaning and life as a key indicator in both risk assessment and the mapping of risk via GIS and other risk representation strategies. Unfortunately these risk management and emergency management discourses make little if any reference to psychological vulnerability or the extensive psychological and health literatures on vulnerability and resilience (e.g., Dohrenwend & Dohrenwend, 1974, 1981; Freedy et al., 1993; Hodgkinson & Stewart, 1991; Katschnigi, 1986; Lazarus & Folkman, 1984; Yager, et al., 1984; McFarlane, 1988, 1989; Monat & Lazarus, 1991; NAMHC, 1996; Spacapan & Thompson, 1991; Zeidner & Endler, 1996). The current research findings and those of many

others document the critical importance of *psychological* mediators of vulnerability and ultimate preparedness and successful coping. These include personality factors such as trait anxiety and coping style, and situational variables such as the nature and extent of prior natural disaster experience and perceived risk. Our current research would indicate that anxiousness and prior traumatic experience are particularly important psychological variables which should be factored into any assessment of 'community vulnerability'. These variables in particular appear to reduce the efficacy of a psychological preparedness intervention such as that trialed, notwithstanding its overall positive role in enhancing community physical and psychological preparedness. Such psychological indicators are measurable, and allow for identification beforehand of those individuals and households likely to be poorly prepared in the event of a cyclone warning situation. It is also the case that it is just such psychological factors relating to chronic anxiety and critical incident distress that are specifically addressed by more focused and intensive anxiety and stress management interventions.

The understandable societal and agency preoccupation with community intervention and recovery in the aftermath of natural disaster events has tended to eclipse the far more extensive human impact of severe warnings and near misses, as in the case of cyclone warnings in a cyclone prone region such as northern coastal Australia. The social science research literature on human response to natural and technological environmental threat clearly documents the powerful psychological impacts of perceived threats (e.g., Baum & Fleming, 1993; Lehman & Taylor, 1986; Cvetkovich & Earle, 1992; Turner, Nigg & Heller Paz, 1986; Wandersman & Hallman, 1993). Indeed the burgeoning literature on risk perception, assessment and communication largely reflects this new understanding that perception is reality and that the warning situation itself can in fact be more distressing than impact, and can have dramatic and long lasting psychological and social impacts (e.g., O'Riordan, 1995; Slovic, 1987, 2000). The research focus of the present study was on the effectiveness of a particular psychological intervention in helping residents manage their emotional response which were hindering adaptive physical preparedness. The research findings, however, with respect to the nature, severity and extent of emotional distress, both before and during a severe cyclone warning situation, and the lasting impact of previous traumatic experience, suggest that a pervasive natural disaster impact, currently neither recognised nor addressed, is the impact of severe cyclone *warning situations* on individuals and communities. These impacts are both serious and consequential, not only in terms of psychological well being and mental health, but because these impacts very directly influence future preparedness and vulnerability (e.g., Reser, 1996).

From a public health perspective it is useful to know that the guide was helpful and improved physical and psychological preparedness for most residents. From a vulnerability perspective it is helpful to know that there are many residents whose chronic anxiety level, coping style, and/or prior traumatic experience with cyclones appears to reduce the overall effectiveness of the guide. It is important to reiterate that fully one half of those residents reporting prior direct cyclone experience found this experience to be highly stressful, and that the proportion of residents who would appear to be prone to high anxiety is reasonably high, one out of five. It was also quite evident in this study that most people were actually quite worried about Cyclone Justin, with situation-precipitated anxiety being widespread. These individual difference findings, along with the intervention and control group comparisons, clearly suggest that there are a large number of individuals who, for reasons of temperament and past experience, find a cyclone warning situation to be particularly stressful and one for which they are typically less well-prepared, physically or psychologically, than other residents. These individuals may benefit from being targeted in future preparedness studies, utilising a more complex intervention (e.g., participation in a group anxiety management and cyclone preparedness program, facilitated by a community mental health professional).

Final window on findings

A final window on what this extensive data set suggests is provided by how people felt when it looked like Cyclone Justin was not going to actually impact on the Cairns region and was heading out to sea. We were particularly interested in whether most people would experience such a situation with a mixture of relief and disappointment, and whether it would be experienced as a near miss or a false alarm. Our own view is that media coverage can strongly influence how people feel following a cyclone warning situation, and that it is vital that preparedness behaviours are reinforced and validated by the media following a serious warning situation. It was pleasing to find that 84 per cent of respondents felt that Cyclone Justin was a 'close call' or 'near miss' situation as distinct from a 'false alarm'. This would indicate that they felt good about their preparedness activities, and that this behaviour was validated by their overall experience during and following the cyclone threat. That 16 per cent of respondents would have viewed the Cyclone Justin warning situation as an over-reaction and a false alarm is still quite worrying, but it doesn't coincide with some problematic media coverage suggesting that the cyclone was a 'fizzer'.

Implications and recommendations for natural disaster public education, warning messages and procedures

The research undertaken was in the context of a tropical cyclone warning situation in Far North Queensland. Any generalisations to other disaster warning situations and circumstances must be done with this qualification in mind. Natural disasters are quite different in many respects, and elicit rather different human responses to risk communications concerning an impending or potential threat (e.g., Bell et al., 2000; Cvetkovich & Earle, 1992; Quarantelli, 1998). Indeed, Quarantelli argues that physical parameters are not sufficient to define and differentiate natural disasters and that a more informative and useful taxonomy and yardstick is with respect to the nature and extent of disruptive impact on the community itself. All of this suggests some caution in generalising findings from a community and regional context such as coastal North Queensland where cyclones are an integral part of 'living in the north'. In particular, communities in cyclone prone regions tend to establish a culture of anticipation and concern, if not preparedness, which influences how disaster preparedness communications are perceived and responded to (e.g., Sims & Bauman, 1972; Renn & Rohrman, 2000; Riad & Norris, 1998, 1999). Similarly individuals living in such regions develop their own personal and prior experience-influenced response pattern to impending cyclone threat, with this particular event having very event-specific meanings and implications. We note this, in part, because the findings of this research are being applied to other natural disaster situations in the context of an underlying and widespread 'all-hazard' approach to natural disaster warning messages and materials in Australia.

One of the most important implications of these research findings is a non-obvious one. We have evaluated the utility of psychological content in community education and preparedness materials, but what happens when such information is not there? The current findings strongly suggest that the provision of preparedness information which heightens the salience, nature, likelihood and magnitude of a natural disaster, without providing adequate and concrete information about what to do and how to deal with such a situation, is likely to result in either a diminished adaptive response to the risk communication or an erosion of existing preparedness motivation and resolve. The data for the second or hanging control group with respect to physical and psychological preparedness indicated that those residents who did not complete a pre-season questionnaire were in fact marginally better prepared physically and psychologically than the control group which completed the pre-season questionnaire. This suggests that heightening the salience and need for natural disaster preparedness, without providing psychological advice and strategies, can in fact be neutralising or even counterproductive with respect to individual and community preparedness. While *almost*



Anxiety accompanies preparedness and can interfere

all natural disaster education and warning materials do include advice and strategies with respect to physical preparedness, *almost none* include information and advice with respect to psychological preparedness. It is arguable that managing one's own psychological response to a disaster preparedness message or warning, or the emotional response of others, is at least of equal importance to actual physical preparedness advice, and that the absence of such advice substantially reduces the effectiveness of the physical preparedness advice and recommendations. This appears to be particularly true for those moderate to high anxious individuals for whom the cyclone season is a source of considerable concern and anxiety, and who, in effect, are most vulnerable.

The argument and the psychological processes involved in risk communication appraisal and response and preparedness activities are somewhat more involved than may be immediately apparent. Our research findings over the past 20 years with cyclone warning preparations suggest that many people are unprepared for the elevated anxiety and concern which accompanies the thinking through and carrying out of standard physical preparedness advice. This anxiety is often unrecognised as such, but is nonetheless distressing, and a common response for many residents is to simply think about other things or stop doing whatever preparedness activity they may have commenced (for example, battening down, checking emergency supplies, or writing down radio station frequencies and emergency service numbers (e.g., Reser, 1980). Anxiety and fear do not just accompany the reading through and thinking about preparedness advice or warning bulletins; it is often an integral and powerful accompaniment to preparedness activities themselves, with these feelings and the activity itself conferring a particular reality and salience to the threat. The clear implication of this argument and both past and current research evidence is that the inclusion of psychological advice about how to anticipate, recognise, and cope with

one's own emotional response to a cyclone threat will enhance the effectiveness of conventional and existing public education and warning materials. The absence of such advice may well diminish and compromise the effectiveness and utility of such materials.

Further effective research on cyclone preparedness and human response to risk communications requires a longer-term research investment and strategic planning. In many ways the most valuable research being undertaken in North America in natural disaster preparedness is that which has targeted particular cities and catchment areas for longitudinal panel studies (e.g., Riad & Norris, 1998; Riad, Norris & Rubak, 1999; Mileti & Fitzpatrick, 1993). Such research initiatives can build up a database and profile of communities, can establish the reliability and appropriateness of measurement, can have in place a methodology and set of procedures for data collection in the event of a warning period or an actual disaster, and can more clearly monitor and assess the experiences over time of particular individuals, households and communities. The far north coast of North Queensland provides an ideal location for such programmatic research and evaluation studies, given the foundation provided by the Centre of Disaster Studies, the composite risk profile of Cairns produced by the Australian Geological Survey Organisation (e.g., Granger et al., 1999), the lead role which has been taken by the Queensland Bureau of Meteorology, and the strong support and commitment of local authorities, such as the Cairns City Council.

Conclusion

The research provides convincing support for the effectiveness of the modified stress inoculation intervention in an actual cyclone threat circumstance. The research design and methodology provided for a very credible and comprehensive evaluation of the psychological preparedness guide, within the constraints of a single study and an ongoing natural disaster situation, and the research data shed considerable light on the nature of residents' cognitive, emotional and behavioural responses and experience at the beginning of the cyclone season and following a severe cyclone warning period. The investment of time, energy and resources in studying the *pre-disaster situation* and *psychological preparedness* as well as physical preparedness has proven to be of substantial value and benefit.

The research findings and substantial media and conference coverage have disseminated the message that the pre-disaster situation, and in particular the pre-cyclone season period, is a critically important time and venue for prevention and mitigation, and that psychological factors and processes during this threat period are of singular importance to effective coping and adaptive responding. The research has also clearly indicated that there are a substantial number of residents in cyclone-prone communities for whom

chronic anxiety, avoidant coping styles, and prior traumatic experience constitute both a substantial vulnerability factor and a genuine impediment to psychological and physical preparedness. The clearly psychological character of this research, the intervention, and the expertise and training of the researchers has served to highlight the importance of professional psychological input as well as the need for transdisciplinary and intersectorial collaboration in the development of effective natural disaster mitigation policies and programs. The findings of this research, undertaken before, during, and following the onset of Cyclone Justin, have allowed for the development of an innovative series of warning statements and educational messages which are being adopted by Emergency Management Australia, and the preparation and publication of a trainer's manual for the facilitation of training workshops focusing on community psychological preparedness (Morrissey & Reser, 2000).

We have attempted to stress that this research study is in many ways exceptional, due to its design, its focus, its disciplinary base, and to the exceptional good fortune of it having been undertaken in the right place at the right time. The data reported here, and the convergent evidence and argument of many other studies eloquently make the case for including psychological advice in natural disaster public education and warning messages and materials. This is happening, here in Australia, to a modest extent, with respect to all hazard brochures produced by Emergency Management Australia. There is nonetheless a pressing public need for more and better advice on how to cope with and better manage one's own emotional and psychological response to dramatic environmental threat or hazard, and that of others. Such human responses constitute very genuine impacts in themselves, whether the event is a serious threat or a physical event, with these psychological impacts often being very stressful, costly and consequential in terms of individual and community vulnerability and resilience.

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Many people are unprepared for the elevated anxiety and concern that accompanies physical preparedness advice

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