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How arts and cultural activities can reduce disaster risk and improve recovery outcomes: An interdisciplinary scoping review with thematic synthesis

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ABSTRACT

Arts and cultural activities are important and increasing components of disaster recovery and resilience programs worldwide. But to date there has been little formal research about these activities and there is little evidence to inform best practice, implementation or impact assessment. This review of published research of arts participation and disaster risk reduction addresses this gap. The characteristics of this heterogenous field are presented, and three dominant themes, six content themes, and one epistemic theme are identified. Results show that arts participation programs can powerfully contribute to community wellbeing in disaster contexts, catalyse improvements in disaster education and disaster preparedness, and support communities to make sense of disaster experiences, to imagine alternative futures, and to reconfigure identity in connection to place. Through thematic synthesis, four models are presented to explain core processes and dimensions evident in arts participation programs within disaster contexts across multiple studies. These models could be applied to improve program efficacy in meeting disaster risk reduction goals. This review also demonstrates the urgent need for more rigorous research in this field, especially studies that produce evidence to inform planning, implementing and assessing the impact of arts and cultural activities.

1. Introduction

Arts and aligned cultural activities are increasingly observable in community disaster recovery contexts worldwide, corresponding with calls for a 'whole of society' response to the impacts of climate change and disasters [1]. Disaster-affected community members have consistently reported that participation in arts programs has improved their social and psychological wellbeing [2]. There is emerging evidence that such programs can reduce disaster risk and increase resilience to future disasters [2,3]. These findings are in keeping with the recently established, now extensive evidence that shows that, in general, engagement with arts and aligned cultural activities generates positive impacts for health and wellbeing across the life course [4,5] and that clinically, art therapy can assist with the treatment of trauma, including trauma related to disaster events (e.g. [6]). Collectively, this evidence predicts benefits for non-clinical, participatory arts programs within disaster recovery contexts.

The positive impacts of participatory arts programs are also predicted by research, much of it led by First Nations scholars, that shows the centrality of connection to culture in general, for disaster risk reduction and resilience [7]. UNESCO (the United Nations Educational, Scientific and Cultural Organization) recognises this, and its Framework documents for protecting culture (2020) and living heritage (2022) in emergencies identify intangible cultural heritage as a foundation for identity and well being, 'a valuable resource that communities may draw on to strengthen their resilience and ability to prepare for, respond to and recover from various types of emergencies' [8]. These Frameworks highlight the close alignment between UNESCO activities and the Sendai Framework for Disaster Risk Reduction, providing a broader frame of reference to inform the value and importance of participation in arts and cultural activities.

However, despite this evidence and acknowledgement of profound

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impact, arts participation programs are rarely included in pre-disaster planning, and are often under-funded [9]. This limits the potential substantial benefits of arts participation and, more broadly, of connection to cultural heritage, for disaster-affected communities [10]. One barrier is that there is little research that establishes how, why, to what extent, or under what conditions arts participation activities contribute positively to disaster recovery. A search of PROSPERO, Open Science Framework and of JBI Evidence Synthesis registries currently identifies no registered reviews of evidence or literature in the areas of arts, creativity or cultural practice, and disasters. There is thus very little research that explores how participatory arts activities might be leveraged to improve disaster planning and contribute to disaster risk reduction efforts more broadly [10,6,11].

This study responds to what we consider an urgent need to investigate the current role and potential contribution of participatory arts activities to disaster management, to better inform policy and practice. This study takes a step towards this objective by conducting a scoping review and narrative synthesis to analyse current research, identifying gaps and complexities, and ultimately suggesting an agenda for future research.

1.1. Definitions

The terms relevant for this study – which include the arts, culture, cultural practice, and creativity, along with disaster, disaster risk reduction, disaster management, recovery, and resilience – all refer to heterogenous phenomena. All have definitions that are much discussed and sometimes hotly debated in academic literature – and the articles we reviewed used these terms variably. For the purpose of delineating what is within scope for this study, we have used the following definitions.

1.1.1. Definitions related to disasters

Disaster: We follow recent sociological scholarship by conceptualising disasters as 'an event in which societies or their larger subunits (such as communities or regions) incur damages, losses, and disruption of their routine functioning' [12,13]. While recognizing that disasters are produced by human factors, for feasibility we focused this review on 'natural' disasters. *Disaster risk reduction*: We follow the United Nations Office for Disaster Risk Reduction (UNDRR) and use this term to refer to activities undertaken to plan for, prepare for, respond to and recover from disaster [14]. *PPRR cycle*: Disaster risk reduction has formerly been conceptualised as occurring across a Prevention, Preparedness, Response, and Recovery (PPRR) cycle, but this cycle is disrupted by contemporary cascading and compounding disasters [15,16].

1.1.2. Definitions of arts, creativity and culture

This review examines arts participation as defined by Sonke et al. [17], while acknowledging that such participation reflects both 'tangible' and 'intangible (or living)' cultural heritage as defined by UNESCO [8].

Arts participation: We follow Sonke et al.'s [17] 'inclusive working definition' (created for the purpose of advancing research) of arts participation as referring to active participation in any art form across any of five modes – creating art, attending live events, consuming arts, learning through the arts, and participating in social, civic, spiritual, and cultural arts practices. This definition explicitly makes room for 'the full range of artistic and creative practices—including Indigenous, spiritual, cultural, and social practices—that exist across communities and groups, as opposed to more Euro-centric notions of art that exclude many of these practices'. We therefore refer to 'creativity' and 'creative practice' within the scope of this definition. *Culture:* We follow the UNESCO definition of culture as 'the distinct spiritual, material, intellectual, and emotional features characterizing a society…encompassing the arts, lifestyle, human rights, value systems, traditions, and beliefs' [18]. In disaster risk reduction Frameworks, UNESCO defines 'cultural heritage' as 'the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage' [8]. Recognising that the full breadth of culture and heritage was beyond the scope of this study, we took an inclusive approach, using Sonke et al.'s [17] definition of 'arts participation' while remaining sensitive to how this reflects cultural heritage.

1.2. Aims

Our aim for this study is to summarise existing research on participatory arts programs with disaster recovery, risk reduction and resilience-related goals and/or outcomes. Our objective is to establish a foundational evidence base for this emerging field, and to identify promising future directions for research, policy and practice. We sought to answer the research questions: (1) What roles and impacts of arts and cultural activities have been identified in the context of disaster management? (2) What methods and methodologies have been used to generate this evidence base? As we progressed through the analysis, we added a third question: (3) How are the roles of art, cultural activity and creativity constructed (framed and interpreted) in disaster management?

2. Method

We used a scoping review methodology [19], having trialled a meta-narrative review methodology [20] but we note that there is little quantitative evidence in this field as yet. Consequently, we adopted an interpretive thematic synthesis approach as part of the review process, as best suited to our goal of increasing scholarly understanding of a new area of research through interpretation and critique [21]. To ensure rigour we used a PRISMA design [22] with specified inclusion and exclusion criteria (see Fig. 1 below).

2.1. Search terms

We piloted a broad range of search terms, including 'disaster', 'emergency' and 'crisis', across Ovid, Scopus, Web of Science, Informit, and PubMed, then restricted the scope of investigation to exclude war and conflict due to their unique features (except where these were referred to in articles that addressed multiple disasters or disasters in general). A full search was then conducted between July and December 2022 across Web of Science, Scopus and PubMed, supplemented by the University of Sydney and University of Melbourne cross-platform search engines. This produced 706 titles for initial title screening.

2.2. Inclusion and exclusion criteria and screening

Studies were identified for inclusion if they investigated arts, cultural or creative activities in disaster prevention, preparedness, response and recovery (PPRR) contexts, and were published in English, in peer-reviewed journals or in reputable academic edited collections (including conference publications). No geographical or publication date limitations were set. All study designs and methodologies were considered. In general, where studies were hard to categorise, we erred on the side of inclusion, to achieve our aim of capturing the range of ways in which the role of arts and culture has been conceptualised in relation to disaster recovery, resilience and risk reduction.

The exclusion criteria were:

- Studies of art therapy where the goal of therapy was individual recovery and/or the setting was exclusively clinical;
- Studies of built and/or economic recovery only, with no references to creative practice or cultural activity;
- Studies that reported on individual creative practice;
- Studies with no references to arts, culture and/or creativity.

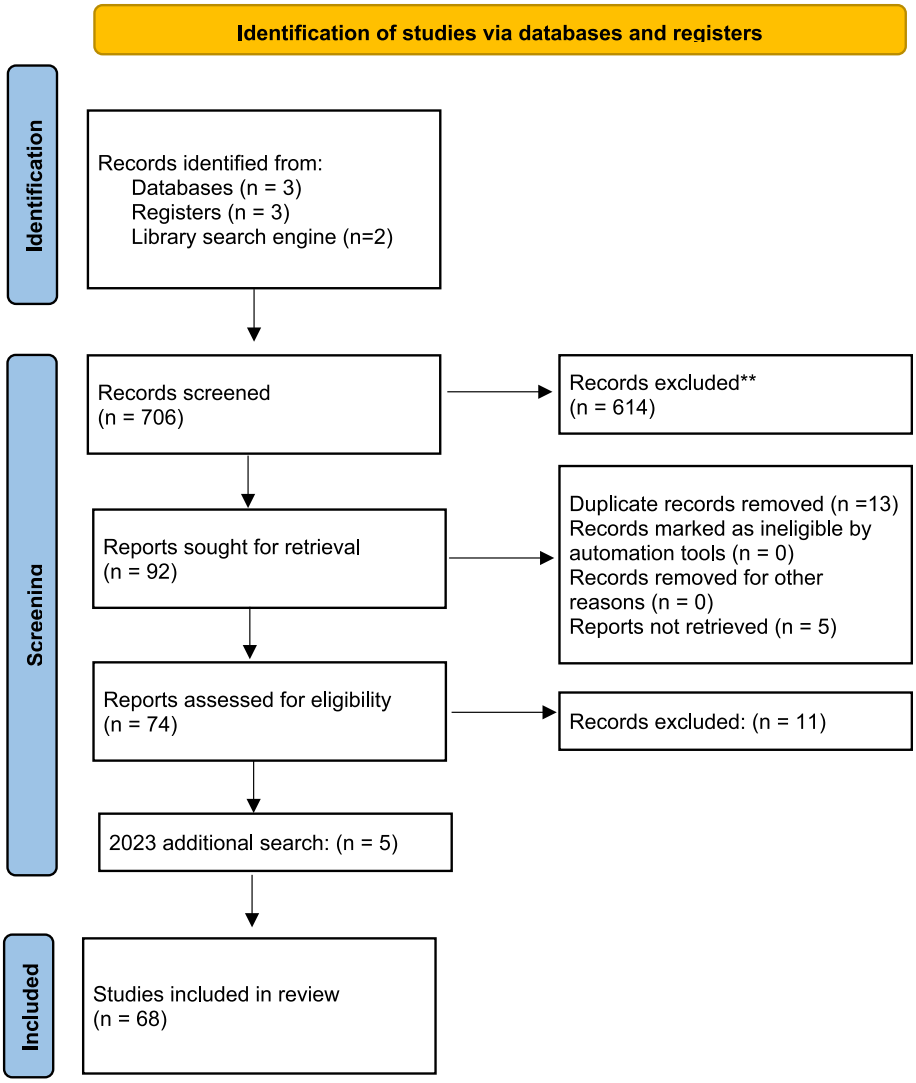

Fig. 1. PRISMA [22] diagram of search process.

Studies of arts and culture specifically in relation the COVID-19 pandemic were also excluded, due to the features of the pandemic – its global scale, long duration, limited impact on physical infrastructure, and widespread social isolation – being distinct from other disaster types [23].

Screening occurred in a multistep process with discussion between all authors. Title scanning excluded 587 records, with 119 remaining. An initial scan of the abstracts for these papers excluded a further 23 records. 96 records remained for detailed discussion, during which a further 4 articles were excluded. 92 records were then sought for fulltext retrieval. Of these, 13 were duplicates and 5 were unable to be retrieved. 74 fulltext articles were retrieved, of which a further 11 were excluded following fulltext scanning. An additional check of the search terms in 2023 identified a further 5 studies. Ultimately, 68 studies were included in the final review.

2.3. Data extraction and quality appraisal

Standardized categories were used to extract data from the sample into an Excel spreadsheet, including 1) article citation elements, 2) arts/cultural activity and disaster details, and 3) details of methods, conceptual approaches, main research questions and findings. One author (NB) extracted the data, which was subsequently checked by two other authors independently (CH, IGL).

To benchmark the sample and identify models and exemplars, we conducted a simplified quality appraisal of each article (see methods in [24])). Due to the methodological and contextual heterogeneity of the sample, qualitative research standards such as SRQR or COREQ were not used. CH used a short version of The Joanna Briggs Institute checklist for qualitative research [25] to assign a binary high quality (1) or moderate quality (2) rating.

2.4. Analysis

Initial analysis was descriptive and interpretive, with impressions and questions discussed between the initial reviewers (NB, CH). Interpretive thematic analysis was then conducted following the procedures recommended by Braun and Clarke [26]. After an initial phase (Phase I) of inductive coding by CH, NB and IGL, codes were compared and grouped into themes to produce a codebook, capturing what Braun and Clarke [27] refer to as 'topic summaries'. The codebook was then applied (Phase II) to the whole sample. During application, a third phase (Phase III) of further reflexive interpretive analysis [28] was conducted through memo writing to iteratively explore dimensions of themes and relationships between themes. Phase III focused on studies rated as high quality (above), with checks of internal validity (relevance and credibility) conducted across the rest of the sample. This process was led by CH and with contributions from IGL and AKB.

A database of the 68 articles summarising article citation elements, codebook codes and binary quality indicator is provided as Supplementary document *Studies of Arts and Cultural Activities for Disaster Risk Reduction Hooker et al 21.4.25.*

3. Results

3.1. Sample characteristics

Interest in arts and culture in the context of disasters has been growing, with 88% of articles appearing in the last decade, and 33% published in the last 5 years (Fig. 2).

The sample was highly heterogenous. 63% of the studies, representing 43 in total, were conducted in the Global North; 29 were conducted in Global South settings (Fig. 3). The geographic distribution partly reflected clusters of studies of particular events (e.g., Hurricane Katrina; Japan tsunami and earthquake). Most articles reported on responses to an individual event, but some reported more generally (e.g. [29]), or on multiple events (e.g. [30]), or in relation to climate change, (e.g. [31]) (Fig. 3). The sample could not be clearly mapped to the four phases of Prevention, Preparedness, Response, and Recovery (PPRR), and was instead mapped to either preparedness or recovery. Most studies reported on recovery contexts, with only 14 studies (21%) concerned with disaster preparation.

Artforms included both recognised fine arts (e.g., visual arts, dance, theatre) cultural practices (e.g., traditional crafts, oral storytelling traditions), and creative arts (e.g., multimedia, graffiti) disciplines, along with art therapy practices (e.g., sandplay), and creative research methods (e.g., facilitated visual arts workshops, see Table 1). Nearly half the sample (49%, 33 studies) were focused on particular population groups, particularly children and young people (32%, 22 studies). The sample also contained studies of projects that chiefly or exclusively concerned the experiences of women (5 studies), the elderly (3 studies), First Nations communities (1 study), and artists themselves (8 studies).

3.1.1. Research disciplines and study methodologies

The sample reflected multiple research disciplines, with general social science and health studies represented along with art therapy; critical sociology; theatre and performance studies; and human geography and urban development.

Most studies used descriptive or qualitative methodologies, many not formally described or systematically pursued. Few studies used standardised quality guidelines. Reflecting resource limitations in post disaster contexts, many studies aimed simply to report whatever was feasible (e.g. [32]).

Only eight studies (12%) incorporated quantitative methodologies, all with small sample sizes and high probability of confounding variables. Five had reportable quantitative data, of which only three used empirically validated scales, only two used pre-post measures and one had a quasi-experimental design. Of studies reporting measured outcomes, a small (n=13) pre-post study of playback theatre as post-disaster intervention [33] stood out as an exemplar for future research design due to its research-informed hypothesis (that playback theatre might have therapeutic effects in a post disaster setting due to the many features it shares with psychodrama), use of validated scales (for anxiety, depression and PTSD), and use of data triangulation from a mixed-methods design for increased robustness (both neuroimaging (fMRI) scans and qualitative interviews were also used). This study found that both anxiety (p=.001, Cohen's d=–1.25) and PTSD (p=.002, Cohen's d=–1.0) symptoms significantly decreased after a series of four playback theatre performances (depression score reduction was not significant). Neurological correlates with the reduction in anxiety scores were identified.

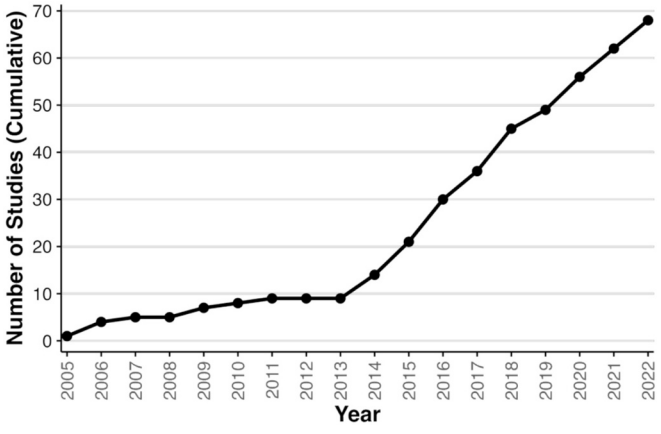

Fig. 2. Number of articles published over time

3.1.2. Evidence of limited, neutral or negative impacts

12 studies reported data suggesting limited, neutral or negative impacts of arts participation. Data suggesting limited or neutral impacts included that particular elements of creativity were not quantitatively associated with increased resilience scores in one study, noting that participation in creative arts was found to increase coping abilities in the same study [34] and that 'cultural context' formed only a small contribution to young people's resilience scores in another study [35]. One study reported a negative impact: Drolet et al. [35] reported that not all young people wished to participate in arts activities that required recalling a disaster (but see the theme 'critical perspectives' below).

3.2. Thematic analysis

Thematic analysis identified ten themes, of which three - 'experience catching', 'psychological recovery' and 'social connection' - were present in the majority of articles. Nine themes identified prominent topics in the literature reviewed. The tenth theme, 'critical perspectives', captured the frequent occurrence of a particular epistemic framework with a liberatory or social justice orientation, in many cases written by authors from Central or South American countries with liberationist scholarly traditions (e.g. [36]). This epistemic orientation was markedly different to (and arguably sometimes incommensurable with) the other nine themes, warranting a distinct thematic category. A summary of the definitions of the three dominant themes, six content themes, and tenth epistemic theme are provided in Table 2. Details of the nine themes are reported below, counterpointed with critical perspectives from the tenth, to integrate power and justice considerations more deeply.

Phase III reflexive interpretive analysis of theme dimensions and relationships between themes, produced four *explanatory models* for how arts and cultural activities can reduce disaster risks: (1) two **Core Processes** that theorise how and why arts and cultural activities confer benefits in disaster contexts and (2) two **dimensions** along which the benefits of arts and cultural activities are conferred. These are described in Section 3.3 below.

3.2.1. Experience catching

Many authors identified the aim of participatory arts activities as providing opportunities for expressing, exploring, representing, documenting, or otherwise 'catching' experiences; sometimes arts-based research methodologies were used to generate research data about disaster experiences (e.g. [37,38]). Arts methodologies were considered important for certain groups, particularly children and youth (see also 3.2.6) and Global South communities [39,40], for whom non-verbal expression of experience was important.

In some cases, it was the disaster experiences of individuals that were given representation through arts participation. But in several studies, the aim was to represent collective or community experience (e.g. [41]). Some studies explicitly utilised documentary artforms [42], including

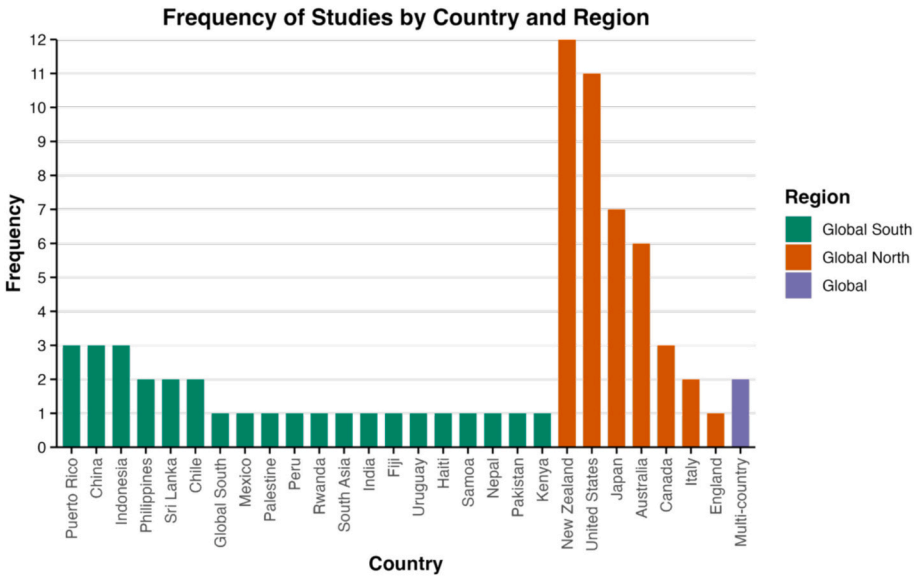

Fig. 3. Location of study contexts

playback theatre [33]. These forms reflected individual experiences with high fidelity, alongside a representative range of community experiences and shifts in experiences [33]. The act of representing community experience facilitated social connection, which produced social benefits (e.g. [43,44,45,41]). 'Experience catching' provided the basis for memorialisation and constructing disaster as part of public memory ([46]; [47]).

In counterpoint, authors who took up power or justice-oriented perspectives (theme 10) questioned *the terms* on which disasters, disaster recovery and disaster risk can or should be understood or represented, including the meaning and use of terms such as 'disaster', 'resilience' and 'recovery' [48,49]. In this epistemic framework, both the extent and experience of disaster were understood as the result of structural inequalities and oppressive social systems. Disasters were often conceptualised as produced by the structures, processes and ideologies of colonialism (e.g. [36,45,31,50]) and/or capitalism (e.g. [51]). Authors writing from these perspectives were interested in how the 'experience' of a disaster is discursively constructed [42], and in how representing this experience could enable alternative, emergent 'Imaginaries' [49] to grow during disaster recovery. Disasters could be construed as 'ruptures' that enabled community members to question taken-for-granted social norms and to seek more equitable and just social arrangements [52,51,49]. Notably, articles concerned with artist perspectives often had a distinctive tone and register; instead of formal, evidentiary language, they explored the aesthetic, affective, phenomenological and multivalent qualities of individual and collective experience (e.g. [52,53,42]).

3.2.2. *Psychological recovery*

As almost every author in the sample discursively associated expressive arts and participatory arts, cultural and creative activities with psychological health, we restricted this code to those where this association was the dominant aim. Arts participation was widely considered to produce psychological benefits by: providing healthy distractions; promoting embodied experiences including (for some) flow states; and offering symbolic and/or culturally appropriate means of self-expression [54,55,29]. Korndörffer et al. [56] found that arts-based interventions demonstrate the principles of psychological first aid. The psychological benefits of art arose, not from self-expression alone, but also from sharing and communicating experiences to others (see also 3.2.3), as in a methodologically rigorous study of playback theatre as post disaster intervention [33].

A subset of articles report on 'therapy' or 'art therapy', particularly for children (e.g. [6,55,38]), see also 3.2.6. However, particular therapeutic goals or particular therapeutic traditions within art therapy were rarely specified (e.g. [57,55]). A subset of articles explicitly focused on preventing or treating trauma (e.g. [33]). Several articles considered participatory arts activities as a practical and beneficial means of providing immediate psychological therapy in Global South settings (e.g. [58,54,55,29]), considering such programs as relatively inexpensive, requiring limited training for delivery, easily tailored for cultural safety, scalable, and able to be provided in group settings.

Studies authored from a critical perspective (theme 10), however, raised queries, including: whether art therapy is a 'Western' approach with practices inappropriate for non-Western settings, or in fact is another instantiation of coloniality [58]; whether offering participatory arts activities might unintentionally infantilise intended participants [45]; or whether low income communities might be offered participatory arts activities *instead of* necessary, but more costly, disaster mitigation measures [6]. More broadly, authors from knowledge traditions that interrogate power problematised the very notion of 'recovery' in postcolonial contexts, where norms have been produced by violence and/or systemic extraction/ underdevelopment [42].

3.2.3. *Social connection*

Most articles reported that participatory arts activities increased social connection within disaster-affected communities. These activities were considered 'to bring people together', to build social cohesion and social capital (sometimes in response to community fragmentation [56]), and to acknowledge, and/or promote, people working together [41]. Social connection was assumed to contribute to psychological recovery, and this was often the explicit rationale for a project [56] and/or for research [44,59].

Social connections produced via arts and cultural activities occurred across three distinct forms. The first were connections within a community, whereby projects enabled more community members to share experiences and emotions, as well as recovery-oriented resources, with one another. The second form aimed to increase connections with, and highlight the voices of, specific (often demographic) groups within the community (see 3.2.5, 3.2.6). The third were projects in which part of the aim was to connect a local community with external communities and with the nation, sharing or representing experience beyond those affected (e.g. [60,50]).

While social connection was valued across the sample as a whole,

Table 1
Disaster Contexts and Artforms

Disaster	Art Forms	No. of studies
Climate change and social issues (Bologna, Italy, ongoing)	Multiple forms - creative communities, cultural heritage, tourism	1
Coastal erosion and rising sea levels (Fiji, ongoing)	Traditional oral storytelling	1
Climate change (Global, ongoing)	Performance	1
	Art therapy	2
Disasters in general (Global, ongoing)	Performance	1
	Multiple forms	2
Extreme weather events (Kenya, ongoing)	Participatory theatre	1
Multiple disasters (Eastern Samar, Philippines, ongoing)	Participatory video	1
South East Asia earthquakes & tsunamis (South East Asia, ongoing)	Art therapy	
	Multiple forms - writing, visual arts, film, photography	1
Extreme weather events (Cornwall, United Kingdom, ongoing)	Participatory theatre	1
Economic crises & environmental catastrophes (Uruguay, ongoing)	Multiple forms - murals, street art	1
Great East Japan Earthquake (paper also discusses Covid pandemic; Japan, 2011-2020)	Arts/creative entrepreneurialism	1
Earthquake (Mexico, 2017)	Multiple forms - children's literature, arts activities	1
Hurricane Harvey (Texas, United States, 2017)	Playback theatre	1
Hurricane Maria (Puerto Rico, 2017)	Visual arts	2
	Arts-based research method	1
Earthquakes (Central Italy, 2016-2017)	Multiple forms - culture, tourism	1
Wildfires (Alberta, 2016)	Multiple forms - community events, film nights	1
Bushfires (Victoria, Australia, 2015)	Multiple forms - drawing, painting, music, drama	1
Earthquakes (Nepal, 2015)	Multiple forms - community art	1
	Digital storytelling	1
Floods (Bundaberg, Australia, 2013)	Arts-based research method	1
Wildfires (Colorado, United States, 2012-2013)	Memorials	1
Multiple – wildfire, tornado, flooding (Missouri, United States; Alberta & Calgary, Canada, 2011-2013)	Youth participatory arts workshops with multiple art forms	3
	Arts/creative entrepreneurialism	
	Arts-based research method	1
	Art therapy	1
	Folk performing arts	1
	Arts management and infrastructure	1
Great East Japan Earthquake & Tsunami (Japan, 2011)	Performing arts	1
Nuclear accident (Fukushima, Japan, 2011)	Participatory theatre	1
	Art therapy	1
	Craft	
	Multiple forms	2
	Activism through art	2
	Pop-ups, events	2
	Arts management and infrastructure	2
		1
Earthquakes (Christchurch, New Zealand, 2010-2011)	Performance	1
	Dance	1
	Multiple forms - music, art therapy, cultural traditions	
Earthquake & Tsunami (Chile, 2010)	Multiple forms - creative thinking, craft	1
		1
Earthquake (Haiti, 2010)	Various - art-making	1
Black Saturday Bushfires (Victoria, Australia, 2009)	Community events	1
	Documentary film	1
Tsunami (Samoa, 2009)	Multiple forms - art therapy, music, arts, craft	1
Sri Lankan civil war (Sri Lanka, 1983-2009)	Visual arts	1
Earthquake (Wenchuan, China, 2008)	Children's play	1
	Art therapy	1
Earthquake (Sichuan, China, 2008)	Children arts and play	1
	Multiple forms - murals, signboards	1
Earthquake (Peru, 2007)	Cultural practices	1
Earthquake (Java, 2006)	Multiple forms - art, creativity, storytelling	1
East Coast bushfires (Tasmania, 2006)	Art therapy	1
Earthquakes (Kashmir, 2005)	Visual arts	1
	Creativity (non-specific)	1
	Multiple forms	2
Hurricane Katrina (New Orleans, United States, 2005)	Children's storytelling	1
	Performance	1
Tsunami (Sumatra, Indonesia, 2005)	Art therapy	1
Tsunami (Sri Lanka, 2004)	Visual arts	1
Tsunami (Aceh, Indonesia, 2004)	Documentary film	1
Bushfires (Canberra, Australia, 2003)	Disaster memorials	1
Earthquakes (Kobe, Japan, 1995)	Cultural practices	1
Rwandan genocide (Rwanda, 1994)	Multiple forms - writing, photography, visual arts, film	1
Bhopal disaster (India, 1984)	Multiple forms - writing, photography, visual arts, film	1

Table 2
Themes in research addressing arts and culture in disaster contexts

Theme	Definition
Dominant themes	
Experience catching	Articles that report on arts and cultural activities expressing the phenomenology and experience of disasters
Psychological recovery	Articles that report on arts or cultural activities improving psychological recovery after a disaster
Social connection	Articles that report on arts or cultural activities increasing social and/or community connection and identity before or after a disaster
Content themes	
Sensemaking	Articles that report on how arts or cultural activities support meaning-making in relation to disasters
Voice, inclusion and culture	Articles that report on arts or cultural activities that enable expression for particular social groups and/or otherwise promote their inclusion in disaster risk reduction
Children and youth	Articles that report on arts or cultural activities directed at those under 18 to support disaster recovery and/or to include them in disaster risk reduction
Education	Articles that report on arts or cultural activities used to achieve educational outcomes, and/or those situated primarily in a school setting
Placemaking	Articles that report on how arts or cultural activities are used for placemaking, and/or recreating landscape and built environment
Economic benefit	Articles that report on the role of arts, culture or creativity in post disaster economic recovery or economic development
Epistemic theme	
Critical perspectives	Articles that investigate, or take, a perspective primarily or strongly influenced by issues of power and/or politics, and/or drawn from critical theory

authors concerned with issues of power and injustice were interested in forms of connection that were solidaristic, for example, forms of 'communitas' [52], or those that provided forms of resistance to the oppressive postcolonial systems that produce and configure disaster events (e.g. [52,53]). Several authors explored a conception of disasters as 'ruptures' that might enable 'different democratic and material claims' [49], 'new ways of being-in-common' [48] and, as above,

alternative 'Imaginaries' [49] to emerge. These authors documented cultural strength, optimism and creative exploration in the wake of disasters, but also provided a troubling assessment of the success of arts, cultural and creative ventures. Such programs could come to reinforce the ideals and ideologies of elites or dominant cultures [61,62,63]. For example, drawing on traditional cultural performance practices that reified communal values in post-earthquake regional Japan produced forms of *coercion*, rather than a positive alternative to the fractured individualism of 'Western' societies [64]. 'Counter cartographies', challenges to dominant powers and paradigms, and new forms of possibility persisted, yet top-down, status-quo neo-liberal recovery measures often prevailed over community and artist led initiatives [49].

3.2.4. Sensemaking

Many authors discussed how participatory arts activities 'made sense of' disaster experience, or were important for meaning-making and explanation in the aftermath of disaster [65]. In some, disasters were equated with the destruction of meaning; recovery therefore involved the (re)creation of meaning (e.g. [48])). Sensemaking was often considered key to psychological recovery through ordering or integrating experiences [66]; this could also contribute to *place-making* (see 3.2.8 below).

Studies reported that participatory arts activities created a 'sense' variously: of self; of identity; of place; of belonging; of optimism; of hope; of continuity or permanence; of control; of major disruption (often, disruption to peoples' 'sense of' place, space or trust in the world); of utter loss; of closure [60,50]. The 'sense' that was being created shifted between individual and collective experience, for example, between a sense of personal recovery, and one of mutual support (e.g. [67,68])).

Sensemaking through participatory art was a means to conceive and articulate the momentousness of a disaster: a particularly important aspect of capturing disaster experience. Artists sought to find language to express the scale of disaster, or to convey the way disaster 'resists narration' [50]. Relatedly, participatory arts programs contributed to commemoration. Sensemaking often included looking forward or imagining the future in some way [68]. For authors writing from critical epistemic frameworks (theme 10), meaning-making was explicitly directed at exposing the unjust social circumstances that rendered some groups more vulnerable to harm in a disaster and at using these explanations to create change (e.g. [52,49]).

3.2.5. Voice, inclusion and culture

Several articles suggested that culturally relevant artistic and creative activities provided a particularly effective means to reach and include marginalised social groups in disaster contexts, mitigating situations where the 'voice' of particular groups was missing or less 'heard'. The terms equity and inclusion however were little used (except [61,69]). In addition to studies of children and young people (discussed in 3.2.6 below), the social groups found in this sample were women (5 studies [70,71,72,40,68]), of which only two directly included an aim of examining women's experiences), the elderly (4 studies, [73,60,31,72]) and artists themselves (8 studies, [44,52,61,74,50,75,76,64], most analysing key works or presenting excerpts from interviews). Our sample included only one study in which the aim was to represent and include First Nations voices and perspectives [31].

These studies emphasised the value of craft and 'folk' art activities – artforms associated with women, older people and/or Global South settings, and also regarded as marginalised in public discourse about, and funding for, the arts. Participatory arts activities were adaptable to cultural context, unlike other disaster response activities (e.g. [54,45,11]); conversely, the cultural relevance of particular artforms needs to be addressed in art-based interventions, particularly art therapies [39].

This theme identified culturally specific practices as central for recovery and resilience. Cultural practices helped to re-establish identity and offered a means of valuing traditional knowledges held by community elders (e.g. [69,60,31,77]). Such programs advocated for increased 'voice' and legitimacy for cultural knowledge in disaster risk reduction [69]. Articles authored from artist perspectives (e.g. [52,42]) were strongly oriented to issues of power and justice, identifying culture as a resource for *resistance* to the global socio-economic conditions that generate disasters in formerly colonised communities (e.g. [53]). Countering implicit dominant narratives about who is regarded as essential in responding to disasters, artists and 'outsiders' - 'those who are comfortable in settings that are not "normal" or are used to, and enjoy, living on the fringes of society' – were considered a resource for important post disaster creativity [78].

3.2.6. Children, youth and education

Since the theme of education substantially overlapped with that of children and youth, we report on these two themes together. One third of the sample, 24 articles, were concerned with children and youth - much of it the output of small research clusters in North America and New Zealand (e.g. [35,79,80,37,59]). The majority of these articles included two assertions in their introductory sections: (1) that the perspectives and experiences of children and young people are overlooked in disaster contexts, and (2) that the arts offer a particularly effective means of connecting and communicating with children and young people and of amplifying their voice in disaster affected communities.

Educational settings and goals (theme 7) were often important in the sample. Schools were sites where children and families gathered after a disaster and where creative interventions were delivered [81,54,38]. Many projects had educational objectives for young people and their communities – both about disaster preparation and recovery (e.g. [40]) and about health more broadly (e.g. [82]).

Participatory arts activities were considered to be primary mediums for engaging with disaster-affected children and youth for multiple reasons, including: that children and youth participate in these types of activities frequently in general [83]; because children are inherently creative; and because participatory art provides a developmentally appropriate medium for engaging with children [67,6,38]. In some studies from Global South settings, participatory arts activities were also considered to be an attractive alternative to professional therapies or services: comparatively low cost, and able to be adapted to their setting and to whatever materials are available for use [6,29,11]. However, the scarce resourcing for programs, and reliance on staff who were often disaster-affected themselves, were barriers to participatory arts activities being delivered for children in post disaster settings [6].

This theme recapitulated other themes in the specific context of children and youth. Multiple studies reported on participatory arts as a means of enabling children to make sense of and convey their experiences of disaster (e.g. [84]), sometimes through activating culturally resonant symbols [38], which could improve their connection to adults (e.g. [85]). Expressive arts activities could allow children to portray fear, vulnerability and grief; they could also enable researchers to see children as strong and resilient [83,81]. Games and other creative activities could create a sense of safety and/or stability after a disaster [30], in part because children could experience these at an embodied (non-verbal) level [83]. All these activities could contribute to psychological recovery or provide therapeutic benefit (e.g. [6]).

These studies found, often through young people's commentary on their own artworks, that young people find creative ways to respond and adapt after a disaster and are eager to do so, underscoring the importance of youth spaces in disaster recovery [80,59]. Theme 10 (critical perspectives) was most strongly represented in terms of calls for increased self-determination and representation for young people across all phases of disaster risk reduction. Features of high quality studies were projects and research designs that legitimated and amplified youth voices, and that used a range of arts modalities to engage a diversity of young people [59].

3.2.7. Placemaking and economic benefit

These two themes are reported together as they largely co-occurred in the same subset of articles. Placemaking, in this sample, was mostly concerned with rebuilding and reestablishing a sense of community and place after a disaster, which required considering economic factors such as funding, policy, and revenue from planned activities (e.g. [62]). Participatory arts and aligned cultural activities were considered, or hoped to be, a component of economic recovery, mostly as a means of reattracting visitors. But the argument that local economies could be recharged through arts and cultural events such as festivals was also questioned, particularly in view of the economic precarity of artists themselves [74].

Some articles were concerned with the work of rebuilding physically damaged locations after a disaster (e.g. [86,87]). Some addressed the role of 'creatives' in this work (e.g. [78]). But what 'creativity' *is* – as entrepreneurial and innovative practices – in the context of 'creative cities', and whether creativity as a mode of operation is enabled by a disaster context, were the objects of investigation in a few articles (e.g. [78]).

Participatory arts and aligned cultural activities facilitated rebuilding a place's meaning and role in community identity [76]. 'Creative placemaking' was considered to encourage citizen participation, communal rejuvenation [61], and improved social inclusion [74]. Placemaking through community rebuilding events such as festivals helped increase community capacity and social cohesion. Several articles investigated 'revitalisation', the 'bottom up' arts activities undertaken, often informally, by local artists and communities [43,48,49,74]. These activities were considered as key to the 'vitality' and liveability of a city.

Authors taking up critical perspectives within the disciplines of geography, urban studies and planning (among others), were particularly interested in the disruptions to individual and collective narratives resulting from disaster and the new possibilities for placemaking that communities and artists pursued in the uncertain, liminal period post-disaster. They called attention to how the spaces and activities of transitional organisations provoked particular 'affective atmospheres' that enacted new senses of place, belonging, imagination and social encounter [48]. These studies could be cautionary, showing how the opportunity for transformation passed rapidly as grassroots activities were constrained by government bureaucracy [49], and how activities that started as 'counter cartography' could become co-opted into 'official narratives of response and recovery, that cheer and sentimentalise acts of helping rather than inviting or producing radical critiques of the status quo' [78].

3.3. Explanatory models

Phase III reflexive interpretive analysis explored dimensions within themes and relationships between themes. This identified two **Core Processes** that theorise the critical benefits provided by arts and cultural activities in disaster contexts, and two **dimensions** along which the benefits of arts and cultural activities are conferred.

3.3.1. Core Processes

Analysis of the relationships between themes identified two Core Processes across multiple studies in the sample.

In Core Process #1, participatory arts activities facilitate people expressing their experience of disaster. This increases social connection and psychological wellbeing, which in turn can enable people to express painful emotions and challenging experiences. The connections run in all directions between any of the three elements to any of the others. In some cases, this process was visible in validated or recognised models used in a study, such as the principles of 'Psychological First Aid' [56]. This process is represented in Fig. 4.

Many authors offered multiple additional details and insights into this three-way relationship, suggesting numerous possible explanations for how and why this process occurs and what social and psychological benefits it can produce. No single explanation emerged. Rather, several study authors referenced the situated and contextual nature of each disaster event and each community context, suggesting that the particular benefits that arise are always somewhat determined by local factors.

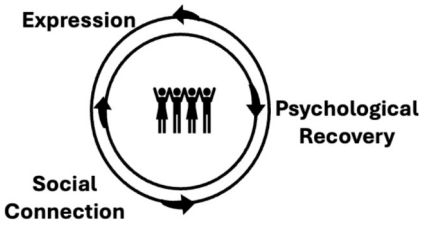

Fig. 4. Core Process #1. Expressing experience, social connection and psychological recovery are co-related.

In Core Process #2 (Fig. 5 below), arts and cultural activities generate or facilitate practical social action to reduce disaster risk. This occurred through two pathways, leading to two categories of social action. The first pathway aimed simply to educate or increase awareness of recommended disaster risk reduction activities, and posited that by this means reductions in local disaster risk can be achieved (e.g. [42,88]). The second pathway aimed to raise people's consciousness of the unjust circumstances that contribute to and are inseparable from a disaster [50]. Raised consciousness could activate participants and communities to resist unjust systems and/or take action towards radically changing these systems, and as a result reduce disaster risk in the long term [51]. Arts and cultural activities, as aesthetic experiences, could therefore facilitate Core Process #2 (Fig. 5 below).

3.3.2. Dimensions

From comparisons across themes and interpretive memo writing, four features of arts and cultural activities in disaster context, along two dimensions, 'Heritage and Identity', emerged (Fig. 6).

Heritage and identity. The dimension of **Heritage and Identity** captures how participatory arts activities can express the value of, and restore, cultural and community heritage and hence, identity. As sense of heritage impacts identity, and changes in identity impact relations to and feelings about heritage, arts and cultural activities can have impact at any point along this dimension.

Identity and, in association, belonging, emerged as important dimensions of the social connection theme, and were present also in studies of the phenomenology of disaster and disaster recovery experience ('experience catching', 'psychological recovery'). Disaster posed threats to identity by disrupting both individual and community trajectories and norms. These disruptions, particularly disruptions to environment, also threatened or removed a sense of belonging, which some projects sought to re-create through arts participation (e.g. [59]). Some studies identified participatory arts experiences as helping re-establish a sense of safety, which contributed or related to the feeling of belonging (e.g. [89]).

Heritage emerged as an important dimension related to identity and

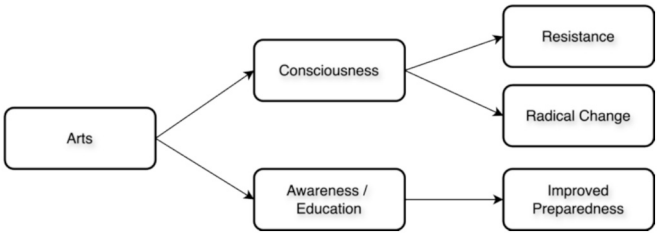

Fig. 5. Core Process #2: creating social action

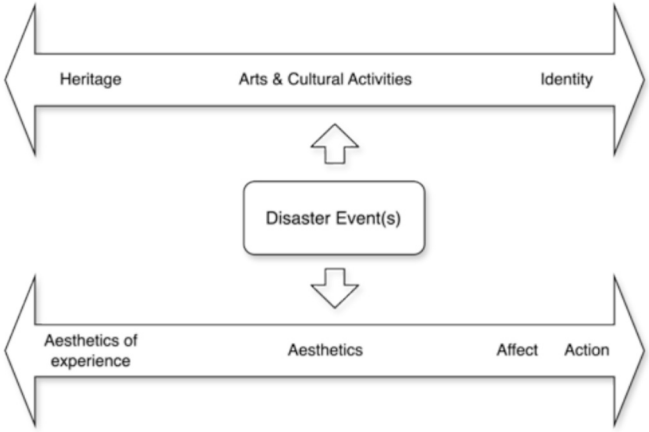

Fig. 6. Two dimensions of benefits from arts and cultural activities in disaster risk reduction

to the phenomenology of disaster experience. 'Heritage' sometimes referred to material culture or cultural heritage (e.g. [60,77]), with the preservation of cultural heritage contributing to maintaining identity after disaster. Crucially, however, some studies explored how participatory arts projects helped disaster experiences to become *part of* heritage, that is, incorporated into narratives of community and personal identity (e.g. [41]) in ways that conveyed the intensity, multivalence, and gravity of disaster experience. Heritage and memorialisation contributed to community placemaking and to the creative renewal of the built environment after disaster ([46]; [47]).

Aesthetics – Affect to action. The dimension of **Aesthetics** captures the role, qualities and impacts of aesthetics as a unique affordance of arts and cultural activities in disaster contexts – although it is notable that discussion of aesthetics was rare in the sample (except [48,50]). The qualities of disaster experience, such as apposition (different experiences placed side by side, often with startling contrast), were found to have aesthetic qualities. These are important in themselves but also facilitated social action: affected by these aesthetics, participants and audiences were moved to take practical actions, such as to prepare for future disasters (see Core Process #2 above).

When mentioned, the aesthetics of disaster response was often paradoxical, including: finding beauty amid destruction; feeling abandoned by, and pride in, a place; finding both a sense of safety and capacity to face deep uncertainty through arts engagement; expressing both grief and gratitude; and experiencing both loss and increased connection. Aesthetic paradoxes held affective affordances that were important for social connection. For example, in one context, ludic (playful) elements in post-disaster traditional cultural performance provided a powerful means of creating intimacy with the audience, and for creating the 'extraordinary space' needed for audiences to engage with the distressing aspects of disaster experience [77].

Across the sample, aesthetics were closely related to social action. Because they *affected* participants and audiences, aesthetic elements could engage communities with disaster risk reduction activities, or make educational materials or documentation more powerful (e.g. [79,42,40]). Particular genres could make trauma and disaster emotions more easily shared and legible to others (e.g. [59])). Alternatively, aesthetics and their affects [48] – for example, transient experience of alternative modes of feeling, acting and conceiving [52] – were hoped to contribute to social transformation in ways that could address the global contexts of coloniality and climate change [36,90].

4. Discussion

This review found that studies from around the world report powerful roles for participatory arts and aligned cultural activities in disaster contexts, with impacts clustered in three domains: psychological recovery and wellbeing, increased social connection and cohesion, and capacity to express overwhelming experiences and emotions. The studies reviewed report a myriad of beneficial outcomes of these activities, including improvements to wellbeing, decreases in forms of mental distress such as depression and anxiety, increases in agency, visibility and voice from marginalised groups (young people, women, elders and artists), the restoration of damaged environments, the evocation of attitudes and emotions critical for post disaster community function (such as a sense of place or safety or belonging), and as a means to explore a range of different potential futures. Studies published since data extraction was completed show similar findings (e.g. [91]); and were echoed in COVID-19 related studies (e.g. [92,93]; [94]).

Reflexive thematic analysis identified two Core Processes that model how arts participation produces benefits for both individuals and communities, and that provide a foundation for identifying mechanisms of action. The first Core Process shows the strong, multidirectional relationship between expressing or representing momentous experiences, psychological recovery after disaster, and increases in social connection and cohesion. Various forms and aspects of this process are well substantiated in psychological studies of recovery and trauma, and of arts and mental health (e.g. [44,95,91,45,96]). However, unlike psychological treatments, participatory arts afforded the means for addressing post disaster mental health challenges at community as well as individual level. This model demonstrates that participatory arts activities can produce positive self-reinforcing cycles of benefit for communities, and can multiply the effects of interventions in any one of the three domains. The model provides a basis for planning for and deploying participatory arts activities with specified aims in these domains, and for assessing the resulting impacts.

Analysis of studies found numerous roles for participatory arts activities in facilitating effective implementation of the Sendai Framework for Disaster Risk Reduction [97], particularly by centring community self-determination and social capacities [91]. Impacts included increasing the reach and impact of disaster education and involving more marginalised groups in disaster risk reduction activities. While the majority of studies focused on recovery (and some response) contexts, Core Process #2 identifies how participatory arts activities can directly catalyse improved community engagement with disaster prevention and preparedness actions, including for more marginalised populations [54,55,29]. With one third of articles addressing children's and youth's needs and views, this appraisal found very strong evidence for the effectiveness of well-designed, high quality and well implemented arts and cultural activities for amplifying youth perspectives and meeting youth needs across the PPRR cycle, in keeping with Sendai Framework recommendations [98,99].

Altogether our results demonstrate the need to generate a strong evidence base for deploying arts and cultural activities and assets for disaster risk reduction – one that can provide guidance for agencies and practitioners and support the planning, implementation and evaluation of activities that leverage cultural capital to improve disaster resilience. That there is currently very limited quantified evidence – most study methods were either qualitative or informed by interpretive traditions from the humanities (see below) – reflects both the novelty of the field and the constraints of disaster research [100]. The small number of mixed methods studies captured here indicate the value of such research designs for creating a strong evidence base. In addition, we highlight the importance of research that examines the importance of arts and culture to support the 'PP' component of the PPRR cycle, and explores how such programs can facilitate improved adaptation, mitigation, and disaster preparation and planning, especially among marginalised groups. Longitudinal research that traces the complex impacts of arts and cultural resources in communities that experience cascading and compounding disasters is another urgent priority.

One implication of these findings is the importance of a well-

resourced and independent cultural sector for building disaster resilience [101,2]. The full benefits from Core Process #1 require drawing from local arts and cultural practices, and from the expertise of local artists and cultural organisations. Authors identified that high quality processes for community partnerships and project governance were crucial for ensuring appropriateness and feasibility, and central to achieving impact and the disaster readiness outcomes desired from Core Process #2. This reinforces the importance of cross-sector collaboration and policy development for maximal disaster resilience. Since this study found that government agencies can constrain rather than enable the creative experimentation that artists and cultural practitioners can bring to post disaster contexts (curtailing community-led reimagining of how to 'build back better'), research that explores models of governance that preserves safety and accountability while supporting exploration of new possibilities will be important in the future.

4.1. *From arts participation to cultural capital: disciplines and framings*

Acknowledging that terminology varied and authors rarely specified definitions, many of the articles reviewed used a lexicon concerned with 'culture' as much as, or in some cases more than, 'the arts'. Many authors reiterated that drawing from local cultural traditions can powerfully engage community members, encourage social connection and connection to place, and help reconstruct identity, values and/or sense of place and belonging. These findings reflect the research collated by UNESCO and others that show the important roles of arts participation for maintaining intangible cultural heritage [53], and of cultural heritage for disaster resilience [8]. This can be usefully conceptualised within the Recovery Capitals (ReCaps) framework [102,103], with participatory arts activities considered as an important component of cultural capital. Our results indicate that arts and cultural programs can be harnessed to increase all three forms of social capital, and to multiply the effects of initiatives across human capital, built environment capital and, potentially, financial capital. Future research could usefully extend understanding of the role and impact of arts, culture and creativity, within the ReCaps framework.

This broader framework is important because of differences in how disasters, and the roles of arts and cultural programs in relation to them, were framed and represented across the sample. Many of the included studies were qualitative and empirical, with aims of reporting (mostly beneficial) impacts. But studies authored from research traditions that scrutinise the operations of power directly or indirectly problematised the very categories used in many of the empirical studies, understanding evidence as always constructed and configured by the knowledge systems of European colonialism and the Imaginaries of contemporary capitalism. From this perspective, the language of benefits and improvements can contribute to the reification and perpetuation of the very forms of power that also produce (and naturalise) disasters in the first place. Similarly, it is noteworthy that the terminology of culture was often used by authors from, or in relation to, Global South settings, indicative of how the *category* of 'the arts' is itself a construction of modern 'Anglo-European societies, while 'culture' is considered appropriate for non-Western 'Others'. Future research will require both agreed definitions for the purpose of evidence and evaluation, while at the same time remaining conscious of the teleology and artifice of these categories and to reevaluate them in parallel with the continued development of artistic and cultural practices [17] and in the light of questioning from historically marginalised scholars, communities, and persons (below).

4.2. *Limitations, pitfalls and unintended consequences*

This review was limited to studies published in English in journals indexed in three research databases. It could be extended by accessing a larger pool of studies through the use of localised search terms and wider inclusion criteria, and by including studies published in languages other than English. Nonetheless, our analysis was able to reach theoretical sufficiency [104] with the sample collected, and to provide extensive evidence to underpin the thematic synthesis and two models identified. We remind readers that this study was not a scoping review of evidence for art therapy/ies specifically, a task that would require quite different search and analytic procedures.

A more important limitation is that the study did not include 'grey literature', such as publicly available project reports. Given that participatory arts and cultural activities are often agency funded, such reports are likely to contain information relevant to assessing impact. Moreover, such reports may capture perspectives from those involved at community level directly, and perspectives that may be marginalised or less well represented through conventional research practices. Therefore, our approach was not able to reflect these critical viewpoints. Relatedly, it is noteworthy that our search strategy captured very few studies of Indigenous- and First Nations-led disaster resilience, or risk reduction activities through aligned cultural practices [105,106,107,7]. Since First Nations scholarship has demonstrated the importance of connection to culture for surviving disaster including the disasters of dispossession and ecocide ([108,109]), and since Indigenous cultural practices are increasingly taken up as strategies to manage or minimise environmental disasters such as bush- and wild-fires (e.g. [106]), we identify this is an important area for future research.

Forms of epistemic injustice, such as the unequal role of non-Western Others as designers and leaders of research as well as voiced research participants, underscore the potential for pitfalls and unintended negative consequences in engaging participatory arts and related cultural activities for the purpose of disaster risk reduction. For example, some authors identified the importance of adapting dominant-culture ('Western') norms when implementing art therapies or participatory arts or cultural programs. Indeed, poor implementation (e.g., using approaches *not* adapted to the culture and needs of a community, and/or *not* informed by bodies of research in relevant areas, for example educational theory; age, development and life stage needs; or youth mental health research), may have harmful effects [37]. These harms may be incurred by artists themselves; it is noteworthy that the sample provided very little discussion of the training and supervision needed to support artists and community workers to conduct projects safely and with a trauma-informed lens, features that have been identified as central for artist wellbeing and to avoid unintended harms in other research [101,9,29]. Similarly, the works reviewed sometimes noted that participatory arts and cultural activities are not necessarily intrinsically beneficial, and that certainly not all people, including not all children or youth, *want* to participate in them, particularly where they involve remembering or reflecting on painful events that many may not wish to revisit in the ways or at the time offered by such activities. Future research exploring best practice in ensuring that people have equitable access to such activities in culturally aligned forms, while respecting different interests and tolerances for engagement, is important.

5. Conclusion

This review shows that participatory arts and aligned cultural activities can facilitate high impact disaster risk reduction activities across the PPRR cycle. Related literature on the benefits of the arts for health predict that participation in arts and culture, and maintenance of intangible cultural heritage, are often fundamental to survival and healing [110], maximise social connection and cohesion [5,111], produce cost-effective health and wellbeing outcomes including in underserved communities [112], and can be effectively targeted to particular groups and particular community-identified priorities. Research to leverage and integrate cultural capital to increase disaster risk reduction – for example, through social prescribing of participatory arts activities (for general discussion of social prescribing see [113,114,115]) – is an urgent priority in a world where climate change is predicted to increase the number, frequency and severity of disaster events [15].

Future research should not neglect artists' perspectives nor matters of aesthetics and creative practice. Analysis that includes concepts and phenomenologies such as rupture, care and justice, and how these affect heritage, commemoration, identity and belonging (e.g. [116]), will both be more productive and more accurately reflective of the perspectives and motivations of those involved. Including perspectives from artists themselves was shown to be of central importance, since these often expanded the scope of ideas and activities that could be brought to bear on disaster risk reduction. Intersections with research on climate grief and anxiety, multispecies justice and mourning [117], reimagined forms of environmental management and Indigenous-led conservation, culture and land management are likely to also provide rich lines of future inquiry, and align with the Recovery Capitals framework [102]. Transdisciplinary methodologies, informed by concepts and theories about how participation in arts and culture can be liberatory practices or reimagine and reinvent 'ways of knowing, being and doing' [118] will be crucial, productive, and deeply rewarding.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Microsoft Copilot in order to reformat citations. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

CRediT authorship contribution statement

Claire Hooker: Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization, Writing – original draft. **Anna Kennedy-Borissow:** Methodology, Investigation, Writing – review & editing, Writing – original draft. **Natasha Beaumont:** Resources, Data curation, Writing – review & editing. **Isabelle Galet-Lalande:** Validation, Resources, Investigation, Data curation, Writing – review & editing, Writing – original draft.

Declaration of competing interest

The Authors have no interests to declare with respect to this paper. We acknowledge support for this study from the CREATE Centre, University of Sydney, which provided some salary for author Natasha Beaumont, to support her contribution. During the preparation of this work the authors used Microsoft Copilot in order to reformat citations. After using this tool, the authors reviewed the citation format, and edited where needed. No other form of generative AI software was used in writing this manuscript. The authors take full responsibility for the content of the published article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pdisas.2025.100501.

Data availability

I have shared the data at the attach file stage

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