BMC Public Health

RESEARCH Open Access

Resilience, coping strategies, and disaster experience: a path analysis of preparedness and avoidance in Taiwan

Yi-Ling Wu[1], Tsai-Wen Lin[2], Jason Lam[3], Samuel S. C. Wang[4] and Herman H. M. Lo[5*]

Abstract

Background This study investigates the relationships between resilience dimensions, coping strategies, and prior disaster experience, focusing on disaster preparedness and avoidance behaviors in Taiwan.

Methods A total of 550 participants were surveyed, with 57.82% being female and the majority aged between 21 and 40 years. Using confirmatory factor analysis (CFA) and path analysis, we examined six resilience dimensions, which include problem-solving, social support, negative emotion regulation, stable interpersonal relationships, assertiveness, and self-regulation, as predictors of disaster preparedness and avoidance behaviors.

Results The models accounted for 41.83–44.83% of the variance in preparedness and 5.43–10.74% of the variance in denial/avoidance. Across all models, problem-solving, assertiveness, and living with family consistently predicted higher preparedness, while income consistently predicted lower denial and avoidance behaviors. Notably, flood experience significantly moderated the relationship between social support and denial/avoidance ($\beta = 0.21$, $p = .017$), indicating that participants with stronger social support who had experienced floods were more likely to engage in denial and avoidance behaviors. Additionally, flood experience negatively moderated the relationship between negative emotion regulation and both preparedness ($\beta = -0.18$, $p = .035$) and denial/avoidance ($\beta = -0.23$, $p = .030$), suggesting that individuals with higher emotional regulation were less likely to prepare or deny disaster risks after flood exposure.

Conclusion These findings highlight the importance of addressing individual resilience capacities and the complexities of prior disaster experiences in disaster preparedness interventions, with particular attention to vulnerable populations.

Keywords Resilience, Coping strategies, Disaster preparedness, Disaster avoidance, Prior disaster experience, Taiwan

*Correspondence:
Herman H. M. Lo
herman.lo@polyu.edu.hk
[1]Master's Program of Transition and Leisure Education for Individuals with Disabilities, University of Taipei, Taipei, Taiwan
[2]National Academy for Education Research, Taipei, Taiwan
[3]University of Southampton, Southampton, UK
[4]Department of Health and Welfare, University of Taipei, Taipei, Taiwan
[5]Department of Applied Social Sciences, Hong Kong Polytechnic University, Hong Kong, China

Introduction

Natural disasters have long been a significant source of devastation for human society, with far-reaching impacts on lives, economies, and mental health. These events pose continuous threats to both individual well-being and collective societal stability. Taiwan, due to its geographical location on the circum-Pacific seismic belt, is particularly vulnerable to a wide range of natural disasters, including earthquakes, typhoons, and floods. According to the Statistical Yearbook of Interior published by the Ministry of the Interior, Taiwan experiences an average of six natural disasters annually, including severe earthquakes, typhoons, and floods [1]. In fact, Taiwan is ranked the eighth most vulnerable place in the world to natural disasters, with 90% of its population and 73% of its land exposed to risks [2]. Between 2000 and 2022 alone, Taiwan faced 117 typhoons, 66 floods, and 20 significant earthquakes, necessitating large-scale rescue operations for affected populations. This frequent exposure to natural disasters underlines the urgent need for effective disaster preparedness and resilience-building at both individual and community levels [3, 4].

Building resilience against natural disasters and fostering effective coping strategies are critical components of post-disaster recovery. Resilience, at its core, refers to the ability to withstand, adapt, and recover from adverse events, while coping strategies are defined as the cognitive and behavioral mechanisms that individuals employ to manage stress and anxiety stemming from these events [5]. Research has demonstrated a strong link between resilience and coping, with resilient individuals more likely to engage in proactive coping strategies that reduce the psychological impact of disaster exposure [6].

In Taiwan, where natural disasters are frequent, understanding the mechanisms of resilience and coping strategies is essential for effective disaster management. Prior research has shown that resilience and coping strategies vary across contexts, such as student performance, terminal medical conditions, and natural disasters, including earthquakes, typhoons, and floods [7–11]. However, there is still a need for greater exploration into how prior disaster experience interacts with resilience dimensions to influence both adaptive and maladaptive coping strategies. While it is known that disaster experience plays a role in shaping coping behaviors, the mechanisms through which it moderates the relationship between resilience and coping strategies remain underexplored, especially in disaster-prone regions like Taiwan.

Resilience, coping strategies, and Social Identity

Resilience is a multidimensional construct that encompasses emotional, cognitive, and social capacities that allow individuals to recover from stress and adversity. In the context of natural disasters, resilience is closely tied to effective coping strategies that can mitigate the psychological and physical impacts of disaster exposure [12, 13]. Lazarus and Folkman's (1984) foundational work on coping strategies identified two primary types: problem-focused coping, which involves taking proactive steps to solve or manage stressful situations, and emotion-focused coping, which involves regulating the emotional response to stress [5]. Later research introduced a third category, avoidant coping strategies, characterized by behavioral or cognitive disengagement from stressors, including denial and avoidance [14–16]. While problem-focused and emotion-focused coping strategies tend to be adaptive, avoidant coping is typically maladaptive and can exacerbate psychological distress following disasters [15, 17].

Recent studies, such as Shing et al. (2016), emphasize that contextual positive coping contributes significantly to resilience following disasters [18]. This research highlights how coping strategies, shaped by prior experiences and social support networks, can either enhance or undermine resilience in the aftermath of disasters. Additionally, Parsons et al. (2021) highlight that geographic and social factors play a critical role in shaping disaster resilience, suggesting that coping capacities vary significantly based on a community's exposure to risk [19]. These findings underscore the need to examine how different types of disasters (e.g., floods, typhoons, and earthquakes) impact resilience and coping behaviors.

The role of collective psychosocial resilience

In addition to individual-level resilience, collective resilience also plays a crucial role in disaster recovery. The Social Identity Model of Collective Psychosocial Resilience (SIMCPR), proposed by Drury et al. (2012), suggests that shared social identities foster collective resilience by promoting cooperation and mutual support within groups during times of crisis [20]. According to this model, when people perceive themselves as part of a group or community, they are more likely to engage in prosocial behaviors such as resource sharing and emotional support, which strengthens collective resilience. In disaster situations, particularly during floods, community solidarity and collective action are often critical for effective disaster response and recovery. Drury et al. (2019) provide evidence that in emergencies, the emergence of disaster communities—groups formed from shared experiences of adversity—plays a key role in fostering mutual aid among survivors [21]. This collective identity facilitates practical and emotional support, essential for a community's ability to adapt and recover during disasters. The authors challenge conventional disaster myths such as mass panic and helplessness, instead highlighting how social identity processes can lead to solidarity and coordinated collective action. For example, they argue

that community members are often the "first responders," providing critical support before professional help arrives, and that facilitating shared identity is essential for authorities to enhance public resilience. Thus, while individual resilience is important, SIMCPR highlights the significance of collective processes in enhancing a community's ability to withstand and recover from disasters.

Study rationale and objectives

Given the frequency of natural disasters in Taiwan, there is an urgent need to better understand how prior disaster experience interacts with resilience dimensions to influence disaster preparedness and denial/avoidance behaviors. While much is known about how resilience predicts adaptive coping strategies, the moderating role of prior disaster experience remains unclear, particularly in terms of how it influences both adaptive and maladaptive strategies. Moreover, there is limited research on how demographic factors such as gender, age, and income may further shape these relationships in a disaster-prone context.

This study addresses these gaps by examining six key resilience dimensions—problem-solving, social support, negative emotion regulation, stable interpersonal relationships, assertiveness, and self-regulation—and their influence on disaster preparedness (adaptive) and disaster denial/avoidance (maladaptive) [21]. Additionally, we explore how prior disaster experience (earthquakes, typhoons, floods) moderates these relationships, providing a nuanced understanding of how different types of disaster experiences shape resilience and coping behaviors. By doing so, the study aims to contribute valuable insights to disaster preparedness interventions, emphasizing both individual and collective resilience in disaster-prone regions like Taiwan.

Current study

This study aims to investigate the interaction between resilience dimensions, coping strategies, and prior disaster experience in shaping disaster preparedness and avoidance behaviors in Taiwan. Taiwan, being highly prone to natural disasters like earthquakes, typhoons, and floods, provides a crucial context for understanding how individuals and communities cope with these events. Drawing on a multidimensional approach to resilience, this research focuses on six key resilience dimensions: problem-solving, social support, negative emotion regulation, stable interpersonal relationships, assertiveness, and self-regulation. These dimensions reflect the emotional, cognitive, and social capacities that individuals rely on when facing adversity, particularly in disaster situations.

While previous studies have demonstrated the importance of resilience in promoting adaptive coping strategies such as problem-solving and preparedness, the role of prior disaster experience in moderating the relationships between resilience and coping strategies remains underexplored. Furthermore, there is limited understanding of how prior disaster experience influences maladaptive coping strategies, such as denial and avoidance, and how demographic factors such as gender, age, and income shape these relationships.

The present study seeks to fill these gaps by examining how prior disaster experience moderates the relationship between resilience dimensions and both adaptive and maladaptive coping strategies. Additionally, the study will explore the influence of demographic factors on these relationships. By investigating these dynamics, this research aims to provide valuable insights into how disaster preparedness interventions can be tailored to account for individual and collective resilience, particularly in regions with high disaster risk like Taiwan. The relationships among the variables under investigation are depicted in Fig. 1.

Hypotheses

H1 Higher levels of resilience, particularly in problem-solving, assertiveness, and social support, will positively predict disaster preparedness. Individuals who score higher in these dimensions are expected to engage more in proactive behaviors, such as gathering disaster-related information and preparing survival kits.

H2 Resilience dimensions such as emotion regulation and self-regulation will negatively predict disaster denial and avoidance. Individuals with stronger emotional control are expected to engage less frequently in maladaptive coping strategies, such as denying disaster risks or avoiding preparation.

H3 Prior disaster experience (e.g., earthquakes, typhoons, floods) will moderate the relationship between resilience dimensions and coping strategies. Individuals with prior disaster experience will show stronger associations between resilience and preparedness, while prior experience may reduce the use of denial and avoidance strategies.

H4 Demographic factors (e.g., gender, age, education, and income) will influence disaster preparedness and avoidance behaviors. It is expected that males and older individuals will score higher on resilience dimensions, while individuals with higher education and income may engage less in avoidance behaviors.

These hypotheses aim to provide a nuanced understanding of how resilience and prior disaster experience interact to influence both adaptive and maladaptive coping

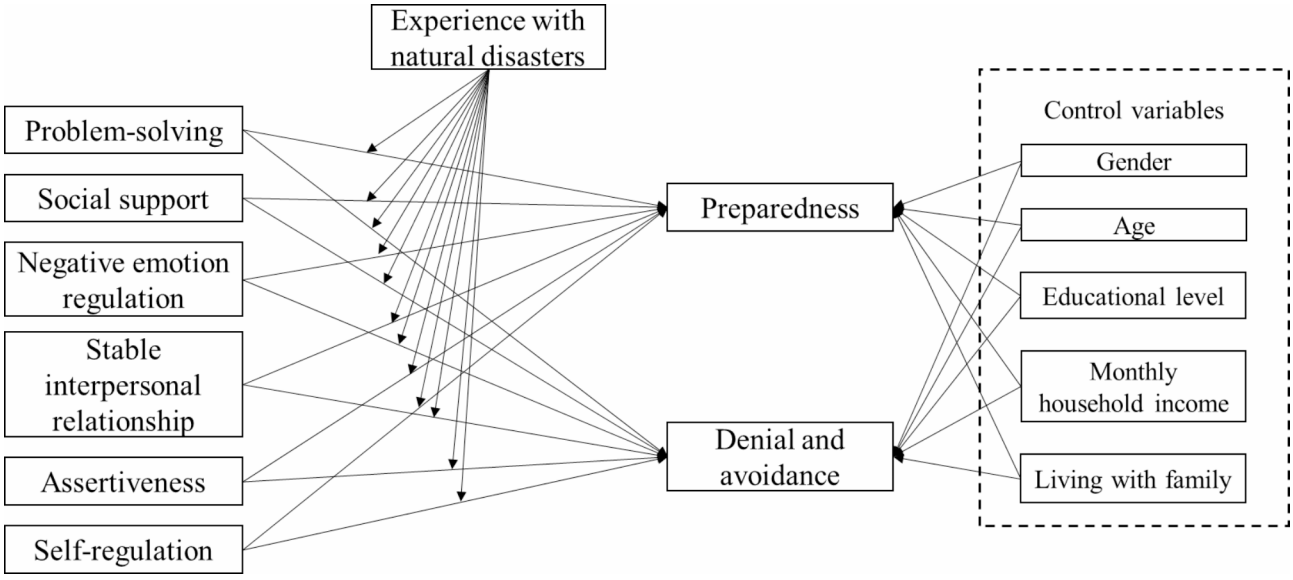

Fig. 1 The conceptual model of the current study

strategies in the context of frequent natural disasters in Taiwan.

Methods

Participants

A total of 655 participants were recruited from Taipei City and New Taipei City using stratified cluster and convenience sampling methods. After screening for multivariate outliers, 105 participants were excluded, leaving a final sample of 550 valid responses. The sample was predominantly female (57.82%), and most participants were aged between 21 and 40 years. Participants' prior disaster experiences were also assessed, with 21.3% having experienced earthquakes, 26.7% having experienced typhoons, and 14.9% having experienced floods. Demographic variables such as age, gender, education level, and household income were collected and later used as control variables in the analyses.

Measurements

All scales were administered in Traditional Chinese, and participants rated the s on a 6-point Likert scale ranging from "strongly disagree" [1] to "strongly agree" [6], unless otherwise specified. The following scales were used (Table 1):

Resilience dimensions

Resilience was measured using a shortened version of the Protective Factors of Disaster Resilience Scale [22]. The scale consists of 20 items across six dimensions, with high internal consistency (Cronbach's $\alpha = 0.95$). The six dimensions are: Problem-solving ($\alpha = 0.90$) which assesses participants' ability to confront challenges and find solutions (sample item: "I can think of several ways to solve a difficult problem"), Social support ($\alpha = 0.86$) which measures access to emotional or practical support from others (sample item: "I have people I can rely on in times of crisis", Negative emotion regulation ($\alpha = 0.88$) which assesses ability to manage negative emotions (Sample item: "I stay calm and maintain a positive outlook in difficult times"), Stable interpersonal relationships ($\alpha = 0.82$), which evaluates the stability of relationships with family and friends (sample item: "I have stable relationships with family and close friends", Assertiveness ($\alpha = 0.82$) which measures confidence in expressing thoughts and feelings (sample item: "I feel comfortable asserting my opinions"), and Self-regulation ($\alpha = 0.86$) which evaluates ability to balance emotions and responsibilities (sample item: "I can manage my emotions and maintain balance during stressful times".

Disaster preparedness

Disaster preparedness was measured using a 5-item scale adapted from Wu & Huang (2011) [23]. This scale assesses behavioral and informational readiness for natural disasters. Sample items include "I am very concerned about information regarding potential disasters", and "I know how to escape safely in the event of a disaster". The internal consistency for this scale was acceptable ($\alpha = 0.80$).

Disaster denial and avoidance

Disaster denial and avoidance, considered maladaptive coping strategies, were measured using a 4-item scale adapted from Pai et al. (2016) [24]. This scale assessed deterministic thinking, optimism bias, and externalization of responsibility related to disaster preparedness. A sample item is "I believe that disasters are acts of fate,

Table 1 Detailed descriptions of items in the 8-Factor model

Dimension and item	
Problem-solving	
Item 1	I am prepared in advance for any potential difficulties.
Item 2	I can use various methods to solve problems when they arise.
Item 3	I have strong confidence in my ability to solve different problems.
Item 4	I can solve problems step by step with a plan.
Social support	
Item 1	I have no difficulty asking for help when I need it.
Item 2	When difficulties arise, I have people around who encourage me.
Item 3	When difficulties arise, I have someone to confide in.
Negative emotion regulation	
Item 1	I can remain calm when faced with difficulties.
Item 2	I can handle unpleasant or painful emotions, such as sadness, fear, and anger, when difficulties arise.
Item 3	Even in the face of difficulties, I can still see the positive side.
Stable interpersonal relationship	
Item 1	My relationship with family members (e.g., parents, spouse, children) is stable.
Item 2	My relationship with other relatives is stable.
Item 3	My relationship with friends is stable.
Assertiveness	
Item 1	I can come up with new ideas when working on tasks.
Item 2	I don't feel embarrassed when expressing my thoughts and feelings.
Item 3	I can express my dissatisfaction when faced with difficulties in life.
Self-regulation	
Item 1	I can openly accept criticism from others without feeling upset and am willing to discuss issues
Item 2	I can calmly face uncertainties in the future.
Item 3	I recover easily after being sick, injured, or experiencing hardship.
Item 4	I can deal with inappropriate situations by refusing or negotiating.
Disasters preparedness	
Item 1	I am very concerned about information about possible disasters
Item 2	I know how to use emergency escape equipment to escape safely
Item 3	I usually prepare survival kits (including simple medical supplies, emergency food, emergency lighting equipment, whistle…etc.)
Item 4	I know how to escape safely in the event of a disaster
Item 5	I know where the closest shelter is.
Disasters denial and avoidance	
Item 1	I believe that disasters are heaven's will, inevitable, and cannot be changed by human beings.
Item 2	I think compound disasters (soil liquefaction, landslides, etc.) will not pose a threat to me.
Item 3	I think disaster prevention is the responsibility of the government, not households.
Item 4	I believe that life and death are a matter of fate, and no special preparation (for disasters) is required.

and nothing can be done to prevent them". The internal consistency for this scale was lower ($\alpha = 0.65$), indicating potential areas for refinement.

Prior disaster experience

Participants' prior disaster experiences were assessed through three yes/no questions regarding their experiences with earthquakes, typhoons, and floods. Responses were used to create a global measure of prior disaster experience, as well as specific measures for each disaster type.

Demographic variables

Demographic information such as age, gender, education level, and household income were collected. These variables were included as controls in the analysis to account for their potential influence on resilience and coping strategies.

Procedure

Participants were recruited using a stratified cluster sampling method to ensure diverse representation across gender and age groups in Taipei City and New Taipei City. Surveys were distributed both online and in person at community centers and libraries. Informed consent was obtained from all participants, and they were assured

of the confidentiality of their responses. The survey, administered in Traditional Chinese, took approximately 20 min to complete.

After data collection, responses were screened for completeness, and participants with more than 20% missing data were excluded. Multivariate outliers were identified using Mahalanobis distance, and 105 participants were removed. The final sample of 550 participants was used for subsequent analyses.

Data analysis

To examine the relationships between resilience dimensions, coping strategies, and prior disaster experience, we utilized both confirmatory factor analysis (CFA) and path analysis. CFA was conducted to validate the measurement model, ensuring that the resilience dimensions and coping strategies were accurately represented by the data. Path analysis was employed to test the hypothesized relationships between resilience, disaster preparedness, and denial/avoidance behaviors, as well as the moderating effects of prior disaster experience.

Moderation analyses were performed using interaction terms, where prior disaster experience (earthquakes, typhoons, and floods) was introduced as a moderator of the relationships between resilience dimensions and coping strategies. Each resilience dimension (problem-solving, social support, emotion regulation, stable interpersonal relationships, assertiveness, and self-regulation) was standardized before creating the interaction terms. These standardized interaction terms were then included in the models to assess the moderating influence of prior disaster experience.

Demographic variables (e.g., gender, age, education, income) were controlled for in the path analysis to account for their potential influence on disaster preparedness and denial/avoidance behaviors. Separate models were tested for each type of disaster experience (earthquakes, typhoons, and floods) to determine how prior exposure to specific disasters moderated the relationships between resilience dimensions and coping strategies.

Statistical analyses were performed using Jamovi software, and model fit was assessed using standard fit indices such as the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The threshold values for acceptable model fit were set at $CFI \geq 0.90$, $TLI \geq 0.90$, $RMSEA \leq 0.08$, and $SRMR \leq 0.08$, following established guidelines [25, 26].

This analytical approach allows for a comprehensive investigation of the relationships between resilience dimensions and coping strategies, while also considering the influence of prior disaster experience and demographic factors. By using both CFA and path analysis, the study provides a robust framework for understanding how these variables interact in the context of frequent natural disasters in Taiwan.

Path analyses were then conducted to examine the relationships between resilience dimensions and coping strategies, with prior disaster experience introduced as a moderator. All resilience predictors were standardized before creating interaction terms to assess moderation effects. Separate models were tested for each type of disaster experience (earthquakes, typhoons, floods) to determine whether prior exposure to specific disasters moderated the relationships between resilience dimensions and coping strategies.

Demographic variables (age, gender, education, income) were controlled for in the path analysis. Statistical analyses were conducted using Jamovi software. Model fit was assessed using the same indices as CFA, ensuring that the path models were robust and adequately explained the relationships of interest.

Results

Demographic characteristics

Table 2 provides an overview of the demographic characteristics of the 550 participants. The sample consisted primarily of younger adults, with 57.82% being female and 42.18% male participants. A significant proportion of respondents (26.73%) were aged between 21 and 30 years, with 18.73% under the age of 20 and 12.36% aged between 31 and 40 years. Participants over the age of 60 comprised 12.37% of the sample. Educational attainment was distributed as follows: 70.73% of participants held a bachelor's degree, and 13.09% had obtained a master's degree. Additionally, 81.09% of participants lived with family members.

In terms of marital status, 44.91% were unmarried but living with a partner, and 42.55% were married. Religious affiliation varied among participants, with 36.73% identifying as having no religious affiliation, 33.27% identifying as Christian, and 15.45% identifying as Daoist. Regarding household income, 24.55% of participants earned between 40,001 and 60,000 NTD per month, followed by 21.82% earning between 20,001 and 40,000 NTD. Prior experience with natural disasters was limited: 78.73% had no experience with earthquakes, 73.27% had never experienced a typhoon, and 85.09% had not experienced a flood.

Confirmatory Factor Analysis (CFA) results

The confirmatory factor analysis (CFA) results indicated a good fit for the 8-factor model, with fit indices of $CFI = 0.93$, $TLI = 0.92$, $SRMR = 0.06$, and $RMSEA = 0.06$ (see Table 3). These values align well with the accepted standards for model fit, confirming the structure of the resilience dimensions and coping strategies.

Table 2 Frequency of demographic variables

Variable	*n* (%)
Gender	
Female	318 (57.82)
Male	232 (42.18)
Age	
Below 20	103 (18.73)
21–30	147 (26.73)
31–40	68 (12.36)
41–50	91 (16.55)
51–60	73 (13.27)
61–70	58 (10.55)
71–80	7 (1.27)
Above 80	3 (0.55)
Educational level	
Primary school	9 (1.64)
Junior school	12 (2.18)
High school	61 (11.09)
Bachelor's	389 (70.73)
Master's	72 (13.09)
Doctorate	7 (1.27)
Marital status	
Married	234 (42.55)
Not married	47 (8.55)
Not married (but with a partner living together)	247 (44.91)
Divorced	11 (2.00)
Widowed	9 (1.64)
Other	2 (0.36)
Religion	
None	202 (36.73)
Daoism	85 (15.45)
Buddhism	63 (11.45)
Christianity	183 (33.27)
Catholic	4 (0.73)
Yiguandao	9 (1.64)
Other	4 (0.73)
Monthly household income	
Below 20,001 NTD	43 (7.82)
20,001–40,000 NTD	120 (21.82)
40,001–60,000 NTD	135 (24.55)
60,001–80,000 NTD	95 (17.27)
80,001-100,000 NTD	70 (12.73)
100,001-150,000 NTD	60 (10.91)
Above 150,000 NTD	27 (4.91)
Living with family	
No	104 (18.91)
Yes	446 (81.09)
Prior experience with earthquakes	
No	433 (78.73)
Yes	117 (21.27)
Prior experience with typhoons	
No	403 (73.27)
Yes	147 (26.73)
Prior experience with floods	

Table 2 (continued)

Variable	*n* (%)
No	468 (85.09)
Yes	82 (14.91)

Note. *N* = 550. NTD = New Taiwan dollar

Table 3 Z value, standardized loadings, and standard errors (*SE*) of items of resilience dimensions and coping strategies in a confirmatory factor analysis

Dimension and item	Z	Loading	SE
Problem-solving			
Item 1	17.69	0.68	0.04
Item 2	24.69	0.86	0.04
Item 3	26.50	0.90	0.04
Item 4	25.28	0.87	0.03
Social support			
Item 1	17.34	0.67	0.04
Item 2	28.91	0.95	0.03
Item 3	26.25	0.89	0.03
Negative emotion regulation			
Item 1	23.83	0.84	0.03
Item 2	23.79	0.84	0.03
Item 3	23.96	0.84	0.04
Stable interpersonal relationship			
Item 1	20.23	0.78	0.03
Item 2	19.40	0.75	0.04
Item 3	21.42	0.81	0.03
Assertiveness			
Item 1	21.03	0.78	0.03
Item 2	22.58	0.83	0.04
Item 3	19.01	0.73	0.04
Self-regulation			
Item 1	20.03	0.75	0.04
Item 2	23.92	0.84	0.03
Item 3	22.89	0.82	0.04
Item 4	19.11	0.72	0.03
Disasters preparedness			
Item 1	15.09	0.62	0.05
Item 2	20.60	0.78	0.04
Item 3	17.90	0.71	0.05
Item 4	20.92	0.79	0.04
Item 5	12.23	0.52	0.06
Disasters denial and avoidance			
Item 1	8.29	0.41	0.07
Item 2	12.97	0.69	0.08
Item 3	12.31	0.64	0.08
Item 4	9.94	0.51	0.08

Note. *N* = 550. All loadings are significant at $p < .001$

Factor loadings across the resilience dimensions were high, reflecting the robustness of the measurement. Problem-solving emerged as a key dimension of resilience, with loadings ranging from 0.68 to 0.90. Social support also showed strong loadings (0.67 to 0.95), with Item 2 standing out with the highest loading of 0.95, highlighting the importance of social networks during disaster situations. Negative emotion regulation displayed consistent loadings of 0.84, demonstrating participants' ability to manage emotions during challenging times. Assertiveness and stable interpersonal relationships exhibited high loadings of 0.78, underscoring their role in resilience-building. Self-regulation had loadings ranging from 0.72 to 0.84, showcasing its significance in emotional control during disasters. For coping strategies, the 5-item scale measuring disaster preparedness demonstrated moderate loadings (0.52 to 0.79) with standard errors between 0.04 and 0.06. Disaster denial and avoidance, in contrast, had weaker factor loadings (0.41 to 0.69), with higher standard errors (0.07 to 0.08), suggesting that these maladaptive strategies were less stable.

Resilience and coping strategies: demographic differences

Regarding resilience dimensions, gender differences were prominent. Males consistently scored higher across several factors, including problem-solving (t(548)) = -3.54, $p < .001$, d = -0.31), negative emotion regulation (t(548)) = -3.15, $p = .002$, d = -0.27), assertiveness (t(548)) = -3.33, $p < .001$, d = -0.29), and self-regulation (t(548)) = -3.21, $p = .001$, d = -0.28). Age was also positively correlated with resilience traits, including problem-solving ($r = .11$, $p = .013$), negative emotion regulation ($r = .21$, $p < .001$), stable interpersonal relationships ($r = .15$, $p < .001$), assertiveness ($r = .16$, $p < .001$), and self-regulation ($r = .19$, $p < .001$). Individuals living with family demonstrated higher scores in negative emotion regulation (t(548)) = -2.76, $p = .006$, d = -0.30) and stable interpersonal relationships (t(548)) = -2.54, $p = .011$, d = -0.28). Additionally, household income was positively correlated with stable interpersonal relationships ($r = .10$, $p = .020$), suggesting that financial stability enhances social support networks. These findings underscore that family support and financial resources are key drivers in fostering resilience, while gender and age also play significant roles in shaping these dimensions.

For coping strategies, people living with family exhibited higher levels of disaster preparedness (t(548)) = -2.36, $p = .019$, d = -0.26), indicating that family support strengthens preparedness behaviors. Males demonstrated significantly higher disaster preparedness (t(548)) = -3.78, $p < .001$, d = -0.33) compared to females, reflecting gendered differences in proactive disaster responses. Age was also positively correlated with preparedness ($r = .09$, $p = .034$), suggesting that older individuals tend

to be better prepared for disasters. Conversely, disaster denial and avoidance behaviors were negatively associated with both education and income levels, with education showing a weak negative correlation ($r = -.10$, $p = .018$) and income having a stronger negative correlation ($r = -.13$, $p = .002$). This suggests that individuals with higher education and income are less likely to engage in maladaptive coping strategies. These patterns highlight the complex interplay between demographic factors and coping behaviors, with family support, gender, and income playing significant roles in determining both preparedness and avoidance tendencies.

Path analysis results

Table 4 summarizes the outcomes from six path models tested in this study, examining the relationships between resilience dimensions, coping strategies, and the moderating effects of prior disaster experience.

Model 1 served as the baseline model, in which six resilience dimensions—problem-solving, assertiveness, social support, negative emotion regulation, stable interpersonal relationships, and self-regulation—were used to predict disaster preparedness and denial/avoidance behaviors. In this model, both problem-solving and assertiveness emerged as significant positive predictors of disaster preparedness. The predictors accounted for 41.83% of the variance in preparedness (Wald χ^2 [6] = 395.53, $p < .001$) and 5.43% of the variance in denial and avoidance (Wald χ^2 [6] = 31.56, $p < .001$).

Model 2 extended the baseline model by controlling for demographic variables such as gender, age, educational level, income, and living with family. After adjusting for these factors, problem-solving and assertiveness remained significant predictors of disaster preparedness. Living with family weakly predicted preparedness, while lower household income significantly predicted higher levels of denial and avoidance. The predictors explained 42.91% of the variance in preparedness (Wald χ^2 [11] = 413.37, $p < .001$) and 8.09% of the variance in denial and avoidance (Wald χ^2 [11] = 48.40, $p < .001$).

Model 3 introduced prior natural disaster experience as a moderator. The model explained 44.49% of the variance in preparedness (Wald χ^2 [18] = 440.88, $p < .001$) and 9.44% of the variance in denial and avoidance (Wald χ^2 [18] = 57.34, $p < .001$). However, prior disaster experience did not significantly moderate the relationships between resilience dimensions and coping strategies. Problem-solving, assertiveness, and living with family remained significant predictors of preparedness, while lower income continued to predict higher denial and avoidance.

Model 4 focused on prior earthquake experience as a moderator. The model explained 43.82% of the variance in preparedness (Wald χ^2 [18] = 428.94, $p < .001$) and 8.70% of the variance in denial and avoidance (Wald χ^2 [18] = 52.39, $p < .001$). Similar to Model 3, prior earthquake experience did not moderate any relationships, nor did it predict coping strategies. Nonetheless, problem-solving, assertiveness, and living with family continued to significantly predict preparedness, while income remained a significant negative predictor of denial and avoidance.

Model 5 explored the moderating role of prior typhoon experience. The model accounted for 44.83% of the variance in preparedness (Wald χ^2 [18] = 446.88, $p < .001$) and 10.74% of the variance in denial and avoidance (Wald χ^2 [18] = 66.16, $p < .001$). While prior typhoon experience did not moderate any relationships, it directly predicted lower levels of denial and avoidance. Problem-solving, assertiveness, and living with family continued to positively predict preparedness, while income remained a significant negative predictor of denial and avoidance.

Model 6 examined the moderating effects of prior flood experience. The model explained 43.91% of the variance in preparedness (Wald χ^2 [18] = 430.56, $p < .001$) and 9.97% of the variance in denial and avoidance (Wald χ^2 [18] = 60.90, $p < .001$). Unlike prior experiences with earthquakes and typhoons, flood experience significantly moderated several relationships.

Most notably, flood experience positively moderated the relationship between social support and denial/avoidance ($\beta = 0.21$, $p = .017$), indicating that participants with stronger social support who had experienced floods were more likely to engage in denial and avoidance behaviors compared to those without flood experience. Furthermore, flood experience negatively moderated the relationship between negative emotion regulation and both preparedness ($\beta = -0.18$, $p = .035$) and denial/avoidance ($\beta = -0.23$, $p = .030$). This suggests that individuals with higher emotional regulation were less likely to engage in preparedness or denial/avoidance behaviors following flood experiences. These findings underscore the nuanced role of prior flood experience in shaping how resilience dimensions influence coping strategies.

In summary, across all models, problem-solving, assertiveness, and living with family consistently predicted higher levels of preparedness, while income remained a consistent negative predictor of denial and avoidance. The moderation effects of flood experience on resilience and coping strategies highlight the complexity of disaster preparedness behaviors, particularly for individuals who have faced unpredictable and overwhelming events like floods.

Discussion

This study examined the relationships between resilience dimensions, coping strategies, and prior disaster experience, particularly focusing on disaster preparedness and denial/avoidance behaviors in Taiwan. The six resilience

Table 4 Standardized coefficients, 95% confidence intervals, standard errors, and p values of the six path analysis models predicting disasters preparedness and disasters denial and avoidance

Variable	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6		
	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*
Preparedness																		
PS	0.38 [0.29, 0.47]	0.05	< 0.001	0.38 [0.28, 0.47]	0.05	< 0.001	0.36 [0.27, 0.46]	0.05	< 0.001	0.36 [0.24, 0.48]	0.06	< 0.001	0.33 [0.23, 0.43]	0.05	< 0.001	0.36 [0.26, 0.47]	0.05	< 0.001
SS	0.01 [-0.09, 0.11]	0.05	0.88	0.02 [-0.08, 0.12]	0.05	0.70	0.04 [-0.06, 0.15]	0.05	0.41	0.05 [-0.07, 0.18]	0.07	0.41	0.07 [-0.05, 0.19]	0.06	0.25	0.08 [-0.05, 0.22]	0.07	0.24
NER	0.06 [-0.06, 0.18]	0.06	0.30	0.04 [-0.08, 0.16]	0.06	0.49	0.04 [-0.08, 0.16]	0.06	0.52	0.06 [-0.10, 0.22]	0.08	0.45	0.04 [-0.10, 0.17]	0.07	0.58	−0.08 [-0.24, 0.09]	0.08	0.37
SIR	0.03 [-0.06, 0.12]	0.05	0.54	0.03 [-0.06, 0.12]	0.05	0.53	0.02 [-0.07, 0.11]	0.05	0.62	0.06 [-0.04, 0.17]	0.05	0.23	0.01 [-0.09, 0.10]	0.05	0.91	0.01 [-0.12, 0.13]	0.06	0.93
Asse	0.23 [0.12, 0.35]	0.06	< 0.001	0.23 [0.11, 0.34]	0.06	< 0.001	0.21 [0.09, 0.32]	0.06	< 0.001	0.26 [0.11, 0.40]	0.07	< 0.001	0.18 [0.05, 0.31]	0.07	0.01	0.16 [0.00, 0.32]	0.08	0.05
SR	0.03 [-0.10, 0.16]	0.07	0.66	0.04 [-0.09, 0.17]	0.07	0.55	0.02 [-0.11, 0.15]	0.07	0.77	−0.04 [-0.20, 0.12]	0.08	0.63	0.02 [-0.12, 0.16]	0.07	0.75	0.12 [-0.06, 0.29]	0.09	0.20
Age				−0.02 [-0.05, 0.02]	0.02	0.49	−0.03 [-0.06, 0.02]	0.02	0.32	−0.02 [-0.05, 0.03]	0.02	0.61	−0.03 [-0.06, 0.02]	0.02	0.33	−0.02 [-0.05, 0.02]	0.02	0.48
Edu				0.02 [-0.07, 0.12]	0.05	0.59	0.02 [-0.07, 0.11]	0.05	0.64	0.02 [-0.07, 0.11]	0.05	0.65	0.01 [-0.08, 0.11]	0.05	0.73	0.03 [-0.05, 0.13]	0.05	0.41
Income				−0.05 [-0.07, 0.01]	0.02	0.18	−0.05 [-0.07, 0.01]	0.02	0.16	−0.04 [-0.07, 0.02]	0.02	0.25	−0.04 [-0.07, 0.02]	0.02	0.24	−0.05 [-0.07, 0.01]	0.02	0.15
Gender				0.05 [-0.02, 0.24]	0.07	0.10	0.05 [-0.02, 0.24]	0.07	0.11	0.05 [-0.03, 0.23]	0.07	0.15	0.06 [-0.02, 0.24]	0.07	0.09	0.05 [-0.04, 0.23]	0.07	0.15
Fam				0.08 [0.04, 0.37]	0.09	0.02	0.08 [0.03, 0.36]	0.08	0.02	0.08 [0.03, 0.36]	0.09	0.02	0.07 [0.02, 0.35]	0.08	0.03	0.08 [0.03, 0.36]	0.08	0.02
Disaster							0.01 [-0.11, 0.15]	0.07	0.72	0.03 [-0.07, 0.24]	0.08	0.30	−0.02 [-0.18, 0.11]	0.07	0.62	0.00 [-0.19, 0.20]	0.10	0.97
Disaster x PS							−0.06 [-0.30, 0.06]	0.09	0.20	−0.03 [-0.29, 0.18]	0.12	0.65	−0.08 [-0.37, 0.04]	0.10	0.11	−0.03 [-0.26, 0.15]	0.11	0.61
Disaster x SS							0.06 [-0.08, 0.32]	0.10	0.25	0.06 [-0.14, 0.37]	0.13	0.38	0.08 [-0.07, 0.40]	0.12	0.17	0.08 [-0.11, 0.43]	0.14	0.25
Disaster x NER							−0.07 [-0.39, 0.10]	0.13	0.23	0.02 [-0.28, 0.35]	0.16	0.83	−0.06 [-0.39, 0.14]	0.14	0.36	−0.18 [-0.69, −0.02]	0.17	0.04
Disaster x SIR							0.04 [-0.09, 0.26]	0.09	0.36	0.08 [-0.06, 0.36]	0.11	0.16	−0.02 [-0.22, 0.15]	0.10	0.72	−0.02 [-0.28, 0.21]	0.12	0.79

Table 4 (continued)

Variable	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6		
	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*	β [95% *CI*]	*SE*	*p*
Disaster x Asse							−0.06 [-0.34, 0.12]	0.12	0.34	0.06 [-0.16, 0.41]	0.14	0.40	−0.08 [-0.41, 0.09]	0.13	0.22	−0.10 [-0.51, 0.12]	0.16	0.23
Disaster x SR							−0.02 [-0.31, 0.21]	0.13	0.71	−0.14 [-0.61, 0.04]	0.17	0.09	−0.01 [-0.30, 0.25]	0.14	0.87	0.12 [-0.10, 0.60]	0.18	0.16
Denial and avoidance																		
PS	0.05 [-0.07, 0.16]	0.06	0.42	0.02 [-0.09, 0.14]	0.06	0.71	0.01 [-0.10, 0.13]	0.06	0.83	−0.02 [-0.17, 0.13]	0.08	0.79	−0.03 [-0.16, 0.10]	0.07	0.61	0.02 [-0.11, 0.15]	0.07	0.76
SS	−0.01 [-0.14, 0.12]	0.07	0.91	−0.02 [-0.15, 0.11]	0.07	0.80	0.01 [-0.13, 0.14]	0.07	0.94	−0.02 [-0.18, 0.15]	0.08	0.83	0.00 [-0.15, 0.15]	0.08	0.99	0.12 [-0.05, 0.29]	0.09	0.17
NER	−0.01 [-0.16, 0.14]	0.08	0.90	0.00 [-0.15, 0.16]	0.08	0.96	0.02 [-0.13, 0.18]	0.08	0.77	0.04 [-0.16, 0.24]	0.10	0.67	0.05 [-0.12, 0.22]	0.09	0.54	−0.16 [-0.37, 0.05]	0.11	0.14
SIR	−0.01 [-0.12, 0.10]	0.06	0.84	0.02 [-0.10, 0.13]	0.06	0.78	0.02 [-0.10, 0.13]	0.06	0.75	0.06 [-0.08, 0.19]	0.07	0.39	0.02 [-0.10, 0.14]	0.06	0.70	0.00 [-0.15, 0.16]	0.08	0.97
Asse	0.09 [-0.05, 0.23]	0.07	0.22	0.08 [-0.07, 0.22]	0.07	0.30	0.05 [-0.09, 0.20]	0.07	0.47	0.04 [-0.14, 0.22]	0.09	0.64	0.05 [-0.11, 0.21]	0.08	0.57	0.02 [-0.18, 0.22]	0.10	0.85
SR	0.14 [-0.02, 0.30]	0.08	0.09	0.15 [-0.01, 0.31]	0.08	0.07	0.12 [-0.05, 0.28]	0.08	0.17	0.17 [-0.04, 0.37]	0.11	0.12	0.08 [-0.09, 0.26]	0.09	0.36	0.15 [-0.07, 0.38]	0.11	0.17
Age				0.02 [-0.04, 0.06]	0.02	0.69	0.01 [-0.04, 0.05]	0.02	0.83	0.03 [-0.03, 0.07]	0.03	0.53	0.01 [-0.04, 0.05]	0.02	0.79	0.02 [-0.04, 0.06]	0.02	0.67
Edu				−0.06 [-0.20, 0.04]	0.06	0.18	−0.06 [-0.20, 0.03]	0.06	0.14	−0.06 [-0.20, 0.04]	0.06	0.18	−0.07 [-0.21, 0.02]	0.06	0.12	−0.05 [-0.18, 0.05]	0.06	0.25
Income				−0.12 [-0.12, −0.02]	0.03	0.01	−0.12 [-0.13, −0.02]	0.03	0.01	−0.11 [-0.12, −0.02]	0.03	0.01	−0.11 [-0.12, −0.01]	0.03	0.01	−0.12 [-0.13, −0.02]	0.03	0.00
Gender				0.01 [-0.15, 0.18]	0.09	0.85	0.00 [-0.16, 0.17]	0.09	0.96	0.01 [-0.15, 0.18]	0.09	0.86	0.00 [-0.16, 0.17]	0.08	0.97	0.00 [-0.17, 0.16]	0.09	0.96
Fam				−0.07 [-0.40, 0.02]	0.11	0.08	−0.07 [-0.40, 0.03]	0.11	0.08	−0.07 [-0.40, 0.03]	0.11	0.10	−0.07 [-0.38, 0.04]	0.11	0.12	−0.08 [-0.40, 0.02]	0.11	0.07
Disaster							−0.02 [-0.20, 0.13]	0.08	0.65	0.03 [-0.13, 0.27]	0.10	0.47	−0.09 [-0.38, −0.02]	0.09	0.03	0.01 [-0.21, 0.28]	0.13	0.78
Disaster x PS							−0.04 [-0.32, 0.14]	0.12	0.46	−0.07 [-0.43, 0.16]	0.15	0.38	−0.09 [-0.44, 0.07]	0.13	0.15	0.01 [-0.25, 0.28]	0.14	0.94
Disaster x SS							0.08 [-0.10, 0.42]	0.13	0.23	−0.01 [-0.34, 0.31]	0.17	0.92	0.02 [-0.26, 0.34]	0.15	0.79	0.21 [0.08, 0.77]	0.18	0.02

Table 4 (continued)

Variable	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6		
	β [95% CI]	***SE***	***p***	**β [95% CI]**	***SE***	***p***	**β [95% CI]**	***SE***	***p***	**β [95% CI]**	***SE***	***p***	**β [95% CI]**	***SE***	***p***	**β [95% CI]**	***SE***	***p***
Disaster x NER							0.00 [-0.30, 0.32]	0.16	0.95	0.07 [-0.27, 0.53]	0.20	0.52	0.06 [-0.22, 0.46]	0.17	0.50	−0.23 [-0.88, −0.04]	0.21	0.03
Disaster x SIR							0.06 [-0.11, 0.34]	0.12	0.33	0.08 [-0.11, 0.43]	0.14	0.25	0.06 [-0.12, 0.36]	0.12	0.33	−0.03 [-0.36, 0.26]	0.16	0.75
Disaster x Asse							−0.05 [-0.39, 0.20]	0.15	0.53	−0.05 [-0.45, 0.27]	0.18	0.63	−0.05 [-0.42, 0.23]	0.17	0.56	−0.07 [-0.53, 0.26]	0.20	0.51
Disaster x SR							−0.11 [-0.55, 0.11]	0.17	0.20	0.01 [-0.38, 0.44]	0.21	0.89	−0.13 [-0.61, 0.08]	0.18	0.13	−0.01 [-0.45, 0.43]	0.23	0.96

Note. *N* = 550. PS = problem-solving, SS = social support, NER = negative emotion regulation, SIR = stable interpersonal relationship, Asse = assertiveness, SR = self-regulation, Edu = educational level, Fam = living with family. The disaster variable in Model 3 measures whether (yes/no) participants experienced any earthquakes, typhoons, or floods. The three specific disasters were modelled specifically in Models 4, 5, and 6. Interaction terms were computed after score standardization

dimensions—problem-solving, social support, negative emotion regulation, stable interpersonal relationships, assertiveness, and self-regulation—were evaluated, with findings suggesting both adaptive and maladaptive responses in the context of prior disaster exposure. The results provide valuable insights into how these resilience dimensions interact with disaster experience to shape coping strategies, reinforcing and expanding upon previous findings [18, 22].

Resilience dimensions and disaster preparedness

As hypothesized, problem-solving and assertiveness emerged as significant positive predictors of disaster preparedness. Individuals who possess stronger problem-solving skills and the ability to assert themselves are more likely to engage in proactive behaviors, such as gathering information and preparing for potential risks [9]. These findings are consistent with existing research that emphasizes the importance of cognitive coping strategies in disaster preparedness interventions. By enhancing individuals' abilities to confront challenges, disaster education programs can improve both individual and community resilience. Moreover, Shing et al. (2016) emphasize that positive coping strategies—particularly when shaped by prior experiences and support networks—are crucial in fostering post-disaster resilience [18].

Interestingly, living with family was found to be a modest but consistent predictor of disaster preparedness across all models. Strong family support networks may facilitate sharing of resources, emotional support, and collaboration in disaster preparedness efforts, reflecting broader understandings of the family unit as a key driver of resilience in disaster contexts [10]. However, the weaker influence of living with family compared to individual traits such as problem-solving and assertiveness suggests that personal coping capacities are central to preparedness outcomes, emphasizing the need to focus on enhancing individual resilience skills.

Demographic factors in disaster preparedness and avoidance

Key demographic factors, including gender, age, and income, significantly influenced both disaster preparedness and avoidance behaviors. Males and older individuals were more likely to engage in preparedness behaviors, possibly reflecting traditional gender roles or greater access to resources and decision-making power among older adults. Age, in particular, may be associated with greater disaster experience, which equips older individuals with the knowledge and strategies needed for preparedness.

Income played a crucial role as a negative predictor of denial and avoidance behaviors. Lower-income

individuals were found to be more prone to maladaptive coping strategies, consistent with Parsons et al. (2021), who highlighted how economic disadvantage correlates with higher vulnerability in disaster contexts [19]. Communities lacking the financial and material resources to prepare for disasters are often less resilient and more susceptible to avoidance behaviors. This underscores the importance of targeted disaster interventions that address both financial limitations and the psychosocial barriers faced by lower-income populations.

Flood experience and maladaptive coping

One of the most intriguing findings was the role of prior flood experience in moderating the relationship between resilience dimensions and denial/avoidance behaviors. Contrary to expectations, participants with stronger social support who had experienced floods were more likely to engage in denial and avoidance behaviors ($\beta = 0.21$, $p = .017$). This finding challenges the conventional understanding that social support fosters adaptive coping in disaster contexts.

A potential explanation for this may lie in collective psychosocial responses. The Social Identity Model of Collective Psychosocial Resilience (SIMCPR), as articulated by Drury et al. (2019), suggests that a shared social identity can foster collective resilience, enhancing a group's capacity to cope with adversity [21]. However, in some cases, this shared identity might also predispose groups to maladaptive behaviors, such as denial or avoidance, particularly when there is a collective tendency to downplay the severity of disaster risks.

In the context of floods, social support networks, while providing emotional solace and solidarity, might inadvertently perpetuate denial or avoidance mechanisms. This could occur through a collective optimism bias or fatalistic outlook, where shared perceptions lead to underestimation of disaster risks. Consequently, these networks could reduce the group's sensitivity to actual threats or heighten fear, prompting avoidance behaviors rather than proactive engagement with the danger. This highlights the dual-edged nature of social cohesion during crises, where collective support can both enable resilience and contribute to maladaptive responses such as risk underestimation.

Gong et al. (2022) highlight how media attention and self-efficacy can significantly shape prosocial behaviors during crises, potentially influencing collective action in disaster situations [23]. Although the study focuses on prosocial behavior during the COVID-19 pandemic, these findings suggest that self-efficacy can reinforce adaptive behaviors in disaster preparedness. Therefore, disaster preparedness programs should focus not only on strengthening social support but also on challenging maladaptive group behaviors by incorporating educational components that promote proactive disaster management strategies. By increasing self-efficacy through responsible media and targeted education, individuals and communities can be better equipped to engage in positive, collective action during crises.

Negative emotion regulation and desensitization

Another key finding was the negative moderation effect of flood experience on the relationship between negative emotion regulation and both preparedness ($\beta = -0.18$, $p = .035$) and denial/avoidance ($\beta = -0.23$, $p = .030$). These results suggest that individuals with higher emotional regulation skills who had experienced floods were less likely to engage in disaster preparedness or avoidance behaviors. This aligns with research on desensitization and psychological numbing, where repeated exposure to traumatic events leads to emotional disengagement and a diminished perception of risk [9]. Li et al. describe a similar phenomenon, the 'psychological typhoon eye,' in which individuals closer to disaster zones show reduced concern for future risks.

Individuals who successfully regulated their emotional responses during previous floods may have become desensitized to future risks, downplaying the need for further preparedness or, conversely, avoiding engagement with the possibility of future disasters altogether. This highlights the complexity of emotional regulation in disaster contexts. While emotional regulation is generally seen as a protective factor, it may paradoxically lead to avoidance behaviors in high-risk populations, particularly those who have experienced traumatic events like floods.

Future interventions should address these nuanced dynamics by emphasizing the importance of emotional engagement in disaster preparedness, even for those with prior exposure. Encouraging adaptive emotional regulation can help individuals manage their emotions effectively without leading to disengagement or risk underestimation.

Vulnerability and community adaptation

The role of income as a predictor of denial and avoidance behaviors emphasizes the heightened vulnerability of lower-income populations. This finding is consistent with Uddin et al. (2021), who highlight how lower-income communities often struggle to access the resources and information necessary for disaster preparedness, making them more susceptible to maladaptive coping behaviors [24]. Uddin et al. further discuss how economically disadvantaged communities develop adaptive and transformational changes in the face of recurring disasters. Therefore, disaster preparedness interventions should focus on providing both material and psychological support to these vulnerable populations, helping reduce

the psychological barriers that contribute to avoidance behaviors.

Limitations

While this study provides valuable insights into the relationships between resilience dimensions, coping strategies, and prior disaster experience, several limitations should be considered. First, the use of self-reported measures introduces the possibility of recall bias, as participants may not accurately recall their past experiences or coping behaviors. Additionally, the internal consistency of the disaster denial/avoidance scale was relatively low ($\alpha = 0.65$), suggesting that this measure may require further refinement for improved reliability in future studies.

Another limitation is the cross-sectional design, which restricts our ability to infer causality between resilience, prior disaster experience, and coping strategies. Longitudinal studies would be more appropriate for capturing changes in resilience and coping over time. Finally, the study focused on three specific types of natural disasters (earthquakes, typhoons, floods) in Taiwan, which may limit the generalizability of the findings to other disaster contexts or geographic regions. Future research should explore how other disaster types, such as landslides or tsunamis, impact resilience and coping, and extend the scope to different cultural and socioeconomic settings.

Practical implications

The findings of this study have several practical implications for disaster preparedness interventions, particularly in regions like Taiwan that frequently experience natural disasters. First, the strong predictive roles of problem-solving and assertiveness highlight the importance of integrating cognitive and behavioral resilience training in disaster education programs. By focusing on enhancing individuals' problem-solving abilities and assertiveness, disaster interventions can empower people to engage more proactively in preparedness behaviors, ultimately improving community resilience.

Second, while social support networks are generally beneficial, they may also contribute to maladaptive behaviors, such as denial and avoidance, especially in flood contexts. Disaster preparedness programs should account for this dual role of social support by incorporating educational components that challenge collective attitudes of optimism bias and encourage active engagement in disaster management.

Additionally, the finding that lower-income individuals are more likely to engage in maladaptive coping behaviors suggests that disaster interventions should prioritize economically disadvantaged populations. These programs should offer both material support and psychological interventions to help reduce feelings of helplessness and foster more adaptive coping behaviors in vulnerable communities.

Conclusion

This study provides valuable insights into how resilience dimensions, prior disaster experience, and demographic factors influence disaster preparedness and avoidance behaviors in Taiwan. The findings underscore the importance of promoting cognitive resilience skills, such as problem-solving and assertiveness, in disaster preparedness interventions. Moreover, the complex interactions between social support, prior disaster experience, and maladaptive coping behaviors highlight the need for tailored interventions that address both individual resilience capacities and collective psychosocial dynamics.

Future research should focus on further refining measures of maladaptive coping, particularly denial and avoidance, and explore how different types of disasters and cultural contexts shape the resilience-coping relationship. By focusing on both individual and collective factors, disaster preparedness programs can enhance overall community resilience and help mitigate the risk of maladaptive coping behaviors, ultimately leading to better disaster outcomes for high-risk populations.

Author contributions

Y.L., T. L., and J. L. assisted in data collection, contributed to the data analysis and drafted this manuscript. S.S.C.W. took major responsibility for the design and conduct of the study. H.H.M.L. was responsible for data analysis and preparation of this manuscript. All authors reviewed, edited, and approved the final manuscript.

Funding

This work was supported by the National Science and Technology Council, Taiwan 2019–2022 (reference number:109-2625-M-845-003 and 108-2625-M-845-004).

Disclosure

statement: The authors report there are no competing interests to declare.

Data availability

The data is available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

Research ethics approval was collected from the Institutional Review Board of the University of Taipei by the fourth author. All participants gave consent to their participation in this study (reference: UT-IRB number: IRB-2020-063). This study did not include experiments on humans and/or the use of human tissues samples.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 26 January 2024 / Accepted: 7 January 2025
Published online: 17 January 2025

References

1. Ministry of the Interior, Republic of China (Taiwan). Statistical Yearbook of Interior. Taiwan: Ministry of the Interior. 2023. Loses caused by natural disasters. Available from: https://ws.moi.gov.tw/001/Upload/400/relfile/0/4405/48349492-6f8c-453b-a9d1-4a8f0593b979/year_en.html
2. Dilley M. Natural disaster hotspots: A Global Risk Analysis. Washington, DC: World Bank; 2005.
3. Lin PX. Extreme weather frequently breeds disasters! Compared with not being flooded, Taiwan should not be afraid of flooding. Foresight. 2021 Aug 10. Available from: https://www.gvm.com.tw/article/81553
4. Radio Taiwan International. Shock non-stop! Psychologist teaches five ways to relieve anxiety and insomnia after the earthquake. 2022 Sep 20 [cited 2023 May 16]. Available from: https://www.rti.org.tw/news/view/id/2144970
5. Lazarus RS, Folkman S. Stress, Appraisal, and coping. New York: Springer Publishing Company; 1984.
6. United Nations International Strategy for Disaster Reduction. Living with risk: A Global Review of Disaster reduction initiatives. Geneva: UNISDR; 2009.
7. De la Fuente J, Santos FH, Garzón-Umerenkova A, Fadda S, Solinas G, Pignata S. Cross-sectional study of resilience, positivity and coping strategies as predictors of engagement-burnout in undergraduate students: implications for prevention and treatment in mental well-being. Front Psychiatry. 2021;12:1–16. https://doi.org/10.3389/fpsyt.2021.596453.
8. Macía P, Barranco M, Gorbeña S, Álvarez-Fuentes E, Iraurgi I. Resilience and coping strategies in relation to mental health outcomes in people with cancer. PLoS ONE. 2021;16(5):1–13. https://doi.org/10.1371/journal.pone.0252075.
9. Li S, Rao LL, Bai XW, Zheng R, Ren XP, Li JZ, et al. Progression of the psychological typhoon eye and variations since the Wenchuan earthquake. PLoS ONE. 2010;5(3):1–6. https://doi.org/10.1371/journal.pone.0009727.
10. Almazan JU, Cruz JP, Alamri MS, Alotaibi JSM, Albougami ASB, Gravoso R, et al. Predicting patterns of disaster-related resiliency among older adult Typhoon Haiyan survivors. Geriatr Nurs. 2018;39(6):629–34. https://doi.org/10.1016/j.gerinurse.2018.04.015.
11. Brockie L, Miller E. Understanding older adults' resilience during the Brisbane floods: social capital, life experience, and optimism. Disaster Med Public Health Prep. 2017;11(1):72–9. https://doi.org/10.1017/dmp.2016.161.
12. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. Child Dev. 2000;71(3):543–62. https://doi.org/10.1111/1467-8624.00164.
13. Masten AS. Ordinary magic: resilience processes in development. Am Psychol. 2001;56(3):227–38. https://doi.org/10.1037/0003-066X.56.3.227.
14. Suls J, Fletcher B. The relative efficacy of avoidant and nonavoidant coping strategies: a meta-analysis. Health Psychol. 1985;4(3):249–88. https://doi.org/10.1037/0278-6133.4.3.249.
15. Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. J Pers Soc Psychol. 1989;56(2):267–83. https://doi.org/10.1037/0022-3514.56.2.267.
16. Mayordomo T, Viguer P, Sales A, Satorres E, Meléndez JC. Resilience and coping as predictors of well-being in adults. J Psychol. 2016;150(7):809–21. https://doi.org/10.1080/00223980.2016.1203276.
17. Nipp RD, El-Jawahri A, Moran SM, D'Arpino SM, Johnson PC, Lage DE, et al. The relationship between coping strategies, quality of life, and mood in patients with incurable cancer. Cancer. 2016;122(13):2110–6. https://doi.org/10.1002/cncr.30025.
18. Shing EZ, Jayawickreme E, Waugh CE. Contextual positive coping as a factor contributing to resilience after disasters. J Clin Psychol. 2016;72(12):1287–306. https://doi.org/10.1002/jclp.22327.
19. Parsons M, Reeve I, McGregor J, Hastings P, Marshall GR, McNeill J, et al. Disaster resilience in Australia: a geographic assessment using an index of coping and adaptive capacity. Int J Disaster Risk Reduct. 2021;62:102422.
20. Drury J. Collective resilience in mass emergencies and disasters: a social identity model. The social cure. Psychology; 2012. pp. 195–215.
21. Drury J, Carter H, Cocking C, Ntontis E, Tekin Guven S, Amlôt R. Facilitating collective psychosocial resilience in the public in emergencies: twelve recommendations based on the social identity approach. Front Public Health. 2019;7:141. https://doi.org/10.3389/fpubh.2019.00141.
22. Hsieh WC, Cheng SF, Chen YW. Research on the construction and development of Disaster Resilience Protection factor scale. J Soc Policy Soc Work. 2017;21(1):49–95.
23. Gong J, Zanuddin H, Hou W, Xu J. Media attention, dependency, self-efficacy, and prosocial behaviours during the outbreak of COVID-19: a constructive journalism perspective. Glob Media China. 2022;7(1):81–98.
24. Uddin MS, Haque CE, Khan MN, Doberstein B, Cox RS. Disasters threaten livelihoods, and people cope, adapt and make transformational changes: community resilience and livelihoods reconstruction in coastal communities of Bangladesh. Int J Disaster Risk Reduct. 2021;63:102444.
25. Wu J, Huang Y. The establishment of vulnerability evaluation indexes: the case of Shueili Township, Nantou, Taiwan. J City Plan. 2011;38(2):195–218.
26. Pai J, Chen Y, Huang KH. A Study of Disaster Adaptation Behavior and Risk Communication for watershed Area Resident—the Case of Kaoping River Watershed in Taiwan. In: European Geosciences Union General Assembly. 2016, Vienna, Austria; 2016 Apr 17–22.

Publisher's note