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Individual Resilience and Disaster-Specific Adaptation and Resilience Following a Bushfire Event in Regional Queensland

Susan F. Rockloff [1,*], Carina C. Anderson [2,3], Lucinda P. Burton [2,4], Victoria R. Terry [2,3], Sally K. Jensen [2], Anne Nolan [5] and Peter C. Terry [3,6]

1 School of Nursing, Midwifery and Social Sciences, CQ University, Bundaberg, QLD 4670, Australia
2 School of Nursing and Midwifery, University of Southern Queensland, Ipswich, QLD 4305, Australia; carina.anderson@unisq.edu.au (C.C.A.); lucinda.burton@health.qld.gov.au (L.P.B.); victoria.terry@unisq.edu.au (V.R.T.); sally@enviroimagination.com (S.K.J.)
3 Centre for Health Research, University of Southern Queensland, Ipswich, QLD 4305, Australia; peter.terry@unisq.edu.au
4 Metro North Health Service—Mental Health, Royal Brisbane Women's Hospital, Brisbane, QLD 4029, Australia
5 Noosa Shire Council, 9 Pelican St, Tewantin, QLD 4565, Australia; anne.nolan@cqumail.com
6 School of Psychology and Wellbeing, University of Southern Queensland, Toowoomba, QLD 4350, Australia
* Correspondence: s.rockloff@cqu.edu.au

Abstract: Natural disasters such as bushfires are a test of individual and group resilience, and in extreme cases, threaten the sustainability of communities. Bushfires have long been common in Australia, although anthropogenic climate change has exacerbated their prevalence and severity. The aim of the present study was to assess the individual resilience and disaster-specific adaptation and resilience of community members in the wake of a bushfire event. Using a quantitative, cross-sectional design, an adult community sample of 165 residents of Noosa Shire in regional Queensland, Australia completed the 25-item Connor-Davidson Resilience Scale (CD-RISC©) and the 43-item Disaster Adaptation and Resilience Scale (DARS). Mean scores for the CD-RISC© indicated significantly greater resilience ($p < 0.001$) than reported previously for a large Australian community cohort. Similarly, the DARS scores indicated significantly greater adaptation and resilience ($p < 0.001$) than that of a comparable cohort in the USA. The two oldest groups of residents (66+ years and 51–65 years) reported significantly greater adaptation and resilience than the group of younger residents (≤50 years; $p < 0.001$). The study findings provide the Noosa Shire community with an objective baseline from which they can assess the efficacy of future resilience-building initiatives and, more broadly, offer a valuable point of reference for future disaster-related research.

Keywords: Australia; disaster; bushfire; adaptation; resilience; community

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1. Introduction

Australia frequently experiences a variety of anthropogenic climate change-related natural disaster events, such as bushfires, heatwaves, floods, cyclones, drought, and landslides [1]. Being the driest inhabited continent, Australia experiences a significant and increasing risk of bushfires [2], as evidenced by the occurrence of several major bushfires in the past; the worst on record being the 2009 "Black Saturday" bushfires [2] followed by the 2019/2020 "Black Summer" bushfire disaster [3]. Along with the cost of managing natural disasters, there are additional burdens, including the loss of life. Bushfires cause loss and damage to businesses, infrastructure, and residences, as well as incurring costs associated with healthcare (physical and psychological) and social disruption [2]. There are national-scale impacts on tourism supply chains and employment loss [4]. These factors underscore the need for community-level initiatives to reduce the economic and social impacts of bushfires.

In Australia, government policy on natural disaster management has shifted from a 'response-focused' to a 'resilience-focused' approach [5]. This has included an emphasis on building resilience, with a focus on preparedness and minimising the risk to and impact on individuals and their surroundings. Traditional 'response-oriented' models no longer satisfy the situation [5]. Previously, efforts focused on investing in the means to manage the emergency response to a disaster event. This paradigm shift aims to foster a self-reliance culture and less dependence on government support, as well as to minimise the economic cost of disasters [5], and represents a neo-liberalist approach (i.e., minimal government intervention) to disaster management [6]. It recognises the importance of establishing baseline levels of individual resilience for future resilience benchmarking and evaluation of targeted strategies [7]. Targeting vulnerable groups and other individuals needing resilience-building programs is vital, especially with a growing older population opting to 'age in place' [6]. This then reduces the social and economic costs to individuals, the community, and government health and social support services.

The 'resilience' concept has been extensively defined and described in the literature [8–11]. Resilience is a multifaceted concept linked to well-being, and represents the capacity of individuals, communities, or systems to withstand, recover, and grow from adversities. Resilience is based on the principle of preparing and strengthening populations and systems, rather than responding in a limited way to reduce hazards or responding to disasters when they occur [12]. However, there is lack of conceptual clarity around the construct of resilience [13]. Before more quantitative means of assessing resilience and adaptability were developed, more generalised wording of 'capacity to adapt', 'capacity to bounce back', and 'adaptability' to a normal state were used somewhat synonymously as qualitative descriptors. In the disaster area, capacity can refer to a diverse set of skills, resources, abilities, and knowledge that individuals, communities, organisations, and societies possess to manage and mitigate the impacts of disasters [14], whereas resilience is the ability to adapt to threats and overcome challenges in a timely and efficient way [15].

Both individual and community resilience are essential for responding to and overcoming disasters. A relationship exists between individual and community resilience ([16] by virtue of the two being connected in natural disaster responses. Individual resilience is one's ability to recover from adversity, while community resilience emphasises the collective capacity to withstand and recover from perturbations. A collection of resilient individuals does not necessarily translate into a resilient community, which requires people to engage in collective activities [17]. Both individual and community resilience are crucial for an effective disaster response, which draws on personal strength and communal support via resource sharing, mutual aid, and cooperation [18]. In the present study, we implemented measures of individual resilience, and adaptation and resilience to natural disasters, to help understand where deficiencies exist, and to tailor interventions and support to individuals who may be disadvantaged or vulnerable to assist their preparedness plans and resourcing.

The present research aimed to assess the individual resilience and disaster-specific adaptation and resilience of Noosa community members after a natural disaster bushfire event. The study aims were developed to: (1) Identify which groups are more resilient post-bushfire disaster based on their responses to the 25-item CD-RISC© and the 43-item DARS scales. Specifically, we focused on individual resilience across demographic variables such as gender, age, education level, homeownership status, prior bushfire experience, etc.; (2) establish a baseline level of community resilience and adaptive responses for future benchmarking and evaluation of targeted strategies and on-ground action. Benchmarking the resilience of individuals in a single community recognises that it may vary depending on the nature of the crises or threat, and the number of such stressors [17].

2. Materials and Methods

2.1. Study Design and Setting

This study was conducted using a quantitative, cross-sectional design to assess individual resilience and disaster-specific adaptation and resilience among community members

in Noosa Shire, Queensland, Australia during an 8-month period from June 2023 to February 2024.

Noosa Shire is located north of Brisbane city on the east coast of Australia in the coastal zone. The area covers 871 km^2 and has a population of over 54,000 people [19]. It has a Liveability Index score above the national average and is recognised for its natural environment and protection of the environment, along with its sense of neighbourhood safety and accessibility to neighbourhood amenities [19]. It has a thriving tourism industry and is a UNESCO Biosphere reserve, with 35% of the natural environment protected [19]. The shire has experienced two natural disaster events within the last five years, the 2019 Noosa Bushfire with more than 8000 residents evacuated [20] and the 2022 flood and landslides causing $100 million in reconstruction costs, along with private residential costs [19].

2.2. Participants

A convenience sample of adult Noosa Shire residents was recruited in community settings, including shopping areas, libraries, markets, sporting venues, community events, parklands, and foreshore areas. In addition to being recruited in person in community settings, participants were also recruited to this study via email advertising (through local government and local community organisations), letter box drops, local media advertising, and snowballing. Inclusion criteria for the study were simply that participants were residents in Noosa Shire, Queensland, Australia and were 18 years or older. Those not meeting these criteria were excluded from this study.

2.3. Measures

Individual resilience was assessed using the Connor-Davidson Resilience Scale (CD-RISC©) [21], a 25-item measure of seven dimensions of resilience, referred to as hardiness (7 items), coping (5 items), adaptability/flexibility (3 items), meaningfulness/purpose (4 items), optimism (2 items), regulation of emotion and cognition (2 items), and self-efficacy (2 items). The CD-RISC© was chosen because the questions were appropriate for understanding resilience across demographic groups. Respondents rated themselves against self-statements (e.g., "I am able to adapt when changes occur", "Having to cope with stress can make me stronger", "I like challenges") on a 5-point Likert-type scale, ranging from 0 = "not true at all" to 4 = "true nearly all the time". As its factor structures may vary according to the setting in which the measure is used, the CD-RISC© authors do not recommend the calculation of subscale scores [21]. Therefore, a total resilience score was calculated by summing scores for all 25 items. The CD-RISC© total score has previously demonstrated adequate reliability, with a reported Cronbach alpha [22] coefficient of 0.93 [21]. The CD-RISC© scale addresses a gap in measurement in the form of a standardised tool to assess individual resilience levels and benchmark change over time. With its widespread application and generalisability [21], the tool allows comparison of the adaptive capacities of individuals and, through aggregation, of communities. The CD-RISC© has been successfully adapted and validated in numerous instances to demonstrate its reliability and validity in different age brackets [23], populations [24], situations [25], and cultural contexts [26].

Adaptation and resilience related specifically to disasters was assessed using the Disaster Adaptation and Resilience Scale (DARS) [27], a 43-item scale of five subscales, referred to as physical resources (9 items), social resources (10 items), problem solving (8 items), distress regulation (9 items), and optimism (7 items). The DARS was chosen because it is the only validated measure of disaster resilience and disaster-related adaptive responses. Respondents rated themselves against self-statements (e.g., "I have insurance to cover disaster-related damages", "My friends are there for me during difficult times", "My life has meaning and purpose") on a 5-point Likert-type scale, ranging from 0 = "not true at all" to 4 = "true nearly all the time". Subscale scores were calculated by summing responses to each subscale item, and a total score for disaster adaptation and resilience

was calculated by summing scores for all 43 items. The content validity of the DARS was established using expert review and the factor structure was supported using structural equation modelling [27]. Reliability estimates (Cronbach alpha) for the five subscales in the original validation study ranged from 0.87 to 0.93, with an alpha value of 0.96 for the overall 43-item scale [27].

The availability of quantitative measures, particularly the CD-RISC© and DARS, is advantageous given the historical use of qualitative descriptors to assess resilience. The two scales both assess resilience but in somewhat different ways. The CD-RISC© is one of the most well-known scales that focuses on general resilience and on personal traits and coping with problems in broader contexts. The generality of the scale means it has been used to measure resilience, specifically an individual's stress-coping ability, and validated across many different cultural contexts, populations, and languages, as mentioned. Unlike the DARS, it has been modified to a shorter version (CD-RISC-10) (10-item) [28] to demonstrate its versatility. In contrast, the DARS has a set 43-item scale with no validated modification. The DARS specifically targets resilience in the context of disasters and uses domains to measure adaptive responses to only these events [29], and has been used in fewer populations.

2.4. Procedure

Consisting of the DARS 43-item scale, the CD-RISC© 25-item scale, and 10 demographic questions, the survey had a total of 78 questions. Two methods of data collection were used: an online survey developed using LimeSurvey [30] and a hardcopy version of the same survey. A range of demographic information was collected that included participant gender, age range, highest level of education, 4-digit postcode, homeowner/tenant status, length of current residency in the area, proposed future residency in the area, primary source of disaster information, and prior experience of natural disasters. Additionally, measures of individual resilience (CD-RISC©) and disaster-specific adaptation and resilience (DARS) were completed. The survey took approximately 20 min to complete.

The study was approved by the Human Research Ethics Committee of the University of Southern Queensland (approval number: H22REA157, date of approval: 1 August 2022). The study was conducted in accordance with the "Statement on Human Experimentation" by the National Health and Medical Research Council of Australia [31] and is reported with reference to the "Strengthening the Reporting of Observational studies in Epidemiology (STROBE)" guidelines [32]. Participants who completed the hardcopy survey provided informed consent, having first read a detailed information sheet that included a description of the project, the voluntary nature of participation, expected benefits and risks, the right to withdraw at any time, a guarantee of confidentiality, and how to report any ethical concerns or complaints. Online participants, having read the same detailed information sheet and responded to the questions, consented to participate by clicking on the submit button at the end of the survey. No participant names were collected to ensure that data were non-identifiable. All data were stored in a password-protected file on the university data storage system.

2.5. Data Analysis

All data were compiled for analysis using the IBM Statistical Package for the Social Sciences (SPSS) for Windows, Version 29 [33]. The first step in the analysis included a data verification process to check for missing and out-of-range values, and normality checks of the distributions of scores for the dependent variables. Next, the internal consistency of measures was assessed using Cronbach alpha coefficients [22]. Means and standard deviations were then calculated for the CD-RISC© and the DARS data were compared to scores reported in the literature by similar cohorts of participants, using independent samples *t*-tests. Multivariate analysis of variance (MANOVA) was applied to compare scores on the dependent measures when participants were grouped according to the demographic variables of interest. Given that seven dependent variables were analysed simultaneously,

to avoid the potential for a Type I error, we applied a Bonferroni adjustment [34] to the alpha level by dividing the traditional $p < 0.05$ by seven, resulting in an adjusted alpha level of $p < 0.007$. Effect sizes were calculated using Cohen's d [35], where d = 0.20, 0.50, and 0.80 was interpreted as small, moderate, and large differences, respectively.

3. Results

3.1. Participant Characteristics

The survey was completed by 165 members of the Noosa Shire community. Of these participants, 37 (22.4%) completed the survey online, and 128 (77.6%) completed a hardcopy paper version. A total of 81 participants (49.1%) identified as male, 71 identified as female (43.0%), and 13 (7.9%) did not answer the question (i.e., no answer). No participant identified as non-binary. Full details of the demographic characteristics of the sample are shown in Table 1. The sample size for each sub-group is given by n.

Table 1. Demographic characteristics of the Noosa community sample (*N* = 165).

Source	*n*	%
Gender		
Male	81	49.1
Female	71	43.0
Other/no answer	13	7.9
Age range (years)		
18–30	7	4.2
31–40	10	6.1
41–50	29	17.6
51–60	21	12.7
61–65	16	9.7
66+	69	41.8
Other/no answer	13	7.9
Highest education level		
Primary school	5	3.0
High school	16	9.7
TAFE	32	19.4
Undergraduate degree	38	23.0
Postgraduate degree	58	35.2
Other/no answer	16	9.7
Residence		
Own home	123	74.5
Rental property	25	15.2
Other/no answer	17	10.3
Residence duration (years)		
<1	11	6.7
1–2	15	9.1
3–5	11	6.7
6–10	27	16.4
>10	88	53.3
Other/no answer	13	7.9
Future residency (years)		
<1	2	1.2
1–2	10	6.1
3–5	10	6.1
6–10	11	6.7
>10	115	69.7
Other/no answer	17	10.3

Table 1. *Cont.*

Source	*n*	%
Source of information		
Google	36	21.8
Facebook	6	3.6
Government website	25	15.2
Local council website	19	11.5
Local service providers	5	3.0
Helplines	3	1.8
Friends/family	19	11.5
Other/no answer	12	7.3
Previous natural disasters		
Yes	56	33.9
No	95	57.6
Other/no answer	14	8.5

3.2. Reliability of Measures

The internal consistency of the 25-item Connor-Davidson Resilience Scale (CD-RISC©) was high, with a Cronbach's alpha (α) of 0.92, indicating excellent reliability among the items for measuring resilience [36]. The internal consistency coefficients of the 43-item DARS was also high for the total score (α = 0.92) and for four of the five subscales (social resources: α = 0.90; problem solving: α = 0.87; distress regulation: α = 0.87; optimism: α = 0.86). However, the internal consistency coefficient of the physical resources subscale (α = 0.58) was below the acceptable level [37], indicating that results pertaining to this subscale should be interpreted with caution.

3.3. Data Screening and Descriptive Statistics

The dataset was initially screened for out-of-range values, missing values, and non-normal distributions for CD-RISC© and DARS responses. All out-of-range values detected among paper submissions were corrected by cross-checking against the original paper questionnaire. No out-of-range values were detected among the online submissions. Missing values on at least one item of the CD-RISC© or DARS were detected for 15.5% of participants. These were addressed by imputing mean values for the item in question. Table 2 shows descriptive and item-total statistics for the DARS. All items showed positive item-total correlations. The Cronbach's alpha for the scale was 0.92, showing high internal-consistency reliability for the scale. Due to copyright restrictions of the CD-RISC©, item-total statistics are available upon request from the corresponding author.

Table 2. Descriptive statistics for the 43-item DARS among the Noosa community sample (*N* = 165).

	N	Min.	Max.	M	SD	Item-Total r	Alpha if Item Deleted
1. I have insurance to cover disaster-related damages	163	0	4	3.25	1.28	0.114	0.931
2. I have enough food to eat	164	2	4	3.86	0.40	0.261	0.926
3. I have stable or permanent housing	163	0	4	3.83	0.63	0.226	0.927
4. My utilities are working	164	2	4	3.94	0.26	0.313	0.926
5. I have reliable transportation to get me where I need to go	164	0	4	3.84	0.63	0.226	0.927
6. I have enough money to pay my rent or mortgage when it is due	159	0	4	3.85	0.47	0.292	0.926
7. I have access to clean water	164	1	4	3.94	0.35	0.231	0.927
8. I have access to medical professionals and services	163	0	4	3.86	0.51	0.204	0.927
9. I have a plan for safety in the event of a disaster	164	0	4	2.61	1.36	0.312	0.928
10. My friends are there for me during difficult times	164	0	4	3.46	0.83	0.515	0.924
11. My family is there for me during difficult times	164	0	4	3.44	1.05	0.444	0.925
12. I am treated fairly by people in my community	164	1	4	3.58	0.64	0.496	0.925
13. I have people I can turn to and ask for help	164	0	4	3.65	0.68	0.561	0.924
14. I get the support I need from my friends and family	164	0	4	3.61	0.77	0.543	0.924
15. I feel like I belong in the community	164	1	4	3.38	0.82	0.613	0.924

Table 2. *Cont.*

	N	Min.	Max.	M	SD	Item-Total r	Alpha if Item Deleted
16. I appreciate my cultural and family traditions	162	1	4	3.44	0.78	0.494	0.925
17. If I need help, I know where to go in the community	164	0	4	3.29	0.95	0.587	0.924
18. I can talk with my family about my problems	164	0	4	3.25	1.05	0.592	0.924
19. I can talk with my friends about my problems	163	0	4	3.31	0.95	0.567	0.924
20. When I am faced with a problem, I think of possible solutions	164	2	4	3.71	0.54	0.524	0.925
21. I am good at solving problems	162	1	4	3.50	0.64	0.365	0.926
22. I look for information to deal with problems	160	1	4	3.53	0.68	0.465	0.925
23. Prioritize problems to work on first	160	0	4	3.22	0.87	0.453	0.925
24. I set achievable goals for my problems	162	0	4	3.08	0.89	0.485	0.925
25. I brainstorm possible options to solve problems	162	0	4	3.22	0.92	0.444	0.925
26. Problem solutions that have worked in the past	162	2	4	3.40	0.69	0.528	0.925
27. To resolve problems, I make a plan and follow it	162	1	4	3.20	0.86	0.511	0.925
28. When I feel upset, I pay attention to my feelings	160	0	4	3.04	0.92	0.520	0.924
29. I am able to manage sad feelings	162	1	4	3.11	0.76	0.522	0.924
30. When I am upset, I take time to figure out what I am feeling	161	0	4	2.98	0.93	0.508	0.925
31. To decrease upsetting thoughts, I change the way I am thinking	158	1	4	2.88	0.84	0.538	0.924
32. I am able to manage angry feelings	157	1	4	3.15	0.83	0.458	0.925
33. I pay attention to bodily sensations of stress	156	1	4	3.23	0.84	0.542	0.924
34. When I feel stressed, I do something to help me relax	158	1	4	3.14	0.78	0.652	0.923
35. If I have flashbacks or memories, I change my attention	156	0	4	2.88	1.00	0.505	0.925
36. I give myself time to recover from upsetting situations	157	0	4	2.82	0.94	0.514	0.924
37. I believe I will make it through difficult times	158	2	4	3.54	0.66	0.571	0.924
38. I am optimistic about my future	158	2	4	3.46	0.66	0.553	0.924
39. When difficult things happen, I know things will get better	157	1	4	3.39	0.72	0.595	0.924
40. I have important goals for the future	157	0	4	3.13	0.97	0.532	0.924
41. I believe I can achieve long-term goals	156	1	4	3.19	0.75	0.640	0.923
42. My life has meaning and purpose	157	1	4	3.40	0.73	0.562	0.924
43. After difficult situations, I tell myself things will get better	156	1	4	3.33	0.70	0.617	0.924

Note. Cronbach's alpha = 0.92. Item-total statistics based on scale with imputed missing values.

The distribution of scores for the CD-RISC© and DARS showed no non-normality. Descriptive statistics for the CD-RISC© and DARS total and subscale scores are shown in Table 3. The scores derived from paper-based and online questionnaires were compared using MANOVA and no significant differences were detected ($F = 2.17$, $p > 0.05$). Consequently, the subsequent analyses report on the combined data obtained from both sources.

Table 3. Descriptive statistics for CD-RISC and DARS scores for the Noosa community sample and comparison of paper and online responses.

Group	n	CD-RISC©		PR		SR		PS		DR		OP		DARS-Total	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
All	165	79.17	11.09	33.04	3.09	34.59	5.93	26.81	4.38	27.24	5.30	23.41	3.73	145.17	15.03
Paper	128	79.39	11.30	32.83	3.13	34.50	6.00	26.42	4.54	27.15	5.61	23.19	3.76	144.15	15.23
Online	37	78.43	10.46	33.78	2.88	34.89	5.73	28.16	3.52	27.57	4.14	24.19	3.58	148.67	13.97

Note: CD-RISC = Connor-Davidson Resilience Scale, PR = physical resources, SR = social resources, PS = problem solving, DR = distress regulation, OP = optimism, DARS = Disaster Adaptation and Resilience Scale total score.

To gauge the level of resilience among our sample, the CD-RISC© scores were first compared to the original sample used in the validation of the scale [21]. No significant difference was found between the group scores from the present sample (M = 79.17, SD = 11.09) and the validation sample (N = 577, M = 80.40, SD = 12.08, t = 1.12, df = 740, $p = 0.26$, d = 0.10). The group scores from the present sample were then compared to a large (N = 7305) Australian community sample [38] selected randomly from the electoral role in the Australian capital, Canberra, and Queanbeyan, a city in New South Wales. The inclusion criteria were being resident in Canberra or Queanbeyan and aged 18 years or older at the start of a longitudinal study. The Liu et al. [38] sample, all of whom provided written informed consent and were assured of confidentiality, covered three age groups (28–32, 48–52, and 68–72 years). The mean CD-RISC© scores were significantly higher

in the present sample (M = 79.17, SD = 11.09) than for the 28–32 years group (n = 1892, M = 71.58, SD = 12.52, t = 7.53, df = 2005, $p < 0.0001$, d = 0.64), the 48–52 years group (n = 2062, M = 71.42, SD = 13.38, t = 7.24, df = 2225, $p < 0.0001$, d = 0.63), and the 68–72 years group (n = 1826, M = 73.45, SD = 13.55, t = 5.27, df = 1989, $p < 0.0001$, d = 0.46). It should be noted that Liu et al. [38] scored the CD-RISC© incorrectly by using a 1–5 response scale instead of the prescribed 0–4 scale [21] and also did not report CD-RISC© mean scores for their whole sample. The scores reported by Liu et al. [38] were therefore adjusted using the CD-RISC© manual [39] to provide an appropriate point of comparison for Australian samples.

Given the absence of normative scores for the DARS, the total scores were compared to those of a community sample from Nashville, Tennessee exposed to an EF3 tornado (wind speeds between 218 and 266 km/h) followed by the COVID-19 pandemic [40]. Data collected by First and Houston [40] used a similar methodology to the present study, including having the same ethics requirements of informed consent and the maintenance of confidentiality, approximately one year following the tornado and one year into the pandemic. Inclusion criteria were being resident in Nashville and aged 18 years or older. This study was used as a point of comparison because no directly comparable dataset (i.e., DARS scores following a bushfire event) was available. The DARS scores from the present sample (M = 145.17, SD = 15.03) were significantly higher than those for the comparison sample (N = 412, M = 129.04, SD = 25.51, t = 7.61, df = 575, $p < 0.0001$, d = 0.77).

3.4. Between-Group Comparisons of CD-RISC© and DARS Scores

It was apparent that the distribution of participants according to some independent variables produced very uneven groups (see Table 1) that were unsuitable for statistical comparison. The small sample in the current study (N = 165) made comparison amongst some groupings, such as age categories, problematic due to correspondingly small cell sizes. Hence, some categories of independent variables were collapsed to produce larger groupings. This was the case, for example, with age. Consequently, the relatively small numbers of participants in the 18–30 years, 31–40 years, and 41–50 years categories were combined into a single ≤50 years group, whereas the 51–60 years and 61–65 years groups were combined into a 51–65 years group. The 65+ years group was left intact. A similar strategy of combining groups was also used for the education, duration of residence, and future residence variables to produce groups that were viable for analysis.

The results of the one-way MANOVAs to investigate between-group differences in the CD-RISC© and DARS subscales and total scores are shown in Table 4. For gender, although the multivariate test was significant (F = 2.49, $p = 0.02$) and explained 10.8% of the variance, none of the univariate difference tests reached significance at the Bonferroni-adjusted level of $p < 0.007$, indicating no significant difference in any resilience score between men and women.

For the age group variable, the multivariate statistic was significant (F = 23.08, $p < 0.001$), explaining 13.1% of the variance. The univariate tests were significant for the DARS total scores (F = 6.74, $p = 0.002$) and physical resources scores (F = 11.62, $p < 0.001$). Follow-up Scheffé tests showed that the 66+ years group ($p < 0.001$) and the 51–65 years group ($p = 0.01$) reported DARS total scores and physical resources scores that were significantly higher than those for the ≤50 years group. Indeed, it is notable that the ≤50 years group scored the lowest of the three age groups on every resilience measure. Cohen's d values showed that the age differences were large (≤50 years vs. 66+ years, d = 0.85) or moderate (≤50 years vs. 51–65 years, d = 0.63) for physical resources, and moderate for the DARS total scores (≤50 years vs. 66+ years, d = 0.65; ≤50 years vs. 51–65 years, d = 0.55). In terms of the education levels of the participants, no significant differences were found between those with an undergraduate degree or higher and those without a degree. The multivariate statistic was not significant (F = 1.89, $p = 0.08$) and, therefore, no univariate comparisons were made.

Table 4. Between-group comparisons for CD-RISC© and DARS scores for the Noosa community sample (n = 165).

Group	n	CD-RISC©		PR		SR		PS		DR		OP		DARS-Total	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Gender															
Male	71	79.88	11.62	32.78	3.25	34.61	5.52	26.50	4.23	26.29	6.32	23.71	3.58	143.86	15.89
Female	81	78.55	11.55	33.07	3.04	34.75	6.22	26.69	4.67	28.16	4.26	23.11	3.97	145.89	14.89
Age															
≤50 years	46	76.46	11.96	**31.24**	**3.65**	32.77	5.48	25.84	4.16	25.93	5.41	22.88	3.86	**138.32**	**16.13**
51–65 years	37	81.84	11.35	**33.22**	**2.96**	34.62	6.41	27.62	4.66	28.22	5.57	24.35	3.68	**146.79**	**16.35**
66+ years	69	79.55	11.18	**33.90**	**2.32**	35.99	5.57	26.57	4.50	27.68	5.38	23.21	3.77	**148.37**	**12.88**
Education															
<degree	56	79.81	11.14	32.20	3.68	34.82	5.31	25.70	4.66	26.71	5.39	23.38	3.84	142.94	15.61
≥degree	96	78.80	11.84	33.36	2.69	34.61	6.22	27.13	4.27	27.62	5.38	23.39	3.78	146.11	15.15
Home status															
Owner	123	78.98	11.80	**33.42**	**2.85**	34.98	5.88	26.80	4.34	27.45	5.32	23.42	3.78	146.03	15.01
Renter	29	80.00	10.62	**30.86**	**3.46**	33.43	5.84	25.75	4.89	26.59	5.68	23.24	3.90	140.36	16.16
Resident duration															
≤10 years	64	81.30	10.62	32.69	3.05	34.35	5.97	27.48	3.47	27.59	5.57	23.78	3.64	145.89	14.18
10+ years	88	77.62	12.02	33.11	3.20	34.93	5.84	25.97	4.98	27.06	5.27	23.10	3.90	144.26	16.19
Future resident															
≤10 years	33	77.85	11.49	32.49	2.93	33.97	6.14	27.13	3.68	26.64	5.59	23.19	3.58	145.07	12.80
10+ years	115	79.62	11.74	33.13	3.16	35.07	5.70	26.49	4.68	27.61	5.32	23.57	3.84	145.47	15.96
Affected postcodes															
More affected	56	77.59	12.18	32.95	3.37	35.56	5.15	25.93	4.52	26.96	5.41	23.15	3.80	145.17	15.87
Less affected	109	79.98	10.46	33.09	2.95	34.09	6.25	27.26	4.26	27.39	5.27	23.55	3.70	145.16	14.66
Disaster experience															
Yes	56	79.29	9.80	32.18	3.54	**32.96**	**5.71**	26.95	4.50	26.14	5.60	23.47	3.59	141.49	16.31
No	95	79.04	11.94	33.45	2.85	**35.79**	**5.40**	26.54	4.42	28.15	5.13	23.41	3.85	147.39	14.45

Note. CD-RISC© = Connor-Davidson Resilience Scale, PR = physical resources, SR = social resources, PS = problem solving, DR = distress regulation, OP = optimism, DARS = Disaster Adaptation and Resilience Scale total score. Significant group differences are indicated in **bold** typeface.

Comparisons between the homeowners and those who rented showed a significant multivariate effect (F = 2.75, p = 0.01), explaining 11.8% of the variance. The univariate tests were significant for physical resources, with homeowners scoring significantly higher than renters (F = 17.30, $p < 0.001$). Cohen's d showed this difference to represent a large effect (d = 0.82). The influence of the duration of residency on the resilience scores was assessed by comparing those who had been resident in their current home for 10 years or less with those who had been resident for 10+ years.

The multivariate statistic was not significant (F = 1.23, p = 0.29) and, therefore, no univariate comparisons were made. Similarly, planned future residency did not influence the resilience scores. The multivariate statistic comparing those who planned to live in their current home for 10 years or less with those who planned to stay for more than 10 years was not significant (F = 1.18, p = 0.32) and, therefore, no univariate comparisons were made.

The results of a comparison between those who lived in postcodes that were most affected by the bushfire and those that were least affected showed no significant multivariate effect (F = 1.49, p = 0.18) and, therefore, no univariate comparisons were made. Regarding previous experience of natural disasters, the multivariate statistic was significant (F = 3.74, $p < 0.001$), with 15.5% of the variance explained. Univariate analyses showed that social resources scores were significantly higher among those who did not have previous experience of natural disasters than among those who did have previous experience (F = 9.32, p = 0.003). The Cohen's d value showed this to be a moderate effect (d = 0.50).

4. Discussion

The present study investigated the resilience and disaster-specific adaptation amongst a community affected by bushfire disasters. In doing so, it identified which groups within the community reported the highest resilience following a bushfire disaster. The quan-

titative measures used for the analysis in our study were the CD-RISC© and the DARS. Understanding resilience levels and establishing baseline values for future benchmarking is an important part of building sustainable communities in Australia and elsewhere. Impacts from climate change in the form of bushfires, floods, cyclones, etc., will make such an assessment providential.

Overall, participants reported individual resilience (CD-RISC©) scores that were significantly higher than those reported by a comparable Australian community sample (Liu et al., 2015). Similarly, our sample reported disaster-specific adaptation (DARS) scores that were significantly higher than a comparable sample from the USA covering a tornado and COVID-19 [40]. Beyond establishing this reasonably high level of individual resilience and disaster-specific adaptation among the community generally, we sought to establish how demographic and experiential variables moderated resilience and adaptation.

Our statistical analysis showed no significant differences in resilience scores based on gender. This finding is consistent with the original studies conducted by Connor and Davidson [21] and among an earthquake survivor sample investigated by Karairmak [25] and suggests that the resilience of individuals facing natural disasters is not gender-based. In contrast, earthquake disaster-related studies from China [41] and Nepal [42] found that men reported greater resilience than women, leading some to conclude that gender is a driver of differential vulnerability to climate-related risk [43]. It should be noted, however, that gender differences in resilience have tended to emerge from studies conducted in patriarchal societies in which men assume primary responsibility for ensuring the safety of families and communities. Our findings suggest a re-orientation of targeted interventions to focus on other possible vulnerability factors, aside from gender, such as socio-economic status, disability, marital status, etc., to produce more equitable resilience-building policies and interventions.

Regarding age, our findings showed that those in the 51–65 years and 66+ years age groups reported higher overall scores for disaster-specific adaptation and resilience than those in the $\leq$50 years age group, as well as higher physical resources scores. This finding is consistent with the stress inoculation explanation, which contends that older adults have typically experienced more past stressors and are, therefore, to some extent, inoculated against future stressors due to their lived experiences of disasters [17]. This can be explained by considering age in the context of disaster preparedness and recovery capacity. Different age groups have varying levels of psychological and emotional stability, meaning more mature adults are likely to have more life experiences to draw upon and better coping skills. For example, older adults have been shown to have better-developed emotion-regulation strategies [44] and to be more likely to use adaptive coping strategies, such as mindfulness [45]. Also, economic stability often comes with age, meaning that material and non-material resources are more readily available to older individuals, which allows preparation and risk minimisation, adaptation, and recovery from natural disasters. Similarly, with increasing age, social networks in the form of familial and community support become denser, more cohesive, and more concentrated sources of social support than they are for younger populations experiencing disaster [46].

It should be noted that the area of Noosa Shire where the study was conducted has a higher median age compared to the rest of Australia and is more affluent [47]. Both factors may help in supporting overall community resilience. Hence, our findings may extend to other communities with economically stable ageing populations, the financial resources to mitigate disaster risk (e.g., robust buildings, resources for disaster preparation), and vulnerabilities associated with age (e.g., medical conditions, mobility issues, frailty). However, our findings may not generalise to ageing populations in Australia and elsewhere that experience the compounding factors of low income, limited resources, and high assistance needs. The global megatrend of an ageing population translates to a longer life expectancy and a shortfall in savings coupled with a decreased workforce to support the healthcare and service needs of the ageing population [48].

Home ownership was another demographic factor associated with significantly higher resilience scores compared to those living in rented accommodation. Home ownership without a mortgage is significantly higher in Noosa (43.7%) relative to other parts of Queensland (29.1%) and Australia overall (31.0%) [47]. Home ownership is a stabilising economic feature for communities, bringing greater cohesion and economic resilience [49], which are beneficial for a community's disaster preparedness [50]. The physical resources scores of homeowners were higher than those of renters, which may be attributed to the role of stability, community ties, and investment in property. Home ownership is an attribute of economic stability and investment in the local community, which is a motivator for better preparedness [49]. Furthermore, homeowners are likely to have a stronger sense of place and social network in the local community for information gathering, emotional support, and physical support, which collectively contribute to economic resilience [51]. Owning a home provides stability, a sense of security and comfort during disasters, and, post-disaster, it may negate negative impacts of relocation. In contrast, past research has shown that the vulnerable individuals in this situation are those with poor health, those who are young, single parents, those who have a lower socio-economic status, and those who lack social support [52]. An important point is that most residents in natural disaster-hit areas do not have their homes damaged or destroyed [52], and this may be due in part to homeowners' selection of quality housing and residential location as a way of managing risk, perhaps variables less in the control of people in the rental market.

Perhaps surprisingly, having previous experience of natural disasters did not significantly impact resilience scores, except that those without prior experience reported higher scores for social resources. A previous small-scale (n = 10) qualitative study conducted in Australia focusing on the Brisbane floods of 2011 and 2013 reported that previous disaster experience was related to greater resilience [53]. However, a recent large-scale (n = 3083) quantitative study of mental health effects 12–18 months after Australia's 2019–2020 bushfires, which is a much more specific point of reference for our study, showed that previous exposure to bushfires was neither a significant predictor of distress nor resilience, whereas being younger was a significant predictor of distress, and being older was a significant predictor of resilience [54]. Hence, our results can be seen to be consistent with previous findings related to resilience following bushfire events in Australia.

The relationship between a person's previous experience with natural disasters and their social resilience is complex. Previous experience with natural disasters may influence perceptions of social resources by shaping community responses, preparedness, and the recovery process to enhance the ability to endure, manage, and adjust to threats when they arise. It has been shown that individuals with more experience of floods are statistically more likely to have taken precautionary measures in the past [55]. In contrast to these results, our findings showed a positive association between having no previous experience of natural disasters and reporting higher social resources scores. To explain this apparent inconsistency, a closer examination of the community is warranted. Previous experience of natural disasters may generate better community cohesion or increased awareness and preparedness. However, a complex interaction may exist whereby individuals with disaster experience, despite actually being better prepared, may feel more vulnerable and less resilient due to the emotional scars of their previous disaster experiences.

Although the present study is limited to the Noosa community and the findings do not necessarily generalise to other communities, it offers a glimpse into how sustainability can be cultivated by first assessing community resilience and adaptation, prior to initiating resilience-building activities. The "One Community at a Time" framework [56] recognises that each community possesses unique needs, strengths, and challenges, warranting an individualised approach to resilience-building interventions. Use of the two scales in the present study allows evaluation of the sustainability and efficacy of interventions, and the concomitant increase and maintenance of community resilience, promoting the adaptation of actions in response to knowledge of community and the development of known evidence-based policies and actions [56] (Ma et al., 2023).

5. Conclusions and Implications

The significance of the present findings lies in the understanding of resilience among bushfire-affected populations and establishing a baseline for improving disaster preparedness, and the ability to respond to negative impacts of natural disasters in the Noosa community. By implementing strategies that build individual and community disaster resilience and adaptation, governments and organisations can best-manage the unpredictable temporal and spatial impacts of climate change-related disasters.

Similarly, the specific needs and vulnerabilities of less prominent groups (e.g., renters) in our study reminds us of the need to develop resilience-building strategies underpinned by policy that is inclusive and effective. To this end, continued research and tailored interventions to support community resilience in the face of natural disasters is essential for sustainability. Targeted interventions to enhance resilience, such as community-building activities for renters and age-specific support services, are necessary to embed greater inclusivity into interventions supporting resilience and adaptation for an uncertain future of climate change. Effective interventions include co-creating them with community technological tools (e.g., mapping tools, e-learning tools), involving citizens in disaster management, and immersive training sessions [57]. Furthermore, the aim of social policy change and community-level intervention is to empower communities, improve disaster preparedness across all groups in communities, and thereby mitigate the negative impacts of climate change-induced disasters. The promotion of disaster preparedness can be improved by understanding the social and economic features of individuals within a community, thereby identifying and proactively reducing the impact on vulnerable groups (e.g., parents with young children, people living with disability) in the community and building the capacity of others. Action to build community preparedness and resilience needs to be 'contextually grounded' [13], meaning there is no universal approach. In conclusion, this study's findings provide the Noosa Shire community with an objective baseline from which to assess the efficacy of future resilience-building initiatives and, more broadly, offer a valuable point of reference for future disaster-related research.

6. Limitations and Future Study Opportunities

Two factors may affect the generalisability of the present findings. Firstly, although our convenience sample of 165 residents was adequate from a statistical perspective, it is not known how well our sample represented the Noosa Shire community more generally. In particular, there were small numbers of young people in our sample, causing us to collapse age categories into larger groupings ($\leq$50 years, 51–65 years, and 66+ years), which necessarily inhibited a more detailed understanding of younger community members who are more likely to be renters. Furthermore, our sample may not have captured the resilience characteristics of the most vulnerable members of the community, including the frail elderly, the disabled, those for whom English was a second language, and those with poor literacy skills.

Secondly, the generalisability of the present findings may be limited due to the specific characteristics of the Noosa Shire community. Certain unique demographic characteristics, social dynamics, and environmental characteristics that typify Noosa Shire may not be shared with other regions and populations. Similarly, while some demographic information was collected, there were other potentially influential factors such as ethnicity, cultural practices, and socio-economic status that were not. It is unknown whether these factors might affect resilience and adaptation responses to disasters. Balanced against the limited generalisability of our findings, two methodological strengths of the present study were the mixed-mode approach to the data collection with online and hardcopy surveys being available, and use of two well-validated scales (CD-RISC© and DARS), with results supporting their utility in assessing disaster-specific adaptation and resilience.

Thirdly, the Noosa community also experienced subsequent natural disasters in the form of flooding during 2020 and 2022, in between the 2019 bushfire disaster and the period of our data collection. We focused our study on the effects of the bushfires because

we were commissioned to do so by the Australian Government via the Black Summer Bushfire Recovery Grants Program, as part of a larger initiative to build resilience among bushfire-affected communities within Noosa Shire. We acknowledge that it is not possible from our data to partial out the effects of the flooding incidents from the effects of the 2019 bushfire event upon the resilience scores of our participants.

Further investigation in the form of longitudinal studies, as opposed to the current cross-sectional study design, will improve the ability to determine causality between variables, which was not possible with a snapshot during the survey data collection period. It is important to have a baseline of resilience and community cohesion prior to a disaster to understand how disasters may impact people's perceptions. Moreover, a deeper understanding of how resilience changes over time is beneficial for planning and policy-making through understanding how interventions boost resilience and studying resilience among identified vulnerable groups (e.g., people with low socio-economic status, people living with a physical disability, members of the LGBTIQA+ community). Finally, there is value in investigating a component of community resilience as outlined by [58], which acknowledges that resilience requires the use of knowledge from a prior response to strengthen the community's capability to combat future incidents.

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