



Relationships Between Climate Mitigation Actions and Mental Health: A Systematic Review of the Research Landscape

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The impacts of climate change-related events on mental health and emotional wellbeing have gained increased attention in recent years. However, research exploring how climate mitigation action, i.e., moving toward more sustainable lifestyles, interrelates with mental health is arguably a more hidden body of work. This research is scattered across fields and uses a variety of concepts to explore both the role that emotional and mental health management skills may play in enabling personal climate mitigation actions, as well as the ways in which accelerated transitions toward lower carbon emitting ways of life may impact on mental wellbeing at both an individual and societal level. Our systematic review therefore aims to bring together for the first time research which has been undertaken in the emerging area of mental health and climate mitigation action. To facilitate this exploration, systematic Web of Science searches were undertaken which: (1) identified 165 publications exploring climate change and mental health issues broadly, and (2) identified 26 publications relating climate mitigation actions with specific mental health impacts (anxiety, trauma, suicide, OCD). We find that mental health is primarily being seen as an outcome of climate change impacts, not a factor in our ability to work to avoid them. The limited work which does exist around mental health and climate mitigation action focusses on anxiety and trauma and spans the psychological, psychosocial, public health and wider social sciences. Anxiety and trauma-avoidance has been found to both stimulate and stifle action in different circumstances. One explanation may be the role organizations (and other social structures like family or gender identities) play in maintaining cultures which either support social defenses against mitigation action or provide emotionally-safe spaces for building climate commitment. Anticipating potential mental health impacts during policy planning—and putting in place appropriate support measures—will be vital to successfully meeting climate targets. We therefore conclude with implications for policy and practice, including the need to: build appropriate psychological support into behavior change interventions, work with groups who can provide each other with emotional peer support, and ensure health and social care professionals are given adequate training.

Keywords: climate change, low-carbon, transition, sustainability, emotional regulation, anxiety, depression, trauma

INTRODUCTION

Climate change is considered the greatest societal challenge of our time. The significant consequences of climate change on human wellbeing are widely acknowledged, for example in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Smith et al., 2014). There is increasing recognition that these consequences encompass not just physical health but also mental and emotional wellbeing, and that these relate to both current and future climate change. New research has thus explored the immediate psychological impacts of loss of livelihoods, displacement and “ways of living” due to a changing climate (Ellis and Albrecht, 2017; Ayeb-Karlsson et al., 2020; Adams and Nyantakyi-Frimpong, 2021) as well as psychological impacts of awareness about predicted changes, with a recent study finding that 59% of young people were very or extremely worried about climate change (Marks et al., 2021).

Alongside—and linked to—the harmful impacts of climate change becoming increasingly visible, targets to transition to lower carbon economies are being more strongly embedded in policy. In Europe, in accordance with Climate Law, the European Union aims to become climate neutral by 2050, with a significant number of strategies developed under the “Green Deal” framework (European Commission, 2019). This objective is an attempt to comply with the Paris Agreement, which strives to keep global temperature rises below 2°C (European Commission, 2021). Globally, other significant policy frameworks include China’s aim for climate neutrality by 2060, and Morocco’s world-leading climate policies centered on the agricultural sector entitled “*Plan Maroc Vert*”. While progress has been made, in most cases it has not been enough to avoid significant climate change effects which are now “locked in”. The latest briefing from the Climate Action Tracker indicates that current pledges and targets will result in a warming of 2.4°C by the end of the century and estimates from current policies will likely lead to an increase of 2.9°C (Stockwell et al., 2021).

The world will therefore either see rapid climatic change, rapid changes toward lower-carbon societies, or—more likely—both in the coming decades. Both will have profound impacts on society—how we live, travel, work, see friends and family etc.—with the potential to impact on emotional wellbeing across societies. Yet, it appears that little research has looked at the relationships between undertaking *actions to combat climate change* and mental health (in contrast to how climate change impacts on mental health). It is research into these relationships that this review aims to uncover, analyse, and make more visible.

Within this special issue on climate risk, affect and emotion¹, our paper looks through the lens of mental health. It is known that emotional regulation is intimately linked to mental health (Gross and Muñoz, 1995) and may serve an important function when it comes to the treatment and prevention of

mental health problems. For example, it has been suggested that emotional regulation can serve as a protective factor for adverse psychological outcomes, by reducing depression and anxiety symptoms in children and adolescents (Danielet al., 2020) or supporting personal growth during stressful circumstances (Taubman-Ben-Ari et al., 2021).

We argue that inclusion of perspectives on mental health are therefore an important part of debates around climate change, affect and emotion. Significantly, mental health is a key way in which affective and emotional dimensions of climate change become societally visible. Mental health is a clear public health issue, however currently the costs of climate change on mental health remain hidden and unaccounted for in climate policy planning. Some have suggested that through pro-active planning governments may potentially develop win-win opportunities to benefit both mental health and climate change (Lawrance et al., 2021). Anticipating these impacts during policy planning—as well as putting in place appropriate support measures—will be vital to successfully meeting climate targets whilst striving to keep people healthy. With climate change impacts (both experienced and anticipated) already proving to be a chronic stressor especially amongst children and adolescents (Marks et al., 2021) the emotional management skills across societies will influence how effectively moves toward lower carbon lifestyles change are navigated, adopted or coped with.

As far as we are aware, this review is the first attempting to explore and make more visible the scattered field of research into mental health and climate mitigation action. The review has two objectives:

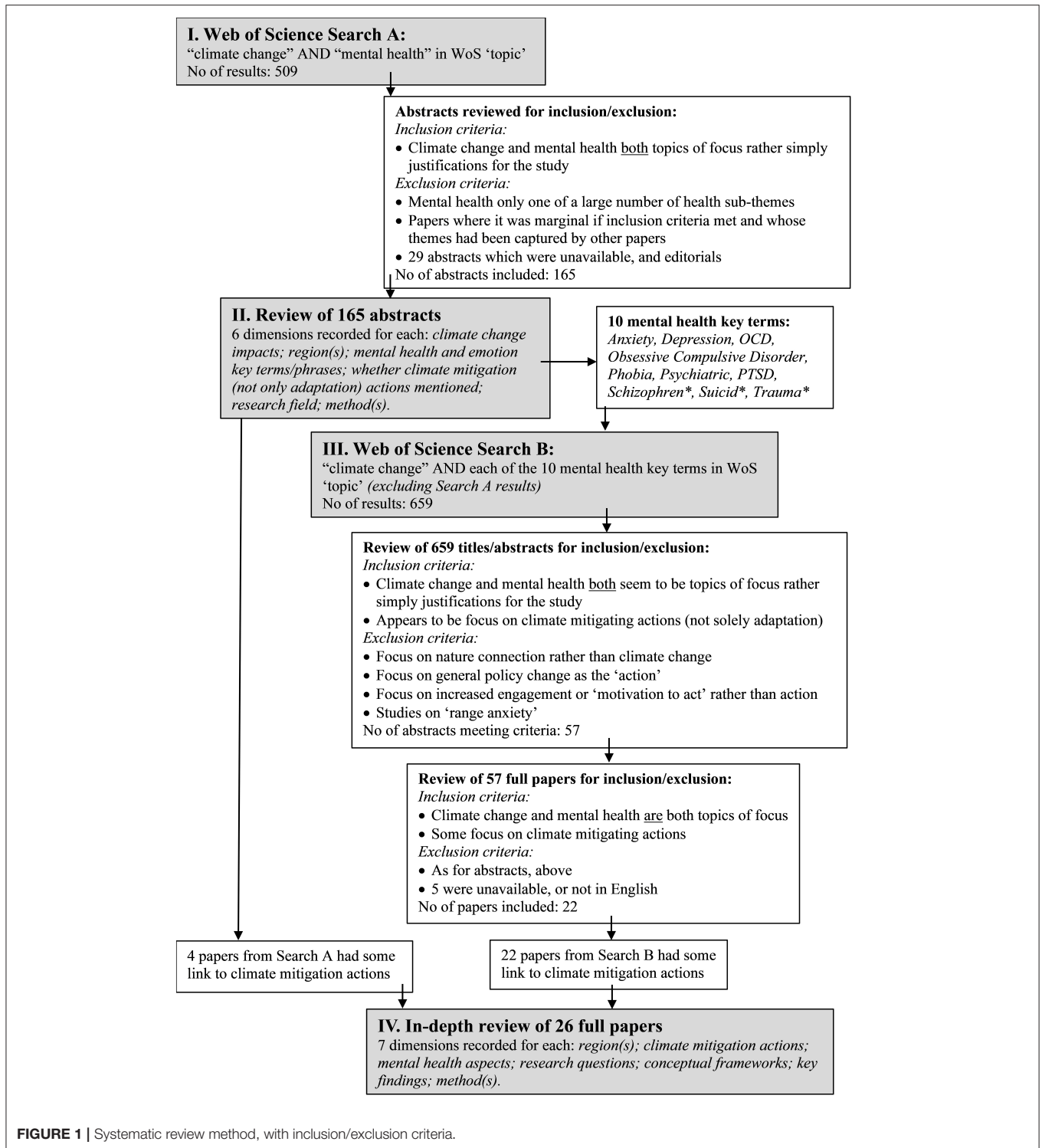
- **Objective 1.** Review broadly current research exploring *climate change* and *mental health*, and in particular assess how much of this work has included considerations of climate mitigating actions i.e., moving toward lower-carbon lifestyles.
- **Objective 2.** Review in-depth current research exploring *climate mitigation actions* and *specific aspects of mental health*. In particular where in the research landscape is this work emerging and what conceptual frameworks are being used?

Our article follows a standard structure of first outlining our methods—namely our systematic review procedure—before presenting the results from that review, organized according to the objectives outlined above (two Subsections respond to Objective 1; one Subsection responds to Objective 2). A short conclusion summarizes the paper’s key findings, implications for policy, and discusses future research directions.

REVIEW METHODS

There are a range of methods for conducting systematic reviews in the social sciences, valid in different situations. Ultimately, when reporting, it is important to be explicit about objectives and transparent in how the methods both led from those objectives and were followed rigorously. Importantly, this systematic review builds on the tradition of social science reviews whose objectives are wider than interrogating a specific cause-and-effect relationship

¹We recognize that there is an ongoing debate surrounding the boundaries of the concepts of “emotion” and “affect,” including how they can be observed, and how and whether they relate to each other (see e.g., Pile, 2010). However, it is beyond the scope of this study to add to this debate, and thus we have considered studies that treat “emotion” or “affect”.



(Petticrew and Roberts, 2008); rather we were seeking to explore how and why research in a particular area is emerging. We were therefore keen to use a systematic search term based approach in order to open up the review to potential inclusion of new fields of research that we as authors may not have been aware of prior,

as well as to some extent overcoming the tendency of reviews to reinforce citation patterns (meaning for example research from the Global South may be overlooked).

The PRISMA system—developed primarily for medical reviews evaluating the outcomes of interventions—provides

a useful 27-point checklist for good reporting of systematic reviews which has informed this paper² (Page et al., 2021). With this in mind, the overall method is presented in **Figure 1**, before each step is described individually in the Subsections below.

Search A: Assessing Climate Change and Mental Health Research

A Web of Science search was conducted on 16th Jun 2021, for “climate change” AND “mental health” in “topic”. This returned 509 results, ranging from 2005 to 2021.

Of these, the abstracts of 29 were unavailable. The abstracts of the remaining 480 publications were screened to assess whether climate change and mental health were both central foci of the publication. In order to determine a common screening criteria the three co-authors each assessed 50 abstracts (of which 20 another co-author also assessed, i.e., leading to 90 papers overall)—there was significant (over 93%) cross-author agreement and we then discussed where the in-out boundary should lie for those “on the boundary”. In particular, papers where mental health was only one of a large number of health-related sub-themes, or where climate change was only a justification for the study rather than a topic of focus, were excluded. Excluded papers also included those primarily covering “resilience” rather than any specific mental health issues (e.g., Theron et al., 2020), or papers concerning “nature-connectedness”, such as the mental health and wellbeing impacts of green spaces (e.g., Korn et al., 2018) or green urban infrastructure (e.g., Andreucci et al., 2021) rather than climate change. The review also excluded papers which seemed to be on the in-out boundary and whose themes were repetitive of other papers which had been included (i.e., they offered little new information for the purposes of this review stage), as well as editorials.

This screening resulted in 165 publications. The abstracts were then divided between the co-authors and reviewed. The following six dimensions were recorded in terms of what each abstract focussed on: *climate change impacts; region(s) of the world; mental health and emotion key terms/phrases; whether any aspect of climate mitigation action was mentioned; research field³; method(s)—including whether they were qualitative/quantitative/mixed*. In addition, the authors noted a number of overarching themes from the publications they reviewed. These findings feed into Subsections Climate Change and Mental Health: Headline Results and Climate Change and Mental Health: Thematic Observations of this paper.

²Of these 27, the points which are relevant to this non-outcomes-based review, and which this paper therefore reports, are: 1–9, 10b, 16–17, 23, 25–26. (Points 10a, 11–15, 18–22, 24, 27 are all related to reporting statistics of outcomes).

³Four categories were used here, informed by the initial assessment of 90 papers: (1) *Health*, including e.g., Public Health, Environmental Health, Nursing; (2) *Psychological Sciences*, including e.g., Social Psychology and Psychiatry; (3) *Social Sciences*, including e.g., Geography, Political Ecology, Global Studies, Peace Studies; (4) *Natural and Economic Sciences* including e.g., Agriculture and Economics.

TABLE 1 | Key terms identified through Search A and used in Search B.

Category (total number)	Search terms
Related to specific mental health conditions (10)	Anxiety, Depression, OCD, Obsessive Compulsive Disorder, Phobia, Psychiatric, PTSD, Schizophren*, Suicid*, Trauma*
Related to specific emotions (14)	Anger, Distress, Fear, Frustration, Grief, Guilt, Happiness, Hope, Joy, Outrage, Sadness, Solastalgia, Stress, Worry
Other related themes (8)	Coping/Cope, Loss, Wellness, Mood, Affect, Neurotic, Self-care, Wellbeing/Well-being

Search B: Set of Searches Using Wider Mental Health Key Terms

The purpose of Search B was to (1) first extend Search A by identifying additional papers which focused in on specific mental health conditions (and climate change); and (2) then identify in particular which of these referenced *climate mitigating actions*. Step 1 was enabled through using the specific mental health related terms recorded as “*mental health and emotion key terms/phrases*” in Search A, as described next.

Review of the 165 abstracts found in Search A had yielded 105 mental health and emotion related phrases. These were then narrowed by excluding terms or phrases deemed likely to bring up irrelevant results due to their use in a broad range of contexts (e.g., “disorder”, “psychological”, “mental”, “somatic/somatoform”) as well as those which were less directly about mental health outcomes (e.g., “addiction”, several terms related to sleep, “sense of security”). The resulting 32 key terms are shown in **Table 1**.

Thus—for Search B—the 10 terms related to specific mental health conditions (first row, **Table 1**) were used in turn together with “climate change” (and not “mental health” since those papers were already included in Search A) in searches between 27 July and 6 September 2021. The numbers of results are shown given in **Table 2**.

Table 1 also shows the further clustering of both: specific emotions covered in the Search A papers (second row, **Table 1**); and other related themes (third row, **Table 1**), since these are informative of the range of issues being explored, and may be of use to support future studies including reviews.

Next, for potential inclusion in the in-depth review, abstracts found in Search B needed to have both climate mitigation action (not only adaptation action) and mental health related issues prominently.⁴ We again excluded studies which focussed on the relationship between connection to nature and mental health (e.g., forest bathing) if there was no focus on carbon reducing actions themselves (e.g., tree planting), or those which focussed

⁴To support consistency across papers on similar topics, results from Searches B1–B5 were divided between the co-authors, with van Bommel leading on results from Search B1, Rohse leading on Search B2, and Robison leading on Searches B3–B5. There was regular discussion between co-authors to ensure consistency of approach.

only on general policy change as the “action”. Within the anxiety search we noted a subset of papers existed which solely focussed on increased engagement with climate change or a general “motivation to act”, rather than reference to specific actions toward either lower-carbon living or higher-carbon living. We ultimately excluded papers relating to “range anxiety” (i.e., Electric Vehicle owners’ concern about running out of charge), as there was no link to wider mental health.

Overall, Search B resulted in 57 results deemed potentially relevant from their abstracts. These publications were downloaded in full and divided between the co-authors; five however were either not able to be sourced or were in a language other than English. After review of the full papers 22 were included in our in-depth review. In addition, six papers had been identified in Search A which seemed to cover some aspect of climate mitigation action, pro-environmental behavior or sustainable lifestyles, together with mental health: after reviewing these papers in full, four of these were also deemed appropriate to include. Together then, the small number of papers we found (26 out of more than 1,000 across searches A and B) supports our original hypothesis that the body of work looking at mental health and climate mitigating actions is currently rather limited.

The 26 papers were divided amongst the co-authors and the following details recorded for each: *region(s) of the world; climate mitigation actions; mental health aspects; research questions; conceptual frameworks; key findings; method(s)—including whether they were qualitative/quantitative/mixed*. This then allowed us to group the papers by disciplinary area, and conduct a thematic analysis of the papers in each sub-group (reported in Subsection Mental health and climate mitigation action: conceptual framings).

RESULTS

In the first two Subsections we first present findings from our review of the 165 abstracts found in Search A, which gives the context of the breadth and depth of current research into climate change and mental health more generally, before moving on to results from the in-depth review of 26 papers with a focus on climate mitigating actions in the third Subsection.

Climate Change and Mental Health: Headline Results Most Papers Focus on the Immediate Impacts of Extreme Weather Events

In this phase of the research (Search A), we observed that a majority of studies (55%) investigated mental health in the context of direct climate change impacts on the natural environment, with many of these papers referring to multiple impacts (e.g., Mousavi et al., 2020; Rother et al., 2020; Tiatia-Seath et al., 2020) and a small proportion making explicit reference to “extreme weather events” (e.g., Mambrey et al., 2019). The largest proportion of these papers concerned the impacts of drought, but also tackled rise in temperature, floods, hurricanes, heatwaves and wildfires (Adams and Nyantakyi-Frimpong, 2021; Melendez and Saltzman, 2021; Silveira et al.,

2021). In contrast, only 10% of papers looked at the more indirect, or longer-term consequences of these impacts, such as loss of access to healthcare in the event of flooding (King et al., 2020), loss of livestock (Nuvey et al., 2020), or water insecurity (Cooper et al., 2019). A notable selection of papers concerned impacts related to climate-induced displacement and migration (e.g., Ayeb-Karlsson, 2021).

Apart from those, 25% of the abstracts included in the review made a rather general reference to climate change impacts, e.g., “impacts of a changing climate” (Hayes et al., 2019) or climate as “creating risks” (Barrett et al., 2016). Only 5% of papers highlighted the psychological impacts of climate change outside of the context of disasters, for example the impacts of being climate change aware (Sanson et al., 2019), perceptions of climate change (Clayton, 2021) or of having environmental concerns (Budziszewska and Jonsson, 2021). The remaining 5% were either unspecified or classified as “Other”.

Papers Which Consider Specific Regions Tend to Focus on the Global North

With regard to region, the largest proportion (45%) of papers focused on the global north⁵, with 30 papers concerning the Australian context (Hanigan et al., 2018). Australia has been particularly vulnerable to climate change events, such as drought (Powers et al., 2015) and bush fires (Gibbs et al., 2013). A significant number of papers focused on the United States (Schwartz et al., 2017). A smaller contribution covered Canada (Woodhall-Melnik and Grogan, 2019), and a handful concerned Europe, with most about the United Kingdom (Ogunbode et al., 2019) and some about Sweden (Budziszewska and Jonsson, 2021). This echoes findings from previous reviews that the majority of studies around mental health and climate change are being conducted in high income countries (see e.g., Sapiains and Ugarte, 2017).

Papers on climate change and mental health that focus on the global south are underrepresented, making up only 20% of those included. The largest proportion of these studies are focused on Asian countries, with a notable portion about Bangladesh (Kabir, 2018). Some papers concerned the African context, with studies taking place in Ghana (Acharibasam and Anuga, 2018) or focusing on Sub-Saharan Africa (Rother et al., 2020) as a whole. Small Islands States such as Polynesia (Gibson et al., 2019) and the Bahamas (Shultz et al., 2020) were the focus of a few papers, with the remaining coming from the Middle-East, more specifically Iran (Abbasi, 2021).

A few (5%) had a multi-country focus (Clemens et al., 2020; Ogunbode et al., 2021). The remaining 5% were classified as “Other” and included papers which made a less distinct reference to geographical region, such as “Circumpolar North” (Cunsolo Willox et al., 2015). Finally, 25% of the abstracts reviewed made no specific mention of geographic region.

⁵The Global North is not exclusively considered as a geographical term, and thus also includes Australia, Canada, Europe, Russia, Israel, Japan, New Zealand, Singapore, South Korea, and the United States.

TABLE 2 | Search B results. Each search also excluded papers referencing “mental health” (since those results were already found in Search A), and the mental health search terms in earlier B searches.

Search no.	Search terms used in “Topic”	No. of results	Major themes of paper abstracts	Results deemed relevant from abstract→after full paper reviewed
B1	Anxiety AND climate change	220	Wide variety e.g., history, film, literary, fish. References to anxiety in global or philosophical contexts	23→ 12
B2	Depression ¹ AND climate change	157	Depression, in the mental health sense, was used very rarely	0
B3	Suicid* AND climate change	76	Link between temperature and suicide, farmer suicides	8→ 2
B4	Trauma* AND climate change (NB. Included in particular due to long form of PTSD)	167	Creative arts	24→ 7
B5	Phobia OR Psychiatric OR PTSD OR Schizophren* OR OCD OR “Obsessive Compulsive Disorder” AND climate change (These terms included in one search since few results for each individually)	39	Link between temperature/climate and mental health hospital admissions (as well as many environmental studies)	3→ 1
Totals		659		57→ 22

¹The initial search returned in excess of 1,000 results, many of which were obviously irrelevant. In order to make the search more manageable, we excluded a number of terms that related to other meanings of depression than that of mental illness, such as being used in the meteorological sense. We did so by picking out words that came up in the top results of the search. We thus excluded papers which referenced: rain; meteor; sea; monsoon; ocean; plant; temperature; soil; weather; inbreed*; hydrology; wind; habitat; “resource depression”; karst; glacier; and saline. As can be seen however, even when these were excluded and the remaining papers’ abstracts read through, none of these papers considered the links between depressive disorder and climate change actions.

Health and Psychology Research Dominates With Quantitative Methods More Prevalent Than Qualitative

The largest proportion of the 165 papers identified through Search A came from Health disciplines (40%) and around a quarter from the Psychological Sciences (25%). A smaller proportion (20%) came from other Social Sciences. Least represented were papers from the Natural and Economic Sciences (10%) and a handful (5%) of the remaining papers did not indicate a defined discipline and were therefore classified as “Other”. With regards to methods, as has been found in previous reviews (e.g., Charlson et al., 2021) quantitative methods are more utilized than qualitative, with 35% using quantitative methods, predominantly *via* surveys (Mason et al., 2018) whereas qualitative methods were highlighted by 20% of the papers included, with interviews (Kumar et al., 2021) being the most common method. A handful of studies (5%) were classified as “mixed,” meaning that both qualitative and quantitative methods were used (Harper et al., 2015). A quarter (25%) of papers did not make explicit whether a particular method was being used. The remaining 15% papers were reviews, a quarter of which were carried out systematically.

The results from this and the previous two Subsections are presented in Tabular form below, in **Table 3**.

Previous Reviews Generally Non-systematic

The majority of reviews on climate change and mental health have been narrative or non-systemic (e.g., Palinkas et al., 2020). Where they have been undertaken systematically,

reviews have tended to focus on: (i) specific geographical regions, e.g., Bangladesh (Hayward and Ayeb-Karlsson, 2021), Sub-Saharan Africa (Rother et al., 2020), Small Island Developing States (Kelman et al., 2021); (ii) specific groups, e.g., indigenous populations (Middleton et al., 2020), children (Clemens et al., 2020), and farmers (Berry et al., 2011); or (iii) specific topics, e.g., suicide (Pervilhac et al., 2020), solastalgia (Galway et al., 2019). These are in clear contrast to this paper’s systematic approach to exploring mental health and actions to combat climate change through reduced carbon emissions.

Climate Change and Mental Health: Thematic Observations

Specific Populations of Interest Include Young People and Health Professionals

A notable number ($n = 28$ out of 165) of papers concerned children and adolescents, recognizing that this group is particularly vulnerable to the mental health impacts of climate change (Sanson et al., 2019), especially those from lower income communities (Chalupka et al., 2020). These highlighted that worry and eco-anxiety about climate change (Gislason et al., 2021), but also more serious mental health problems such as depression and sleep disorders can lead to issues with emotional regulation or cognition, also later in life as adults (Burke et al., 2018).

There were also a number of contributions ($n = 11$ out of 165) which were specifically focused on health professionals. While some studies collected observations from clinicians

TABLE 3 | Impacts, regions, and disciplines represented in the 165 papers from Search A.

Impacts	%	Region(s)	%	Disciplines	%
Direct climate change impacts	55	Global North	45	Health	40
Indirect climate change impacts	10	Global South	20	Psychological Sciences	25
General impacts	25	Multi-country	5	Social Sciences	20
Psychological impacts	5	Other	5	Natural & Economic Sciences	10
Other	5	No specific geography	25	Other	5

(Shultz et al., 2020), others recognized that health professionals, social workers included, will be particularly affected by climate-related natural disasters (Tosone et al., 2015). A few papers highlight the important role of health professionals, such as nurses, in mitigating the mental health impacts of climate change (Kameg, 2020).

Language Used Emphasizes “Negative” Emotions and Mental Health Experiences Rather Than Positive
Out of 105 mental health and emotion related terms and phrases found in Search A, we only identified 8 as having a positive connotation (community connectedness; community resilience; happiness; hope; joy; positive emotions; prosocial purpose; social connectedness). They appeared in just 8% ($n = 14$ out of 165) of the papers reviewed for Search A. Most studies using those terms considered how having those positive emotions or characteristics can help with adapting to the extreme impacts of climate change, but a handful of studies highlighted them as emotions or characteristics that people are “missing” or that are decreasing because of climate change. This is perhaps unsurprising, but reinforces how the term “mental health” is significantly more likely to be associated with negative emotions, and descriptions of poor mental health, rather than explorations of how good mental health is achieved.

Search A also helped to identify, in a systematic manner, the aspects of mental health which are currently being covered in climate change literature. The most prevalent were thus found to be Anxiety, Trauma/PTSD and Suicide, with much smaller pockets considering Depression, OCD/Obsessive Compulsive Disorder, Phobias, Schizophrenia, and general reference to “Psychiatric” related issues.

The Object of Enquiry Is Most Commonly Measuring of Mental Health Problems Rather Than Testing Solutions

Few of the studies seemed to look at potential support mechanisms for mental health in the face of climate change; rather, the majority sought to measure and document impacts. This also led to a prevalence of studies which relied on quantitative measures—in particular hospital admissions and deaths—meaning much more limited attention is being paid to mental health issues “in the community”.

Extremely few (<4%) mentioned the move toward more sustainable lifestyles. Indeed, living with climate change and taking action to prevent climate change were in this way seemingly treated as very separate endeavors. This finding may

in part reflect how many of those to suffer impacts in fact have less scope to make carbon reductions due to already living low-carbon lives, e.g., refugees—(Torres and Casey, 2017). As we will see this significant focus on disaster-related impacts—with pro-active societal change to try to avoid climate change barely featuring—was carried forward to search B also.

Mental Health and Climate Mitigation Action: Conceptual Framings

We now turn to the 26 papers which were read and analyzed in full for our in-depth review—details of which are given in **Table 4**. As per **Table 2** our searches covered 10 mental health related terms however the work we found on climate mitigation action primarily related to anxiety and trauma, with a few papers touching on suicide and depression, and one focused on OCD. Only one paper which considered a specific region was focused on the Global South [Pacific Small Island Developing States in Hayward et al. (2019)], in contrast to 16 which focused on the Global North (the rest not specifying a region).

This Subsection explores the question of where in the research landscape work on climate mitigation action and mental health is emerging, and whether there are particular conceptual frameworks being drawn on—again with details given in **Table 4**. We found two main bodies of work across the 26 papers—(1) more traditional Psychological studies and (2) Psychosocial work—with only a handful of papers that did not fit under either of those umbrellas, broadly belonging to (3) Social Sciences and Health. We discuss these three groups in turn here.

Traditional Psychological Framings

In total just under half (12) papers fell under the traditional Psychological Sciences. These were papers which looked particularly to observe and measure (often quantitatively) cognitive attitudes, behaviors and/or responses to message framings. They carried a very strong emphasis on climate anxiety (10 out of 12 papers, with one of the remaining papers discussing OCD which is significantly related to anxiety). Reflecting the length of time over which the papers were written (2001–2021) the specific conceptual or theoretical frameworks of these works (where applied) often built on different parts of the psychological literature. Nevertheless, there were some common themes which we draw out here.

In particular, a significant portion of the papers explored the question of if and how climate anxiety might be “*constructive (a motivated pro-environmental response) or unconstructive (a symptom of pathological worry)*” (Verplanken et al., 2020,

TABLE 4 | Papers included in our in-depth review highlighted links between mental health issues and climate mitigation action.

Search	References	Mental health aspects	Climate mitigation actions	Conceptual frameworks or central ideas	Body of work
B1	Geiger et al. (2021)	Anxiety, despair (more centrally)	Diet, energy usage, political climate action	Reactions to risk: threat perceptions, emotional responses, and normative perception	(1) Psychological
B1	Helm et al. (2021)	Anxiety	Going childfree (reproductive attitudes)	“Population-environment” environmental changes impacting individuals’ fertility intentions	
B1	Clayton and Karaszia (2020)	Anxiety	Behavioral engagement measures (e.g., recycling, energy usage)	Climate anxiety as an adaptive response	
B1	Mkono (2020)	Anxiety, eco-angst (eco-fear, eco-guilt)	Air vs. train travel	Flygskam (Flight Shaming)—the feeling of guilt re: environmental impacts	
B1	Verplanken et al. (2020)	Anxiety/habitual global warming worry	Pro-environmental attitude/action/behavior incl. energy, buying local	Chronic pathological worry (unconstructive) vs. constructive thinking	
B1	Kapeller and Jager (2020)	Anxiety	Pro-environmental intentions/behaviors	Socio-Psychological model of threat and defense processes	
A	Bains and Turnbull (2019)	Purpose (as beneficial for mental health)	Dietary choices, civic participation in conservation (“clean up” activities)	Positive Psychology—Sense of Purpose and Meaning	
A	Ogunbode et al. (2019)	Anxiety, distress	Home energy, car usage, political action (e.g., writing to MP)	Psychological Resilience, Resilience Paradox	
B1	Akil et al. (2018)	Anxiety	Consumption of goods and services, pro-materialistic/pro-environmental choices	Terror management theory	
B1	Verplanken and Roy (2013)	Habitual ecological worrying, anxiety	Pro-environmental actions (incl. energy use, transport, diet, purchasing, advocacy)	Value-Belief-Norm (VBN) theory of environmentalism	
A	Jones et al. (2012)	Obsessive compulsive disorder	Water usage, energy usage	Checking compulsions motivated by obsessions around harm (to self or others)	
B1	Stoll-Kleemann et al. (2001)	Anxiety (denial as a way to avoid)	Carbon/travel taxes, tough regulatory requirements for energy efficiency	Four cognitive explanations for emotional dissonance (incl. tragedy-of-the-commons)	
B3	Cardon (2021)	Suicide, collective pathologies	Continued defense of the fossil fuel industry	Species suicide discourse, Tragedy of the commons, Anti-colonialism	(2) Psychosocial
B3	Harvey (2020)	Suicide (ecocide), self-destructiveness	Consumerism as fueling climate change	Hyper-individualism, Intersubjectivity, Ecosophy	
B4	Harvey et al. (2020)	Trauma (present & future), eco-anxiety, collective mental illness	Public organizations reducing their carbon footprints	Climate Psychology (drawing on Psychoanalysis, Jungian Psychology, Ecopsychology, Philosophy, Social theory, and more)	
B1	Nelson (2020)	Anxiety	Fossil fuel use, mining/drilling, ICEing (obstructing electric vehicle chargers)	Petromasculinity	
B4	Bellamy (2019)	Trauma, depressive positions, paranoia/schizophrenia	Changing damaging behaviors, Carbon Conversations/Transition Movement	Unconscious processes, Fragmentation	
B4	Brulle and Norgaard (2019)	(Cultural) trauma	Failure to mitigate climate change (social inertia)	Social order based on three key components <i>field</i> , <i>habitus</i> , and <i>doxa</i>	
B1	Sanson et al. (2019)	PTSD, stress, increased suicide/violence	Preparing young people for “lifestyle changes” due to carbon reductions	Psychosocial development—parents role in preparing for/protecting from climate change	
B4	Woodbury (2019)	Climate trauma, depression, chronic psychological disease	Lack of mitigation action	Puts forward that reframing climate change as trauma would enable more action	

(Continued)

TABLE 4 | Continued

Search	References	Mental health aspects	Climate mitigation actions	Conceptual frameworks or central ideas	Body of work
B1	Hoggett and Randall (2018)	Anxiety, denial, disavowal	Climate activism, low impact lives	Social defenses (against anxiety). Emotion work (emotions shape/shaped by organizational actors)	
B5	Barbalat (2020)	Mental health related to addiction, eating disorders	Reducing individual carbon footprint, encouraging behavior change	Motivational interviewing (clinical strategy): confronting, collaborating, withdrawing	
B4	Hayward et al. (2019)	Traumatic histories (of colonization, racism)	Climate advocacy, shift to low carbon living	Pacific South Island Community values "Vai Nui or Fonofale" (interconnected well-living)	© Social science/health
B4	Kim and Chung (2019)	Trauma	Siting of wind turbines, energy transition measures	Place-disruption (cf. place attachment/identity). Sense-scapes, forming place.	
A	Barrett et al. (2016)	Mindfulness, stress, depressive symptoms	Behaviors related to e.g., energy use, transport, dietary choices, purchasing	Stages of change theory (Healthcare)	
B4	Butler and Harley (2010)	Acute and chronic stress, trauma	Actions to reduce individual emissions, e.g., active transport, group action	Ecomedicine	

abstract). The results across the papers were mixed, as outlined next.

Firstly, conditions in a number of studies were such that anxiety did *not* directly increase willingness to act on climate change, or resulted in unconstructive (e.g., obsessive) behaviors. Thus, Clayton and Karazsia (2020)—working to develop a tool to measure climate anxiety—found anxiety did not correlate with behavioral responses to climate change. Focus group work by Stoll-Kleemann et al. (2001) suggested that individuals may be anxious about climate change, but erect “psychological barriers” (linked to denial and resentment) about changing their behavior. And Jones et al. (2012) worked with those experiencing obsessive compulsions related to climate change, supporting the idea that climate change can exacerbate existing mental health conditions.

However, other studies *did* link anxiety to active climate mitigation responses. Thus, Verplanken and Roy (2013) position “habitual worrying” as a constructive response to climate change, based on the value-belief-norm theory of environmentalism. In a later paper, the concept of habitual worrying is repositioned as an aspect of “eco-anxiety,” similarly suggesting that it could be an adaptive pro-environmental response (Verplanken et al., 2020). Geiger et al. (2021)—focusing on emotional (rather than mental health) responses—found anxiety and despair were the most likely to correlate with action intention. Helm et al. (2021), in their research about going childfree as a response to climate concern, found people making significant life choices as part of a way to deal with their concerns and anxiety.

One explanation for these inconsistencies can be found in the idea that “[n]egative emotional reactions need to occur at an optimal level to enable people to respond appropriately to climate risks” (Ogunbode et al., 2019, p. 703). In that paper, the authors put forward the idea of a “Resilience Paradox” where those with increased capacity to cope with the impacts of climate change, who may therefore be less prone

to related emotional impacts, may also be less willing to adopt climate mitigation behaviors to avoid those impacts. We will revisit other explanations in the discussion of psychosocial framings below.

A smaller subset of the papers explored how climate change messaging might interrelate with anxiety, generally proposing that attempting to induce anxiety is counterproductive in achieving behavioral change. Thus, Akil et al. (2018) applied Terror Management Theory to explain why, when exposed to anxiogenic messaging about climate change, the majority of consumers made materialistic consumption choices. Kapeller and Jager (2020) applied a model of threat and defense processes, finding that more information does not lead to pro-environmental behavior, without accounting for other factors, such as values. Mkono (2020) describes how the Swedish movements of “flygskam” (flight shaming) and “tagskryt” (train brag), often played out on social media, can result in anxiety and negative emotions, such as guilt. Their argument is that other messaging may be more effective in encouraging behavioral change.

Finally, the only paper not to consider anxiety centrally looked at how the psychological construct of “prosocial purpose” could be used to encourage climate mitigation behaviors as well as tackle the mental health related issues of social isolation and loneliness (Bains and Turnbull, 2019).

In summary: (i) virtually all of the papers using a traditional psychological framing were focused on anxiety; (ii) they often looked to assess how or in what circumstances climate anxiety might support or inhibit pro-environmental behaviors, with mixed results; (iii) a handful of papers proposed that messaging designed to induce climate anxiety was likely to be counterproductive.

Psychosocial Framings

We turn next to the nine papers in our in-depth review which built strongly on the psychosocial tradition; papers which highlighted suicide and trauma as key mental health issues were in particular more likely to have this framing. These papers built on a variety of psychosocial conceptual framings including social defenses (Hoggett and Randall, 2018), gender identities such as “petromasculinity”—climate-destructive behaviors as reactions to “*underlying racial, gender, and climate-related anxieties*” (Nelson, 2020, p. 283), intersubjectivity (Harvey, 2020), and the impact that cultural traumas like environmental destruction may play on our capacity to act (Brulle and Norgaard, 2019). Taken together the nine papers—all written over 2018–2021—form a relatively coherent body of thought, with many drawing on shared underlying concepts, several of which are summarized in the special issue introduction piece (Harvey et al., 2020); one exception perhaps being (Cardon, 2021) which builds more on narrative and literature-based work than psychoanalytical. The concept of defenses is prominent in half the papers, with one such defense “disavowal”—locking uncomfortable information away so it does not interfere with life—featuring in five. Also central to the psychosocial is the notion that “*emotions such as anxiety shape and are shaped by organizational actors*” (Hoggett and Randall, 2018, p. 225) i.e., they are not individual attributes but rather a product of both psychological and social/cultural context. The psychosocial field is highly qualitative, being founded in the therapeutic arena, and these papers tended to draw on qualitative evidence including clinical experience. Overall we draw out three themes from the set.

Firstly, these papers emphasize the collective nature of society’s (lack of) climate mitigation action, moving away from this as a problem of individual behavior. Cardon (2021) raises the idea of collective mental illness [a concept also highlighted by Harvey et al. (2020)] as a lens through which to examine humanity’s failure to preserve the very ecological systems we depend upon. Brulle and Norgaard (2019) seek to explain this lack of action as a strategy to avoid the cultural traumas which would be involved in doing so. Echoing this, the role of cultural structures—in particular organizations and gender—in supporting climate mitigation action or denial are examined. Hoggett and Randall (2018, p. 240–241) highlight how cultural differences can mean the experience of climate anxiety leads to very different approaches to action. For the climate scientists they spoke to: “*aspects of scientific culture and practice probably provide significant social defenses against anxiety*,” whereas climate activists: “*developed an emotionally supportive culture that helped them sustain their commitment over time*”. Mental health issues have gender differentiation, and Nelson (2020) argues that this may be significant when it comes to continued promotion of fossil fuel use by some men in particular and therefore “*suggest to redefine white masculinity so that it is disentangled from fossil fuels*”.

Secondly, in contrast then to some of the pro-environmental behavior measures examined in the psychological papers, when it comes to “solutions” this body of work tends to examine how society can help develop the emotional skills needed to face and respond appropriately to “climate traumas”. Interestingly,

in reference back to both the Introduction where links between emotional regulation and mental health are discussed, and findings in Subsection Climate change and mental health: thematic observations related to the wider mental health and climate change literature, this small but developing body of work *did* have a clear focus on interventions to support better mental health, which is perhaps unsurprising given psychosocial research’s roots in therapeutic interventions. Bellamy (p. 105) proposes that insights into unconscious psychosocial processes have major “*implications for how we go about helping individuals and society to face up to, and respond appropriately, to climate change*”. Harvey (2020) identifies a need to accept and feel emotions as pre-cursor to acting, then engaging in actions that reconnect. Sanson et al. (2019) highlight the importance of parents in supporting psychological skill development—e.g., “*building children’s hope, efficacy, resilience, and engagement*” (p. 200)—in order for young people to actively contribute to low-carbon futures. This has echoes of public health papers (next Subsection) which call on health professionals to recognize responsibilities in providing support.

Thirdly, digging into the idea of climate trauma, both Brulle and Norgaard (2019) and Harvey et al. (2020) distinguish between immediate trauma due to environmental impacts of climate change and “future trauma” associated with how “*climate change constitutes a profound symbolic challenge to the existing social order*” (Brulle and Norgaard, 2019, p. 2–3). They reflect that these may be more prevalent in privileged, e.g., Global North contexts, who are able to be worried about future impacts which have not yet materialized. Further supporting the consideration of future trauma, Woodbury (2019, p. 5) propose that “Climate Trauma”—as an “*ever-present existential threat*,” rather than a trauma related to a past experience as in PTSD experiences—requires new frameworks to understand.

In summary: these papers highlighted (i) how the surrounding (organizational, family, gender) culture plays a key role in whether mental health relevant experiences related to climate change lead to action, or defense and denial; (ii) were therefore particularly interested in how emotional management skills could be developed through social structures like families—but also workplaces—to potentially protect against mental health traumas and support appropriate responses to the climate crisis; (iii) the role of future traumas as a cause of both immediate mental health impact and simultaneously an explanation for large-scale avoidance of significant action.

Other Social Science and Public Health Framings

Finally, five papers fell outside of our psychological and psychosocial classifications above, one from Search A (“mental health” and “climate change”), two from Search B4 (“trauma” and “climate change”), and one from search B5 (“psychiatric” and “climate change”). Two were categorized as pertaining to the Social Sciences (Hayward et al., 2019; Kim and Chung, 2019) and three to Health (Butler and Harley, 2010; Barrett et al., 2016; Barbalat, 2020). They are geographically, conceptually and methodologically disparate—although with an emphasis on qualitative methods—and offer a range of insights into the question of mental health and climate mitigating actions.

We turn first to the papers from the Social Sciences. In their opinion paper, Hayward et al. (2019) argue that “narratives of despair” that spread the idea that it is too late for climate mitigation action may discourage people from accepting a shared sense of responsibility for putting right climate injustices and for taking mitigating action. They use examples from Pacific Small Island Developing States to demonstrate how feelings of fear, grief and hopelessness in the face of climate change are being overcome by Island communities thanks to their “*traditional values of interconnection and mutual solidarity*” (p. 3). They go further, and propose that when those values are respected, they can be used alongside scientific advances to enable mitigation (and adaptation) action, including shifts to low carbon lifestyles. Drawing on qualitative interviews and documentary analysis in Korea, Kim and Chung (2019) focus partly on how past trauma linked to natural disasters, in their case study landslides, becomes part of local communities’ sense of place. They observe how this trauma resurfaced when the siting of a wind turbine caused a landslide, leading eventually to strong opposition to wind power within their case study area.

Some similar lines of inquiry can be found across the three Health papers, although they all take different approaches: Barbalat (2020) offers a qualitative analysis of political inaction on climate change; Butler and Harley’s (2010) is a review; Barrett et al. (2016) present a concept yet to be tested. The responsibilities of health professionals in living more sustainably and showing leadership in actions to prevent the health effects of climate change is at the heart of Butler and Harley’s (2010) review and call for a new discipline of “ecomedicine,” but the idea of responsibility of the medical profession is also mentioned in Barbalat (2020)—this also echoes messages with regards social workers given in psychosocial paper Harvey (2020). Finally, Barrett et al. (2016) and Barbalat (2020) use clinical or therapeutic work and apply it to the understanding of behavior change in relation to climate change, albeit in different ways. Barbalat (2020) uses clinical “change strategies” to analyse current approaches commonly deployed to make politicians act on climate change and demonstrate their lack of effectiveness. Barrett et al. (2016) propose the concept of a mindfulness programme that includes environmental education to change the high consumption behaviors of the inhabitants of an affluent US suburb.

In summary: (i) this set of papers re-emphasizes, with specific place-based examples, the social structures and cultural contexts that shape emotions, mental health states and motivations and highlights how these can lead to people either taking action or opposing change; (ii) they also highlight the responsibilities of health professionals and the potential of clinical and therapeutic work in leading behavior change and transition to lower carbon lifestyles. This has policy implications in terms of how this type of work and leadership can be supported by policy-making.

SUMMARY AND CONCLUSIONS

Whilst the focus of health-related climate change planning to date has been on minimizing physical health impacts, evidence

points to the mental health repercussions being significantly disruptive. Over the past 18 months, the COVID-19 pandemic has laid bare the importance of mental health considerations when targetting rapid societal changes through policy, meaning that *action to combat climate change* is likely to have additional mental and emotional health impacts, on top of those due to dealing with the impacts of climate change; some research refers to these impacts as the “cultural traumas” involved in significant societal shifts. Mental health needs to therefore be considered at the earliest stages of transition planning, including pro-actively building mental health support infrastructure rather than waiting until times of crisis.

Our review has firstly echoed previous reviews which have surveyed the body of evidence on how climate change (in particular temperature increases, extreme weather events, and loss of livelihoods) is and will result in increased mental health needs. Our review has then gone further to demonstrate that, in contrast, there is currently extremely limited research on how mental health considerations, and infrastructure (or lack of it), affects our ability to limit climate change.

Here we summarize the key messages from our review, and reflect on study limitations, before outlining implications for practice and policy.

As demonstrated by Search A, mental health is primarily being seen as an *outcome* of climate change impacts, not a factor in our ability to work to avoid them. This also points to somewhat of a disconnect in the literature between those who are seen to be impacted by climate change, and those whose actions are causing it. Whilst this in part may reflect the real, and extreme, disparities between how the responsibilities and burdens of climate change are distributed unevenly, this is not the whole picture since the majority of this work focussed on developed (i.e., high carbon emitting) countries. Indeed, this echoes observations made by Randall a decade ago (Randall, 2009) about the split between narratives on the extreme expected impacts climate change (which emphasize loss and trauma) and narratives about solutions, where loss is completely excised.

In addition, there has been an emphasis on the needs of young people and health professionals in this sphere, however the majority of research to date has sought to document impacts rather than experiment with solutions, and this can also be seen by the relatively small amount of research which has explored positive mental health aspects.

Moving to the work which does exist around mental health and climate mitigation action—found *via* Searches A and B—this focusses primarily on how anxiety and trauma may impact on our ability to act; we found little work for example on depression. We found work across the psychological, psychosocial, public health, and wider social sciences. The psychological explorations of this area draw on a very wide range of concepts, although with a strong focus on climate anxiety. In contrast, the psychosocial literature forms a more coherent body of work in this area and papers referencing trauma tended to have this framing.

When it came to anxiety, we found work examining anxiety as a constructive response to climate change, as well as how reduced anxiety over impacts may lessen motivation to work to avoid those impacts, and further how anxiety or the desire to

avoid traumatic changes may provoke denial and disavowal. A potential explanation for how anxiety and trauma-avoidance can both stimulate or stifle action in different circumstances may be the role organizations (and other social structures like family or gender identities) play in maintaining cultures, either supporting social defenses against action or providing emotionally-safe spaces for building commitment. Papers from those working at the frontline of both the health and social care spheres—where mental health impacts are most directly seen—have called for leadership on these issues for many years.

We were particularly interested in this review to explore who and how researchers are investigating the links between mental health and climate mitigation action, and what this might mean for future research which aims to explore the role of emotional management is driving forward climate mitigation action. In this regard we highlight two potential avenues for future research. Firstly, we found work which proposed a need to recognize and accept difficult emotions related to climate change in order to unlock real action. However, few papers have explored whether and how undertaking mitigation actions themselves may improve mental health outcomes, or the positive mental health strategies of those who do undertake significant action. An obvious response to climate anxiety might be to take climate action, but there has been seemingly little research exploring the impacts of this. Secondly, whilst several papers aimed to encourage specific groups (e.g., parents, healthcare workers) to do more to support mental and emotional wellbeing in the face of climate change, there was little examination of how climate policy might incorporate some of these insights. Government behavior change programmes (e.g., based on financial incentives) have not had sufficient impact to date, and there is a need for research into how incorporating mental and emotional support as part of policy programmes could be done.

We reflect briefly on the methodological limitations of this study. As explained in our Review methods, we deliberately used a systematic search term based approach in order to open up the review to potential inclusion of new fields. However, the use of key term searches is also limiting. As we found, a huge variety of concepts are being invoked covering overlapping themes. Indeed, we deliberately noted the diversity of terms related to “climate mitigation action,” which included (but are not limited to): pro-environmental behavior, climate activism/advocacy, (high) consumption, consumerism, transition, ecological/carbon footprint. Furthermore, our in-depth review included only papers where mental health and climate mitigation action were flagged up in the abstract; it would not have been feasible to screen every paper in full however this does mean that there will be papers that would have been deemed relevant from their full text. This review (and the papers therein) can however serve as a foundation upon which the key concepts found could be further explored, for example resilience framings, climate engagement, or emotional regulation. Finally, we did not assess the risk of bias in each study because this systematic review did not aim to evaluate outcomes, rather we were interested in assessing where in the research literature this work is emerging, which meant that all studies which met our topic-based criteria were relevant

for inclusion. Nonetheless, the findings should be read with that in mind.

As discussed in the Introduction, mental health considerations are a direct way in which the experience of emotions, and emotional management, related to climate change can be brought to attention at a policy level. Understanding the relationships between low-carbon transition policies and mental health is critical if governments are to be successful in such policies’ design, and if organizations (including, but not limited to, the health and social care sector) are going to be successful in their implementation. We therefore outline here a number of implications from the review for both policy- and practice-based organizations looking to implement and support societal transitions.

Firstly, we consider implications for the design of interventions aimed at behavior change. These include the need to recognize that confronting climate change invokes strong emotions which can impact on mental health, and indeed that this is a natural and often appropriate response to a traumatic situation, which can even prompt action. However, for climate mitigating actions to result, interventions must include appropriate psychological or emotional support, in order to avoid psychological defense building. Including such support in climate action initiatives was part of the ground-breaking nature of the “Carbon Conversations” course which proved to encourage very significant behavioral changes in participants (Büchs et al., 2015). Our findings also suggest that working with groups—including families, work settings and communities—can be powerful and support ongoing development of emotional management processes through peer interaction. The review also revealed there has to date been a focus on measuring “problems,” with a lack of evaluation of interventions and solutions in this field. Lastly, when it comes to messaging around climate change interventions, our review points to a need to openly acknowledge the potential psychological impacts of climate change (rather than minimizing these) but to avoid deliberately seeking to induce difficult emotions. Rather, interventions could seek to root themselves in “*active hope*” (Hayes et al., 2018).

Secondly, this review has implications for the training and support of health and social care staff. The climate crisis is already having tangible impacts by increasing the emotional work undertaken by individuals (Robison, 2019), but these impacts extend beyond those directly experiencing them. Mental health impacts for society (which have been significantly exacerbated by the COVID-19 pandemic) include sick leave, hospital admissions, and demands on health and social care services, with “hidden” impacts also. It is clear that many in the health and social care services already recognize the need for leadership in this area. Practitioners may not yet be equipped to recognize mental health challenges relating to climate change, and this should be addressed, as well as supporting their own emotional management skill development.

To conclude: mental health does and will play a central role in carbon emission reduction. We call on researchers to help develop this important field further, and hope that this novel review supports that endeavor.

AUTHOR CONTRIBUTIONS

RR led on the conceptual and methodological framing of the paper, as well as coordinating the manuscript preparation, submission, and response to reviewers. MB undertook much of the systematic search work within this framework, with all authors regularly discussing this. All authors shared the screening of papers for searches A and B, and the review of the papers found, but with MB undertaking a larger proportion than RR and MR. All authors contributed to the analysis and writing of the results section, with RR leading on bringing this together.

All authors contributed to the article and approved the submitted version.

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