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Research Article

Addressing the Psychological Impact of Natural Disasters; A State-Wide Response

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Abstract

Objectives: Evaluate the effectiveness of a state-wide post-disaster Trauma-Focused Cognitive Behaviour Therapy Program (TF-CBT) implemented post-2010-11 Queensland floods and cyclones.

Methods: Assessment and treatment data of participants (aged 18 or over) referred to the local unit of the Specialist Mental Health Program were retrospectively evaluated. In 2012, 215 people entered the treatment program. Pre-and post-treatment measures were, Post-traumatic Symptom Checklist (PCL), Kessler 10 (K10), Global Assessment of Function (GAF) and SF12. Evaluation was undertaken using Cohen *d* to assess treatment effectiveness.

Results: Pre-and-post-treatment PCL (n=173) and K10 (n=171) demonstrated a decline in scores (49.8, SD:16.73 to 33.77, SD:15.44; $p<0.001$ and 27.98, SD:9.2 to 18.81, SD:8.6; $p<0.001$) respectively. The GAF (n=179) pre-post data indicated improved function pre (64.04, SD:10.99 to 79.56, SD:11.56) (pre-post GAF, $p<0.001$). The pre and post SF12 scores were not significant. The Cohen d pre-and-post treatment scores indicated treatment effectiveness PCL (0.996), K10 (1.029) and GAF (1.377). The SF12 showed no effect. Paired scores were significant; PCL (49.54 ± 17.11 to 34.15 ± 15.98 ($t(154) = 18.12$, $p <0.005$), K10 (27.96 ± 9.45 to 19.12 ± 8.72 ($t(152) = 16.79$, $p<0.005$) and GAF (64.79 ± 10.69 to 79.02 ± 11.91 ($t(159) = -18.243$, $p<0.005$) and SF12-Mental Health subscale (45.30 ± 11.31 to 36.33 ± 11.10 ($t(62) = 4.87$, $p<0.005$). SF12-Physical Health subscale was not significant ($t(61) = -0.48$, $p= 0.63$).

Conclusions: A multi-site post-disaster TF-CBT is an effective intervention. The pre-and post-treatment PCL and K10 results indicate considerable morbidity may persist, indicating a need for ongoing psychosocial support.

Keywords: Specialist Mental Health Program; Treatment Outcomes following Natural Disasters; Need for Ongoing Care;

Research Implications

The known: Exposure to natural disasters may result in adverse psychosocial outcomes. While some experience early symptom resolution, others may require ongoing psychosocial care. Intervention studies often include a limited number of participants residing in a localised region.

The new: This Australian naturalistic study of disaster-affected people demonstrates a standardised intervention program for those with chronic symptoms (>6 months duration) can be effective and conducted across rural, regional, and metropolitan centres.

The implications: The study highlights the effectiveness of a state-wide Post-disaster Trauma-Focussed Cognitive Behaviour Therapy. The outcome data demonstrates that ongoing therapy or monitoring may be required beyond the current post-disaster funding model.

Introduction

Australia's susceptibility to natural disasters is emphasised by the 1983 Ash Wednesday and the 2009 Black Saturday Bush Fires [1], the floods and cyclones that affected Queensland in 2010-2011 and the more recent flooding that has affected eastern Australia [2]. These events affect the psychological and economic well-being of communities and individuals in the short term and over time [3].

Post-disaster outcomes depend on various factors, including pre-disaster physical and psychological health, previous life events and social and economic factors [4]. Although many people recover, others may develop post-traumatic stress disorder (PTSD), depression, anxiety, and substance use disorders. Factors such as the severity and duration of the event, access to services, social connectedness, and change in work status influence psychological outcomes [5], with the response capacities and effects in urban and rural areas differing [6].

Timely and effective responses to disasters are an issue for all countries. Variability in the rate of mental disorders after disasters is emphasised by studies that report anxiety rates of 7-42%, complicated grief (28-41%), depression (6.5-38%), PTSD (11-89%), and substance misuse (1.3-24%) [7]. Post-disaster treatment studies are affected by this variation in psychological morbidity, with the broad range of psychological interventions that include cognitive behaviour therapies (CBT), eye-movement desensitisation and reprocessing (EMD-R), pet-assisted therapy and complementary medicines and a limited number of longitudinal studies [8, 9].

A systematic review by Lopes et al. (2014) further highlights the difficulty of determining the most effective post-disaster intervention treatment. The review noted few studies met the criteria for CBT treatment post-disaster, with most related to victims of earthquakes [10].

The 2022 floods affecting the eastern states of Australia, the floods and cyclones in Queensland, Australia, between December 2010 and February 2011, underline the challenges of responding to large-scale disasters. The Queensland events affected 68 of Queensland's 73 Local Government Authorities (LGAs) and 1.3 million people. Cities and towns became isolated, and a major provincial hospital required the evacuation of all their patients [11].

The Queensland disaster response included the establishment of The Queensland Mental Health Natural Disaster Recovery Plan 2011–13 (The Plan). The Plan linked primary health care, non-government organisations (NGOs), community-based supports, psychological first aid programs and established a specialised mental health program (SMHP). The response sought to encourage capacity building and provision of accessible services to at-risk populations through a multilayered approach that included the non-government and primary health sectors and evidence-informed specialist mental health care [12]. SMHP teams were located in areas most affected by the floods and cyclones and focused on treating those 18 and over (Table 1).

Location of Recovery and Resilience Teams	Full-time staff equivalent (FTE)
North Queensland	8
Townsville	8
Central Queensland	7.5
Wide Bay	2
Sunshine Coast	2
Brisbane Southeast Corner	12
West Moreton	12
Darling Downs	10.5
Southwest Queensland	4
Total FTE	**66**

Table 1: Distribution and staff numbers of Recovery and Resilience across State.

Specialist mental health clinicians employed by the program were trained in Skills for Psychological Recovery (SPR) and Trauma-Focused CBT (TF-CBT). Clinicians participated in either face-to-face training or a web-based program focused on providing recovery-orientated trauma-informed care. The TF-CBT program consisted of 12 sessions and included psychoeducation, the development of social skills and problem-solving capacities, relaxation training, affect regulation, cognitive therapy, trauma-focused therapy and stabilisation and safety sessions. The treatment modules were linked with outcome goals established in conjunction with the individual and clinical assessment. Materials developed for the program included a clinician's field guide and psychoeducation handout resources. Supervision was provided by a senior local team member and senior staff attached to the Centre for Trauma Loss and Disaster Recovery [13].

Method

This paper reports a retrospective evaluation of the effectiveness of the TF-CBT program provided by the SMHP to 215 patients affected by the 2010-11 disasters during 2012. Ethics approval was granted by Metro South Health Human Centre for Health Research Ethics Committee (HREC/14/QPAH/472) and Queensland University of Technology (Ethics approval number 1500000016) - A retrospective evaluation of the outcomes of State-wide disaster mental health programs established and delivered following the Cyclones and Floods of 2010-2011.

SMHP clinicians assessed each person after referral to the program. The psychosocial and general health measures assessed the impact of the disaster and reflected assessments identified by Cénat et al. (2020) and a local panel of experts [14]. The assessments included patient narratives related to the event and quantitative measures to assess behavioural, psychological, and social phenomena. Data were obtained at triage, intake and discharge (Table 2).

Standardised Measures	Pre-treatment Screening Measures	Assessment (Self-rated forwarded to the caller)	Discharge Assessment
Flood/Cyclone affected	Narrative Question		
Fear of Dying	Narrative Question		
Losses: (Financial / Personal)	Narrative Question		
Core Bereavement Items (CBI) [a **]	1 item (yes = full CBI)	CBI (if indicated)	
PTSD Checklist – Civilian Version (PCL-C) [c]		PCL-C (self-rated)	PCL-C (self-rated)
National Opinion Research Centre DSM Screen for Gambling Problems (NODS) [b]	1 Item (positive = 4 items)	NODS 4 Items (if indicated)	
Kessler 10(+4) [c]		Full Measure (self-rated)	Full Measure (self-rated
Resilience questionnaire 2 Items	2 Items	Full Measure (self-rated)	
OPTIMISM questionnaire 2 Items	2 Items	Full Measure (self-rated)	
Single Item CATI question	1 item	Full Measure (self-rated)	
Short Form 12 Health Survey (SF12) [c]		Full Measure (self-rated)	Full Measure (self-rated)
Alcohol Use Disorders Identification Test (AUDIT 6) [b]	Items 1 & 2 (score > 4 = Audit 6)	Full Measure if indicated (self-rated)	
Intimate Partners – Aggression (IPA) question [b]	1 Item	Clinician Rated	
Global Assessment of Function (GAF) [c]		Full Measure (Clinician Rated)	Full Measure (Clinician Rated)

Health of the Nation Outcomes Scale (HoNOS / HoNOS 65+) Based on previous two weeks [b]		Full Measure (Clinician Rated)	Full Measure (Clinician Rated)
a: If experienced Bereavement referred to Bereavement Team b: Inadequate data collected for analysis c: Measures used for evaluating effectiveness of treatment program **: If score positive on CBI referred to Bereavement Team			

Table 2: Triage, Pre-program, and Discharge Assessments.

The pre-and-post treatment repeat measures used to evaluate treatment efficacy were the Post-traumatic Symptom Check List Civilian version (PCL-C) [15], Kessler Psychological Distress Scale (K10) [16], Short Form Survey (mental and physical health) (SF12) [17], Global Assessment of Function (GAF) [18] and Health of the Nation Outcome Scales (HoNOS) [19].

The study population was drawn from the 881 people referred to the SMHP in 2012 following the 2010-2011 natural disasters. The duration between disaster exposure and referral ranged from 9 to 22 months. The analysis criteria for the study group (n=215) were that an individual completed an episode of care as evidenced by; delivery of three (3) or more face-to-face sessions, participation in at least one standardised 'Trauma-Focused Therapy Module', and completion of pre-and post-outcome assessments.

Data and clinical information were recorded in an electronic record. Following cessation of the program, de-identified information was entered into a secure database for subsequent evaluation. Independent data entry officers collated the de-identified information for storage in password-protected IBM SPSS (V23) files using a standardised data dictionary.

IBM SPSS Statistics was used to evaluate pre-and post-treatment outcomes. The treatment effect size was calculated by computing the difference between pre-and post-treatment outcome measure means and dividing this by the pooled standard deviation of those means. Effect size values (Cohen *d*) of 0.20 indicate small, 0.50 moderate, and 0.80+ large treatment effects. Larger effect sizes indicate more symptom reduction and fewer residual symptoms at the end of treatment [20].

Results

Program participants lived in Central Queensland(22%), Metropolitan region and Gold Coast (15%), West Moreton (23%), Darling Downs (18%) and South-West Queensland (11%).

The PCL (n=173) pre-and post-treatment scores confirmed symptom reduction (m=49.8, *SD*:16.73 to m=33.77, SD:15.44; p<0.001). Similarly, the K10 (n=171) showed a decline in scores following treatment (m=27.98, SD:9.2 to 18.81, SD:8.6; p<0.001). The GAF (n=179) mean pre-treatment (64.04, SD:10.99) signified social, occupational, and interpersonal functioning difficulties. The post-treatment GAF scores (m=79.56, SD:11.56) reflect improved daily functioning and symptom reduction (pre-post GAF, p<0.001). Analysis of the SF12-Physical Health (SF12-PCS) (p=0.97) and SF12-Mental Health (SF12-MCS) (p=0.24) did not identify a significant change in pre-and post-treatment scores (Table 3). The HoNOS data were excluded from the study due to the number of subjects with missing data.

Cohen *d* pre-and post-treatment scores (pooled variance) were obtained for the PCL (0.996), K10 (1.029), GAF (1.377), SF12-PCS (0.007) and SF12-MCS (0.19) (Table 3). This represented a large effect size for the GAF, PCL and K10 but nil effect for the SF12-PCS and SF12-MCS.

	n	Mean Pre (Post)	SEM Pre (Post)	Standard Deviation Pre (Post)	95% Confidence interval	t value	p-value	95% Confidence interval	Cohens d (effect size) Pooled variance
GAF	179	64.04(79.56)	0.82(0.86)	10.99(11.56)	62.4, 65.7 (77.9, 81.3)	-15.52	<0.001	-17.86, -13.16	1.377
PCL	173	49.8(33.77)	1.27(1.17)	16.73(15.44)	47.3, 52.3 (31.5, 36.1)	9.26	<0.001	12.63, 19.43	0.996
K10	171	27.98(18.81)	0.7(0.66)	9.2(8.62)	26.6, 29.4 (17.5, 20.1)	9.51	<0.001	7.27, 11.07	1.029
SF12-Physical Health (SF12-PCS)	71	44.3(44.21)	1.43(1.55)	12.02(13.05)	41.5, 47.1 (41.2, 47.3)	0.043	0.97 (NS)	-4.07, 4.25	0.007
SF12-Mental Health (SF12-MCS)	73	43.3(45.63)	1.41(1.41)	12.03(12.08)	40.5, 46.1 (42.6, 48.6)	1.17	0.24 (NS)	-6.27,1.61	0.19

Table 3: Treatment Outcomes: Effect Size.

To further assess the effectiveness of the TF-CBT program, a matched-pairs analysis was undertaken (Table 4). Bonferroni corrections were used to account for multiple comparisons. The matched paired pre-and post-dependent t-test for the GAF, PCL, K10 and SF12-MCS found a significant difference for both one-sided and two-sided comparisons (p<0.001) for all these assessments.

Evaluation of the pre-and post-intervention paired scores (Table 4) with a Bonferroni correction was applied to all analyses. Following treatment, the PCL score decreased from 49.54 ± 17.11 to 34.15 ± 15.98 (t(154) = 18.12, p<0.005). The K10 score decreased from 27.96 ± 9.45 to 19.12 ± 8.72 (t(152) = 16.79, p<0.005. The GAF score increased from 64.79 ± 10.69 to 79.02 ± 11.91 (t(159) = -18.243, p<0.005).The matched pairs SF12-MCS demonstrated a decrease from 45.30 ± 11.31 to 36.33 ± 11.10 (t(62) = 4.87, p<0.005). In contrast, the SF12-PCS pre (43.61 ± 11.83) and post-treatment scores (44.56 ± 12.90) did not differ (t(61) = -0.48, p= 0.63).

Comparison Dependent t-test	N	Missing Cases	Mean	SD	95% Confidence Interval	SEM
GAF Pre - Post	160 (160)	36 (36)	64.79 (79.02)	10.69 (11.91)	63.12, 66.46 (77.16, 80.88)	0.85 (0.94)
PCL Pre - Post	155 (155)	41 (41)	49.54 (34.15)	17.11 (15.98)	46.83, 52.26 (31.62, 36.69)	1.38 (1.28)
K10 Pre - Post	153 (153)	43 (43)	27.96 (19.12)	9.45 (8.72)	26.45, 29.47 (17.72, 20.51)	0.76 (0.71)
SF12-MCS Pre-Post	63 (63)	133 (133)	45.30 (36.33)	11.31 (11.10)	42.45, 48.15 (33.54, 39.13	1.43 (1.40)
SF 12 PCS Pre-Post	62 (62)	134 (134)	43.61 (44.56)	11.83 (12.90)	40.61, 46.62 (41.29, 47.84)	1.50 (1.64)

Test	Mean	SD	SEM	95% CI	t	df	One-sided 'p'	Two-side 'p'
GAF Pre - Post	-14.23	9.87	0.78	-15.77, -12.69	-18.23	159	<0.001	<0.001
PCL Pre - Post	15.39	10.57	0.85	13.71, 17.07	18.12	154	<0.001	<0.001
K10 Pre - Post	8.84	6.52	0.53	7.80, 9.88	16.79	152	<0.001	<0.001
SF12-MCS Pre-Post	8.97	14.63	1.84	5.29, 12.65	4.87	62	<0.001	<0.001
SF 12 PCS Pre-Post	0.95	15.53	1.97	- 4.86, 2.99	-0.48	61	0.32	0.63

Table 4: Treatment Outcomes Matched Pairs Analysis: Comparison Dependent t-test (Pre-Post).

As shown in Table 5, the ES analyses revealed a large Cohen *d* and Hedges *d* ES for the pre-and post-GAF, PCL and K10. The SF12-PCS ES was less than zero, while the SF12-MCS demonstrated a moderate impact. This score was in reverse, indicating that the matched pairs analysis suggested a deterioration in mental health as assessed by the SF12-MCS. The Hedges' *g* was undertaken to address the risk of bias related to sample size [21].

Test	Point Estimate	95% CI
GAF Pre – Post: **Cohen's *d* (Hedges' correction)**	-1.44 (-1.44)	-1.66, -1.23 (-1.66, -1.22)
PCL Pre – Post **Cohen's *d* (Hedges' correction)**	1.46 (1.45)	1.23, 1.68 (1.23, 1.68)
K10 Pre – Post **Cohen's *d* (Hedges' correction)**	1.36 (1.35)	1.14, 1.58 (1.13, 1.57)
SF12-MCS Pre-Post **Cohen's *d* (Hedges' correction)**	0.61 (0.61)	0.34, 0.88 (0.34, 0.86)
SF 12-PCS Pre-Post **Cohen's *d* (Hedges' correction)**	*-0.061 (-0.061)*	*-0.31, 0.19 (0.31, 0.19)*
Cohen's d uses the sample standard deviation of the mean difference. Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.		

Table 5: Treatment Outcomes Matched Pairs Analysis Effect Size.

Discussion

The importance of this naturalistic study is highlighted by the systematic review by Lopes et al. (2014) that from over 800 papers, only 11 studies identified (n=742) were related to natural disasters and included standardised pre-and post-intervention assessments, a diagnosis of PTSD, and treatment with cognitive behaviour therapy. Ten of the studies focussed on people affected by earthquakes [10]. A 2018 Cochrane Review of treatment provided to people living in humanitarian settings identified 36 studies; however, the treatment groups also included those exposed to armed conflict. Two studies used EMD-R and non-used TF-CBT [22].

Unlike other studies, this evaluation includes people living in metropolitan, regional and rural communities. The study findings support the efficacy of TF-CBT with a reduction in PTSD (PCL) and psychological distress (K10) and improved Global Function (GAF). There was, however, no improvement in general health (SF12-PCS). Although the self-report measures (PCL, K10) demonstrated improvement, the scores indicate many people remained symptomatic, suggesting the need for further treatment, and continued monitoring of their mental health status (Table 3).

Post-traumatic symptom change (PCL)

The study findings compare with other evaluations and demonstrate that an evidence-informed program can be provided and supported across an area several times the size of Great Britain [23]. The pre-post symptom reduction demonstrates similar efficacy to programs provided to earthquake victims in Turkey and China [10].

Psychological Distress (K 10)

The high level of pre-treatment distress in the study group compares with Australian community samples that indicate around 10% of the population score in the high range (K10=22-29) and 3-4% in the very high range (K10=30-50) [24]. The level of distress in the study group is further highlighted when comparing a cross-sectional online survey of 547 Australians during COVID-19 (mean K10 score of 19.6 (SD=7.6)) [25].

SF12

The SF12 has two summary scales describing mental health wellbeing (SF12-MCS) and physical wellbeing (SF12-PCS). Higher scores indicate better health, with an assumption the scoring algorithms for physical and mental health are not correlated [26].

The pre-treatment SF12-MCS and SF12-PCS group and matched pairs means compare with an Australian community sample (n=10,641) that found means of SF12-MCS 49.05 (SD:10.36) and SF12-PCS 48.85 (SD:10.05) [27]. Interestingly neither the group nor matched pairs SF12-PCS (Tables 3, 4 and 5) identified a significant change, while the matched pairs SF12-MCS demonstrated a decline in the mean score, indicating an increase in psychological morbidity.

The decline in the SF12-MCS score for both the group and matched pairs occurred despite the reduced PCL and K10 scores and the improved GAF score. One explanation may relate to the observation that despite the decrease in symptoms as measured by the PCL and K10, both measures indicate the presence of ongoing morbidity. The decline in score may also be explained by factors such as new stressors related to the disasters or other events that may have occurred during the treatment period.

Global Assessment of Functioning (GAF)

Despite the growing number of natural disasters, knowledge of functioning over time versus cross-sectional functioning remains limited. Most studies are cross-sectional rather than longitudinal and unrelated to therapeutic interventions [28]. Even the outcome measures in many of the 9/11 studies focussed on symptom reduction rather than function [29, 30]. This study demonstrates the impact on global function of those affected by the events of 2010-11 before treatment and post-intervention (Table 4).

Integrating evidence-based care into day-to-day clinical practice when services are confronted with the challenge of damaged infrastructure, the potential individual and community economic losses and the adverse psychosocial outcomes of disasters places significant demands on clinicians. Factors such as access to supervision, therapist beliefs and organisational imperatives may negatively influence the application of evidence-based interventions within a disaster environment. These aspects and variability in adherence to International and Australian post-disaster treatment guidelines can influence treatment outcomes [31-33]. The results highlight that while symptom reduction may be significant that psychological symptoms may remain elevated suggesting the need for ongoing therapy beyond the disaster funding timescale of two years. In addition, mental health assessment and counselling grants are often a fraction of the allocated aid funds and the spending on infrastructure [34-35].

The evaluation of the TF-CBT implemented following the Queensland 2010-11 disasters, like other naturalistic studies, is affected by clinician experience, level of supervision, patient psychosocial factors and non-adherence to protocols as evidenced by the failure to complete some assessments. While these factors place limitations on the evaluation, it does, like other naturalistic studies, place the assessment of the program outcomes within the 'real world setting' in which clinicians and health services work [36].

Strengths

This retrospective evaluation adopts a naturalistic format to appraise the outcome of interventions utilised in response to the Floods and Cyclones of 2010-11. While Randomised Controlled Trials (RCTs) are recognized as the 'gold standard' for evaluating efficacy [37], RCTs have limitations. RCTs generally use highly trained clinicians with high levels of supervision. The programs are often conducted in academic centres using strict inclusion and exclusion criteria. Evaluation of naturalistic studies provides an opportunity to assess the effect of clinical interventions and whether the treatment outcomes have real-world meaning in the study population [38]. Although naturalistic studies may not aid in establishing the influence of a treatment on the outcome to a therapy, naturalistic evaluations can be seen as complementary to RCTs [39, 40]. The SMHP treated a population with chronic symptoms between 9-22 months following the natural disasters. Participants were experiencing persistent and significant symptoms. Importantly the program provided treatment across a broad range of geographically diverse communities, delivered by local clinicians with a standardised protocol and supervision.

Limitations

The study did not evaluate whether those who attended more sessions achieved better outcomes. Some participants did not complete all the assessment measures, and the HoNOS data could not be included in the evaluation due to the amount of missing data. Information related to post-disaster experiences between the commencement and completion of the program was not recorded in the data set, and reasons for ceasing therapy were not recorded. Like other naturalistic studies, clinician experience, level of supervision, and non-adherence to protocols may influence the outcomes.

Conclusion

The naturalistic evaluation demonstrates the treatment program's effectiveness; however, the post-intervention mean PCL and K10 scores for the group and matched pairs continue to reflect significant morbidity levels. The pre-and post-treatment results indicate that despite treatment, many participants continue to exhibit considerable morbidity suggesting that psychosocial support interventions should continue beyond the two-year timeframe provided by the Australian Government disaster relief funding.

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