

# ‘Safe spaces’ and community building for climate scientists, exploring emotions through a case study

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## Abstract

Environmental scientists are acutely aware of the increasing dangers posed by the climate crisis, and this professional awareness is linked to raised levels of climate anxiety. In this paper we explore the use of group therapy as a tool to create a safe space for researchers to share their feelings on climate change. We examine the transcripts of a 2-day group therapy session provided to seven environmental scientists based in the United States by a professional therapist. We analyse more than 12 hours of anonymised audio transcripts to identify patterns, observations and shared experiences. Our results suggest that group therapy may provide positive and cathartic experiences for environmental scientists through sharing emotions and experiences with peers, both about the challenges of their professional lives and difficulties in processing feelings about their work subjects and the climate crisis. Further, results indicate that participants benefited from sharing strategies for coping with the emotional toll of the climate crisis.

**Keywords:** climate emotions; climate anxiety; group therapy; climate therapy; climate crisis; scientists; grounded theory; safe spaces

## Plain Language Summary

Climate anxiety and environmental anxiety are real, growing concerns for many groups. In this paper we explore the use of group therapy as a tool to create a safe space for researchers to share their feelings on climate change. We analyse the transcripts from a group therapy session with US based environmental scientists. Our results suggest that group therapy can provide positive and cathartic experiences for researchers as they process the climate crisis.

## Acknowledgements

We would like to thank the editor and two reviewers for their constructive and considered feedback that helped this manuscript improve greatly.

## Author Contributions

Conceptualization: N.H. and J.D.

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### **Declarations**

The authors have no funding to report. The authors have declared that no competing interests exist.

The authors have no additional support to report.

## Introduction

As we forge into the 21st Century we continue to see records being set in temperature (Rahmstorf and Coumou, 2011), rainfall (Fowler *et al.*, 2021) and extreme weather events (Cai *et al.*, 2014; Perkins-Kirkpatrick and Lewis, 2020), with discussions centring around tipping points (Lenton *et al.*, 2019) and the need for systemic change. News of climate disasters appear with increasing frequency, most recently on the devastating flooding on a colossal scale across Pakistan, directly attributed to climate change (Otto *et al.*, 2022). Acting to minimise loss and suffering caused by the climate crisis is the vital next step, through increasing awareness about the crises we face, and support for and action towards mitigation and adaptation (Patz, Grabow and Limaye, 2014; Vicedo-Cabrera *et al.*, 2021).

Awareness of the crises weighs heavy. Increased knowledge of the climate crisis is linked to raised levels of anxiety (sometimes referred to as ‘climate anxiety’) (Whitmarsh *et al.*, 2022), a term that has received considerable research attention of late (Hayes *et al.* 2018, Palinkas and Wong 2020; Coffey *et al.* 2021; Ojala *et al.* 2021), and is the focus of increasing public concern (Hickman *et al.* 2021; Manning and Clayton 2018). Climate anxiety has been described in a variety of ways in the literature: as a negative result of awareness of the climate crisis and the cause of barriers to action (e.g. Heeren, Mouguiama-Daouda and Contreras, 2022); as a useful mediator of pro-environmental behaviours (e.g. Whitmarsh *et al.*, 2022); as an undesirable mental health problem (e.g. Schwartz *et al.*, 2022). Some researchers propose defining potentially positive aspects of climate concern as ‘climate anger’ (Stanley *et al.*, 2021), ‘climate distress’ or ‘climate empathy’, as distinct from related ‘clinically maladaptive climate anxiety’ (i.e. ‘clinical climate anxiety’) (Crandon *et al.*, 2022), and others refer to ‘eco-paralysis’ as the detrimental outcome of such an emotional state (Heeren, Mouguiama-Daouda and Contreras, 2022).

As the literature exploring this phenomenon grows, so do the terms used to describe it (Coffey *et al.*, 2021; Stanley *et al.*, 2021). For us, ‘climate anxiety’ sits within the broader concept of ‘climate emotions’, which acknowledges that anxiety, as a secondary emotion (Braniecka, 2014), is a layered response to a suite of (often conflicting and simultaneously experienced) positive and negative emotions. We believe that this broader conceptual model can improve our understanding of emotional responses and potential solutions to climate anxiety. It is important to note that while the majority of researchers and practitioners do not consider climate anxiety as a true mental health disorder in its own right, and caution that doing so may lead to a lack of action against climate change (Bhullar *et al.* 2022), it is clear that maladaptive aspects of climate anxiety may be a risk factor and exacerbate or trigger other mental health problems (Ogunbode *et al.* 2023). Whatever definition of climate anxiety is adopted, and however the impacts of this anxiety are framed, understanding how we feel about the climate crisis and the state of the planet is important (Wang *et al.*, 2018).

For researchers working in social-environmental topics, climate change is increasingly viewed as an integral part of their work (Haunschild et al. 2016; Alexandre-Benavent 2017). This increasing attention is therefore likely to be associated with an increase in negative emotional responses, anxiety and possibly significant mental health problems including burnout (Gildford *et al.*, 2019): particularly as many of these people will feel a professional duty to continue working towards climate adaptation and mitigation (Getson *et al.*, 2021). Indeed, this professional attention is likely to be associated with a deep understanding of scientific uncertainty on the impacts and trajectory of the climate, and the limitations in public awareness and political action. We might expect to see greater impacts of this awareness and understanding on secondary emotions like anxiety (Braniecka, 2014) and, subsequently, mental health (Clayton, 2018).

There have been calls for further research into to what extent scientists feel anxiety related to the climate crisis, and how their professional roles and knowledge might predispose them to mental health problems or solutions (Clayton, 2018). Our own work has led us to call for ‘safe spaces’ to discuss how environmental and climate scientists feel (Duggan *et al.*, 2021), driven by observations that scientists often feel unable to discuss their climate emotions. Understanding how professional awareness of environmental crises affects scientists could improve our ability to reduce and ameliorate negative impacts on mental health. Identifying potential interventions could aid in increasing professional resilience and support action-oriented, pro-environmental behaviours in everyday life.

Various solutions have been proposed for dealing with climate and environmental anxiety (e.g. see Bauden and Jachens 2021), including: raising awareness of the symptoms of and need for individual support related to burnout, trauma and other mental health issues; building capacity for self-care through, for example, mindfulness and meditation; increasing capacity of mental health professionals to support climate and environmental anxiety through improved frameworks and professional training; establishing and fostering support communities, such as peer-to-peer networks (Naslund *et al.*, 2016); driving institutional change to modify the professional landscape scientists find themselves in, providing supportive working environments. For all of these solutions, an initial vital step is to support scientists in identifying and acknowledging their need for support: for us (Duggan *et al.*, 2021) and others (Kennedy-Woodard and Kennedy-Williams, 2022), this starts with the creation of safe spaces in which individual scientists can talk about their climate emotions.

The concept of ‘safe spaces’ originated in the psychology literature of the 1960’s when exploring parent-child relationships (Winnicott, 1965). The idea has since been applied to more diverse contexts in psychology, medicine (Best, Butow and Olver, 2016) education (Kisfalvi and Oliver, 2015).

Typically ‘a safe space’ refers to concerted efforts to promote the emotional and psychological well-being of marginalised people (Anderson, 2021). We extend this definition to embrace all people, but rely on the same underlying concept of protection: in this case, protection from the risk of judgement.

Safe spaces for researchers in environmental and climate science could lead to a range of positive outcomes, including consolidating and understanding anxiety as a complex secondary emotion and its root cause (Braniecka, 2014) and fostering or rebuilding a sense of community and belonging through shared experiences (Schultz *et al.*, 2016).

Here, we describe the results of one effort to create a safe space for sharing experiences and feelings in the form of a 2-day group therapy session for a diverse group of seven environmental scientists based in the United States of America. Specifically we seek to explore how scientists felt throughout group therapy to understand: *i) can group climate therapy lead to the creation of a safe space for environmental researchers, ii) do participants see group climate therapy as worthwhile, and iii) what epiphanies or discoveries do participants make throughout a group climate therapy session.* For a deeper consideration on the creation of a safe space during this particular intervention and for a positionality statement from the authors, refer to [supplementary material](#).

### ***Methods:***

Here, we report on a case study involving a group therapy experience provided to seven US-based environmental researchers. The therapy session was organised by a team of Sweden-based documentary film-makers for the purposes of communication to the public of the impacts of climate anxiety on environmental researchers and the potential for group therapy to support them. We were contacted during the planning stages of the project, and were offered the transcripts of the event for analysis. We did not organise or conduct the group therapy, nor did we have any input into this process. As such, no ethical approval was sought for the sessions, since the research conducted was isolated from the intervention. Ethical implications were discussed with the ethics board at the Australian National University, and it was deemed that no ethical review was required given the research conducted was isolated from the intervention and dissemination of research results does not allow identification of specific individuals.

### ***The intervention***

The therapy took place over two full days, in a residential setting, and was facilitated by a qualified therapist (with the following US qualifications; Licensed Clinical Social Worker, Board Certified Diplomate, Certified Group Psychotherapist, Fellow of the American Group Psychotherapy

Association). Individual sessions lasted between 52 minutes and 2 hours and 21 minutes, with a total of c. 12 hours 45 minutes of group discussion over the two days. Some sessions were guided, such that discussion was focused on specific tasks (e.g. participants drawing pictorial representations of their fears) or content (e.g. thinking about how to talk to a child about the state of the planet). For much of the time, however, discussion was unguided (i.e. only very occasional prompting questions). We elaborate the format and content of each session in Table 1. The content was summarised by reading through the therapist's transcript and extracting themes that emerged. The therapy took place on the 18<sup>th</sup> and 19<sup>th</sup> February 2022 in New Jersey, USA.

Table 1. Format and content of each component session of the 2-day group therapy.

Session	Day	Start	Finish	Content
Session 1	1	09:57	11:19	Introductions, Guided discussion: general emotions
Session 2	1	11:55	13:18	Guided discussion: general emotions
Session 3a	1	14:26	15:13	Exercise: short mindfulness session, visualising favourite place on earth, followed by discussion
Session 3b	1	15:13	16:46	Exercise: visualising greatest fear and drawing it, followed by discussion
Session 4	1	17:14	18:06	Guided discussion: impact of climate emotions on relationships
Session 5	2	08:53	10:38	Exercise: speaking to a child from the future
Session 6	2	11:14	12:36	Guided discussion: climate emotions and professional obligations
Session 7	2	14:03	15:44	Guided discussion: having children in the climate crisis
Session 8	2	16:11	17:36	Guided discussion: final thoughts and feedback

### *The participants*

The seven participants all lived in the USA, and were selected purposively in an attempt to have balance, representativeness and diversity. A total of 92 participants were initially invited, with 15 responding positively and a final set of 7 participants chosen for the intervention. The participants had not met prior to the intervention. For a breakdown of demographic data, see Table 2.

Table 2. Demographic data of the participants. This information was provided by the documentary production team based on their interactions with participants. As such we have opted not to include gender/sex.

Characteristic	Category	n=
Age group	35-44	4
	45-54	3
First Language	Swahili	1
	Japanese	1
	English	5
Cultural background	Kenyan	1
	Japanese	1
	Indian American	1
	Afro American	1
	Anglo American	3
Place of Birth	Kenya	1
	Japan	1
	United States of America	5
Scientific Expertise	Agricultural science	1
	Ecology	1
	Climate science	1
	Atmospheric science	2
	Entomology	1
	Paleoclimatology	1

### *The data*

The data that we were provided took the form of an automatically transcribed word-by-word transcript of the audio recordings of the event. Transcription and processing were conducted by the documentary film-makers, and we were provided as text files for each day. Each participant had an independent microphone and eight audio channels were thus recorded independently, aiding isolation of the audio source. Only active sessions were recorded and transcribed – social discussions between sessions were not recorded. Audio tracks were transcribed, time-stamped and then combined, with any identifying information stripped and recoded with ‘speaker 1’, ‘speaker 2’, etc.

### *The methodology*

We make use of what Pidgeon and Henwood (1997) describe as ‘grounded theory-lite’: we adopt grounded theory principles in the development of the categories and concepts that we use, without the intention of producing a full theory. Our project begins with data analysis and thus we do not refer to it as based on ‘grounded theory full’ (Glaser and Strauss, 1980; Strauss and Corbin, 2014).

### *Manual coding*

We used an iterative ‘reading-coding-reading-coding’ process to develop our coding schema and identify core themes in our data. We constructed an initial draft coding schema based on previous research (Duggan *et al.*, 2021) focusing on references to core positive and negative emotions. We both, independently read through a 30-minute transcript chosen at random and attempted to code the data in Nvivo. Following this, we met to discuss our experiences, revising our coding schema to include new codes. This novel schema was then used in a second trial of 50 minutes of transcript chosen at random. The schema was simplified after both authors shared their interpretations and classifications. We then randomly selected another 50 minute section of the transcript and coded the schema independently once more, comparing results to ensure suitability and applicability. The final coding schema is provided in Table 1.

JD then coded the entire transcript and NH checked, commented on, and revised the coding. We then met to discuss the coding at length before finalising it. Throughout the checking process, NH extracted detailed notes on cross code themes (i.e. surprising, interesting or unexpected linkages between codes, and other non-coded topics of interest). These notes were also discussed and summarised together. These summaries formed the basis of our results and discussion.

### *Visualisations*

Visualisations were produced in R. Code and summary data for reproducing the visualisations are available in this permanent data repository: <https://doi.org/10.5281/zenodo.7427698>.

## **Results**

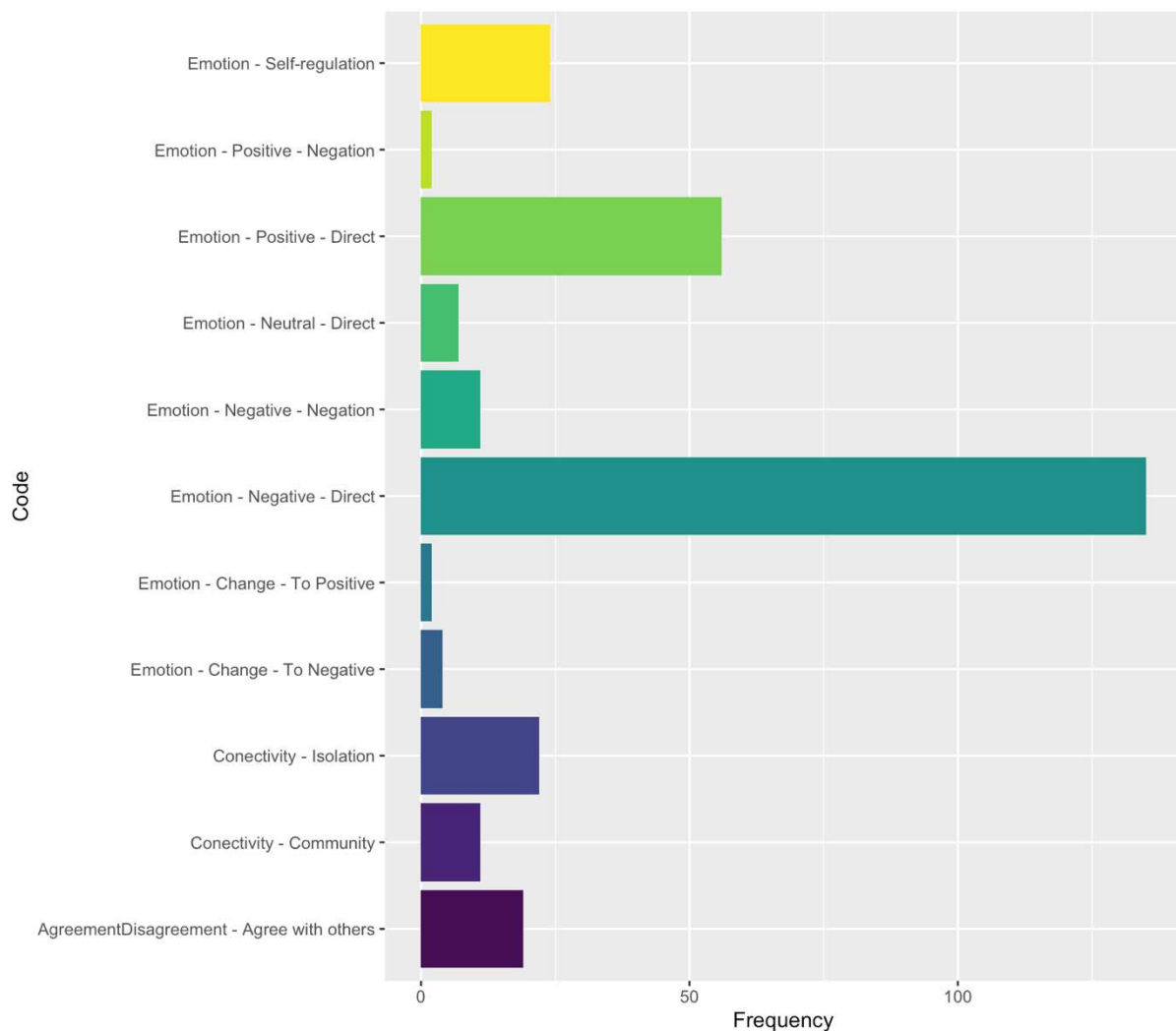
We identified three groups of codes within the data: emotions, references to connectivity to others, and moments of conversational agreement or disagreement (see Table 1).

**Table 3.** Emergent codes from the manual coding exercise and their explanations.

Code	Description
Emotion – self-regulation	Speaker indicates that they exert effort in managing emotions, not allowing themselves to feel certain emotions or indicating that they ‘can’t feel a certain way or ‘won’t let themselves’



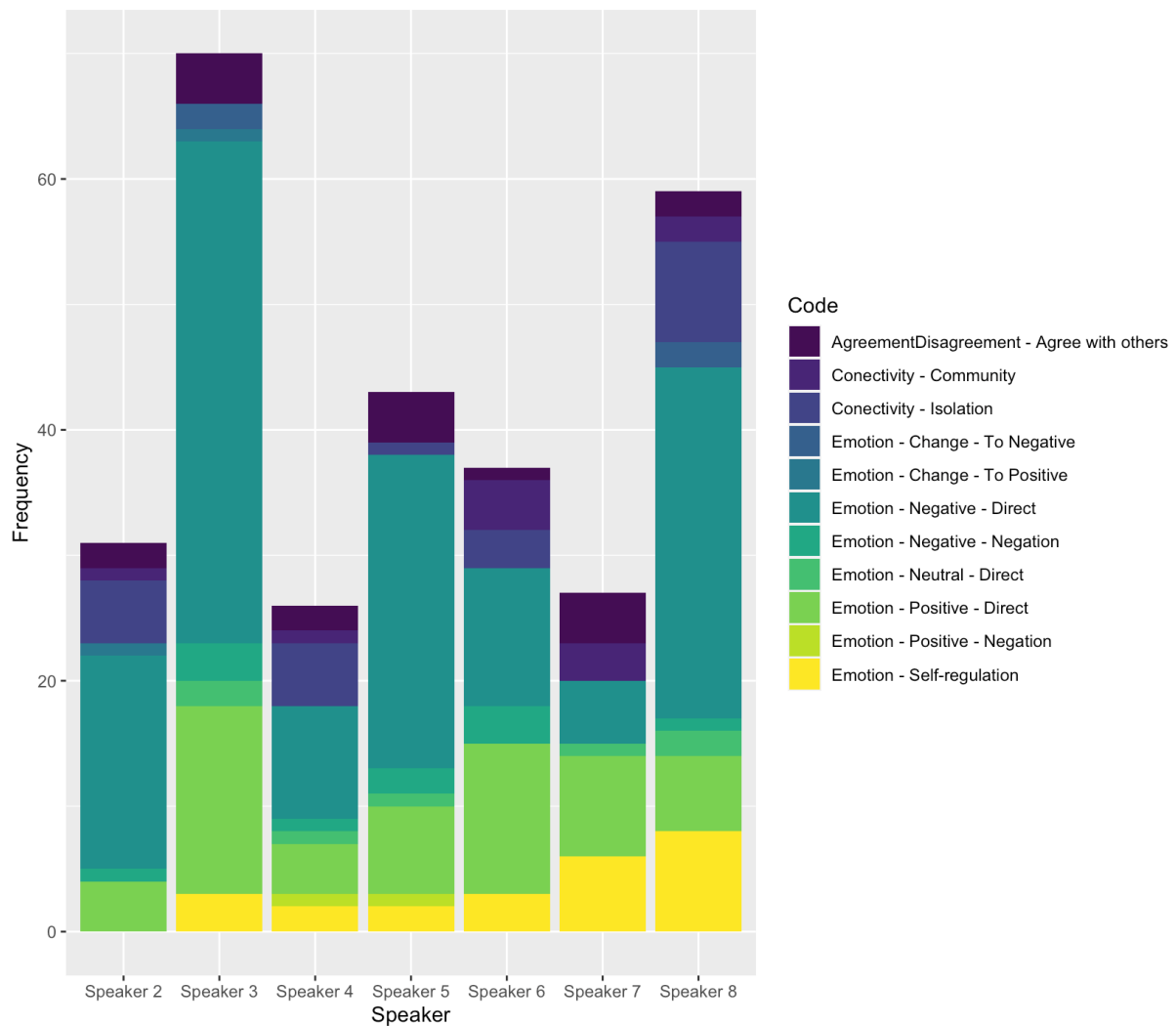
Emotion – positive – direct	A positive emotion is expressed. E.g. ‘I feel happy’, ‘I feel excited’
Emotion – positive – negation	A positive emotion is expressed with an opposing qualifier. E.g. ‘I don’t feel happy’
Emotion – negative – direct	A negative emotion is expressed. E.g. ‘I feel sad, ‘It makes me disappointed’
Emotion – negative – negation	A negative emotion is expressed with an opposing qualifier. E.g. ‘I don’t feel sad’
Emotion – neutral – direct	A neutral emotion is expressed. E.g. ‘I feel humbled’, ‘I feel impatient’
Emotion – neutral – negation	A neutral emotion is expressed with an opposing qualifier. E.g. ‘I don’t feel humbled’
Emotion – change – to positive	A change in emotion in a positive direction is expressed. E.g. ‘I used to feel sad but not I feel happy’ or ‘I used to feel happy, but now I am ecstatic’
Emotion – change – to negative	A change in emotion in a negative direction is expressed. E.g. ‘I used to feel happy but now I feel sad or ‘I used to feel sad, but now I am devastated’
Emotion – change – to neutral	A change from an emotion of either polarity towards neutral. E.g. ‘I was happy but now I am apathetic’
Connectivity – isolation	A speaker indicating that they feel a sense of isolation, either with their peers in the room or more generally through their work or life. E.g. “I feel like no one is there for me”
Connectivity – community	A speaker indicating that they feel a sense of community, either with their peers in the room or more generally through their work or life. E.g. “I feel like I have new family now”
Agreement/disagreement – agree with others	A speaker agreeing with another participant in the room. E.g. “Amen!”, “you are right”
Agreement/disagreement – disagree with others	A speaker disagreeing with another participant in the room. E.g. “I don’t necessarily think that is correct”



**Figure 1.** Manually coded statement frequency across the 2-day therapy session. See the Table 1 and text for an explanation of the codes. Data and code are available here: <https://doi.org/10.5281/zenodo.7427698>.

Throughout the entire two days of therapy, direct negative feelings were more commonly referenced ( $n=135$ ) than direct positive ( $n=56$ ) (Figure 1). Emotional self-regulation (i.e. expending effort in trying to control or prevent certain emotions) was mentioned on multiple occasions ( $n=24$ ) with Speaker 2 being the only participant that did not reference it.

When looking at individuals across the two days, a number of patterns become clear (Figure 2). In absolute terms, Speaker 3 expressed both direct positive ( $n=15$ ) and direct negative ( $n=40$ ) emotions most often. Speaker 8 most frequently referenced some level of isolation ( $n=8$ ) while Speakers 2 and 4 demonstrated direct positivity on the fewest occasions ( $n=4$ ), and Speaker 2 was the only speaker who did not express an element of emotional self-regulation. Most speakers expressed more negative emotions than positive, the only exceptions were Speaker 6 (positive  $n=12$ , negative  $n=11$ ) and Speaker 7 (positive  $n=8$ , negative  $n=5$ ).



**Figure 2.** Manually coded statement frequency across the 2-day therapy session separated by speaker. See the text for an explanation of the codes. Data and code are available here: <https://doi.org/10.5281/zenodo.7427698>.

i) *Was a Safe space created?*

In reviewing and coding the transcripts, there are a number of indications that a safe space was indeed created over the 2-day therapy session. Firstly, all participants contributed to discussions, both in terms of presence in the conversations and emotional and intellectual contributions. Multiple participants also actively referenced feeling comfortable in the space:

*“{There is an] agreement that we are entering ...this space .. treating people with dignity”*

*“We never said that aloud, but I think it was really heavily unspoken”*

*“I don’t know all y’all politics at all or various beliefs, but it feels like we’re probably [from] within a relatively small delta on some things and so we’re thinking about creating a ... brave space for people*

*to talk about things that are really hard and where ...people are going to be on very differing parts of that spectrum.”*

Further supporting our belief that a safe space was created is the fact that participants shared personal and emotionally charged stories, indicating a sufficient perception of safety and trust. Related to this, participants also demonstrated vulnerability (for example by crying) and explicitly referenced this observation at the end of the session:

*“This was crazy. It was so crazy that everybody was willing to be so vulnerable and so introspective and to share everything, and that we all created this crazy situation that enabled everybody to do that with each other. It felt very natural and also really unlikely that that could have happened – that a collection of scientists could have been brought together and created this dynamic.”*

ii) *Was the group therapy worthwhile?*

In general, we observe that the group session appears to have been a valuable one. This was both implicitly and explicitly stated by participants within the data towards the end of the session:

*“I’m privileged to be sitting here with an amazing group of people. I think what came out of this conversation ...[is] the way things have been framed and reframed and picked apart and put back together again – [it] is incredibly useful.”*

One participant explicitly stated that their hope of having a connection during the session was achieved:

*“Just having a connection like that was probably my biggest hope.”*

Several participants also stated that the experienced had been a useful one:

*“I think in conversing with you all, it really helped me actually pinpoint what it is I actually am afraid of – that climate was swirling around in there. But [it]... is not climate change itself, because I do strongly believe in human adaptability. I think it’s more the fear that we as humanity will choose to just let things keep happening the way they have been... and I think it got kind of swirled around with a bunch of other things. And I think really having [the] opportunity to peel a lot of this apart [has] really helped me to remember why I’ve pursued things and why I’ve gone after things the way I have.”*

*“I think it’s been like a bit of a return to center, which I think I definitely needed badly. So thank you, everyone.”*

*“I really am so impressed with people’s power, passion, commitment, resilience. And that just gives me more of all of those things, too. Seeing the complexity of everybody is helpful for me when I interact with the scientific community.”*

### iii) Epiphanies

Throughout the group therapy session participants had several revelations or epiphanies either around their lives as scientists and how this interacts with and intersects their emotional experience of the current state of the planet, most notably the climate crisis. Or, on the concept of therapy and their reaction to it. We have summarised these major themes along with an exemplary quote in Table 2. Emotions and concepts exhibited included guilt, anger, motivation, self-censorship, professional objectivity, community and support, pastoral care and responsibility, trust and safety, sharing emotions and strategies, catharsis and relief, obligation, family, intersectionality with race and gender and impactfulness. These factors appeared to act antagonistically on participants’ wellbeing in their professional roles, leading to feelings of isolation, demotivation, guilt and grief. Layered on top of this, their work in environmental research in the face of the climate crisis appears to have exacerbated feelings of guilt, isolation and demotivation. In the face of this, group therapy shows signs of providing positive and cathartic experiences through sharing emotions and experiences with peers, both about the challenges of their professional lives and difficulties in processing feelings about their work subjects and the climate crisis. In addition, participants benefited by sharing strategies for coping with the emotional toll of the climate crisis and supporting students in their professional pastoral duties. Refer to Table 4 for key themes alongside exemplar quotes. For multiple examples and a full list of themes that emerged see [supplementary information](#).

Table 4. Summary of epiphanies emerging from the data.

Life as a scientist	Example Quote
A lack of impact affecting morale	<i>“In terms of my scientific contribution, it’s not that great. I mean, I love what I do, and I ...don’t know how much I am actually doing service to the community”</i>
A motivation to keep working	<i>“I don’t think I want to let go of my anger, within moderation”</i>
The importance of community support	<i>“I think we expected to be strong for our students, but I feel like nobody is there for us as well.”</i>
Intersectionality of race, gender and disability	<i>“I always tell students you have to do experiments in pairs documented because as a person of color, I would be doubted, you know, if we made that great discovery.”</i>
Self-censoring	<i>“People may build a wall between me and society. So I really never share that [I am a scientist] with other folks.”</i>
Therapy	

Challenges in self care	<i>"I deal with stuff that [can] kill, maim, hurt people all the time and that's both intellectually extremely stimulating and emotionally often pretty devastating"</i>
An opportunity to share	<i>"I actually haven't had a discussion like this before. And it's making me realize and things"</i>
Emotional support	<i>"And that sucks that you have to feel this way. It sucks that we have to feel this way"</i>
Thoughts on hope	<i>"I personally don't want to think about hope too much."</i>
Positive responses to therapy	<i>"It's actually good. I actually haven't had a discussion like this before. And it's making me realize things. So thank you"</i>

## Discussion

Climate anxiety is a phenomenon growing in prevalence, and with this growth comes a need to identify tools and techniques for its management. This study builds on an earlier exploration of climate emotions (Duggan *et al.*, 2021) and investigates the use of group therapy as a tool for managing emotions around climate change. Our results suggest that safe spaces can be made amongst a group of scientists who are strangers, that the concepts discussed indicate an acceptance of the safe spaces and a willingness to engage in deep discussions about climate emotions. They also suggest that the majority of the participants felt the therapy was useful.

One important note must be made about the generalisability of this therapy session. While this study represents a valuable contribution to the literature and an important step towards understanding how safe spaces can support climate scientists to process climate emotions, we must be cautious in generalising the findings. This is a single case study, and as such does not necessarily offer a large breadth of understanding. It does however offer considerable depth (Flyvbjerg, 2006), and highlights a range of other concerns around the inclusivity of science research more broadly. In the following section we explore the results of this study, consider the limitations and propose future directions.

It is clear when reviewing the results that some themes were particularly infrequent in our coding, particularly considering the total length of discussions exceeded 12 hours. It should be noted that the frequency of codes is not reflective of the importance that participants attribute to a given emotion (Cvitanovic *et al.* 2016;2021), nor does it capture a participant's dominance in the conversation or the length or intensity of emotions described. An individual may have talked at length without interruption, exhibiting a given emotion, but this would still only be one occurrence of that emotion. At the start of the study, we hoped to make use of a pre-existing coding schema (Duggan *et al.*, 2021), which coded explicitly referenced individual emotions (e.g. anger, fear, bewilderment). It soon became clear that this was impossible using audio transcripts (rather than letters, which was the subject of the previous schema). This was in part because the text was transcription of speech, which was often meandering, sometimes imprecisely transcribed, and involved frequent metaphors, implications, etc. as a result, the coding used here is necessarily more crude. While this approach is

effective for the preliminary exploration conducted here, further research could explore opportunities for improving the coding schema, giving more attention to sentiment and intensity of emotion beyond just its occurrence.

*i) Was a Safe Space created?*

The clearest indication of the creation of a safe space perhaps comes from the explicit acknowledgement by participants that they could speak openly and be free of judgement. Similarly, the fact all participants had time and space to contribute to the conversation indicates cohesion amongst the group (Burlingame et al. 2011; Hornsey, 2007) which could feasibly be interpreted as a related to a safe space (Burlingame et al. 2002). The fact that there were numerous occurrences of agreement and no occurrences of disagreement may also support the idea of high group cohesion and the creation of a safe space (Kivlighan et al. 2019), but further research is required to confidently suggest this.

*ii) Was the group therapy worthwhile?*

Again, the acknowledgement of appreciation and indication of worth directly voiced by participants is a strong indicator that the therapy was worthwhile. Retaining all participants for the full two days of the intervention could also be an indicator of at least short term ‘success’ (McCallum et al. 2002). To fully capture the magnitude and duration of this success, future research could consist of longitudinal studies and multiple interventions.

*iii) Epiphanies*

An unsurprising result in this analysis was the high frequency of negative emotions described by participants. Since the focus of the group therapy session was on emotions resulting from the climate crisis and we know from previous research that climate scientists do feel a range of negative emotions when considering the topic (Duggan *et al.*, 2021) this is to be expected. Interestingly though, these climate emotions were often linked with reflections on academia and personal circumstance, as summarised in Table 4. These related primarily to: a lack of impact affecting morale; motivation from negative emotions like anger; the importance of community support; intersectionality of race, gender and disability in the work place; and self-censoring when talking about their professions. This

relationship could suggest that climate emotions may well exacerbate existing negative workplace dynamics, but further research is needed to fully understand this. Of particular interest would be an exploration of the institutional pressure to publish in ‘high-impact’ academic journals versus having a demonstrable, local-scale impact through participatory, socially-engaged, practical research.

### *Limitations*

It must also be noted that this therapy session was undertaken as part of a film documentary. While steps were taken to ensure the process would be *true*, we cannot be certain that this had no meaningful effect on participants’ behaviour. It is possible that some behaviours were performative or that other responses were guarded as a result of the cameras. The purposefully diverse nature of the group of participants was a deliberate choice from the documentary film-makers. The sample of 7 participants may not be fully representative of the broader science community, but it does highlight important issues faced by some groups of people, namely the intersectionality of race and gender in participants’ life as researchers and how they respond to group therapy for work-related subjects like climate anxiety. Future research should seek to investigate a broader sample of climate researchers from across different age, race, gender, and other social backgrounds. Further replications would also support analysis of different styles and formats of facilitation to account for possible biases and interactions amongst participants – that is, it is possible that during this intervention individual participants may have dominated the conversation as a result of social biases rooted in gender, academic seniority or age.

Whilst we anonymised the transcripts, there is no doubt that throughout the coding process we built pictures of who the participants were in our head. Along with personal information that they shared, this will have undoubtedly affected our view of who they were, and thus may have introduced unconscious biases in the coding (Berger, 2015). However, this risk of bias is largely unavoidable because of the nature of the flowing conversation across the 2-day session (i.e. personal information was integral to the coded speech). One possibility with these data is that participants were consciously or subconsciously presenting themselves according to counter-normative patterns due to the make-up of other participants (e.g. false-modesty, boastfully, or contrary to gender norms or racial tokenism) (Vohs, Baumeister and Ciarocco, 2005), and there is a risk that the results may include some degree of performative bias. Similarly, the session was part of a public documentary project with the therapy provided free-of-charge. As a result, there is also a risk of selection bias in the type of participant who agreed to take part. Further replications could seek to minimise or quantify these risks of bias, for example by seeking representation and balance in the type of participant selected to take part or by recruiting without self-selection.



A logical extension of this form of group therapy for environmental professionals in the face of the climate crisis would be organisational or institutional support for researchers working at the same institution. However, the participants in this study were strangers prior to the therapy session, and worked in related but different sub-fields. As a result, it is likely that this prior and continued social and professional disconnection affected the willingness to participate, along with the nature of the interactions and involvement across the group. In short, strangers may be more likely to take risks in sharing information and emotions than existing colleagues with social and professional hierarchies already in place (Vohs, Baumeister and Ciarocco, 2005). Extreme care should therefore be taken before institutionalising group therapy such as this to ensure that participants are safeguarded and safe spaces are truly fostered. Here, more research is necessary to explore the functioning of group therapy in a setting where participants are colleagues.

### *Conclusion*

This study represents an important first step in understanding the value of therapy as a tool for creating safe spaces for environmental scientists to share and explore how they feel. We have shown that group therapy does appear to be a place where scientists can show a range of positive, neutral and negative emotions, and that the frequency and type of these emotions vary between individuals and over time. Results suggest that a safe space was indeed created, and that group therapy is a worthwhile approach that not only offers climate scientists an opportunity to reflect on their emotions around climate change, but also creates a space where all emotional drivers from their life and work can be presented and the interplay of these feelings explored. More data is needed to explore how the temporal element may correlate to changes in emotion, and to determine whether therapy can act as a community builder or lessen feelings of isolation. Further research is also required to unpack how results may differ across cultural, professional, gender and identity divides. Regardless, this study adds weight to our previous calls for the creation of more safe spaces for climate scientists.

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## **Electronic Supplementary Materials (EMS)**

### ***On creating a ‘Safe Space’:***

It is worth noting that the safe space referred to herein was subject to video recording for the purposes of creating a documentary film on the topic. However, we feel a safe space was still the goal and the outcome because of the extended process of trust building between the film-makers and participants, the presence of prior informed consent, and the explicit provision of a power of veto by the film-makers for any participant who felt at any point something they discussed should be struck from the record. This power of veto existed from the point of filming until the point at which this manuscript was submitted for publication. Our results back up this observation that the sessions were viewed as a safe space by all participants.

### ***Positionality statement:***

It is important at this point for us, the authors, to acknowledge our positionality. That is, who we are in relation to the study participants (Herr and Anderson, 2005) and how our ontology and epistemology may impact how we conduct our research and interpret the findings (Moon and Blackman, 2014). We are both white males from the Global North, with lived experiences that may well vary considerably from the study participants. We are also interdisciplinary scientists with a natural science background using qualitative methods to analyse the feelings and emotions of natural scientists, likely viewing, analysing and interpreting the data with a different philosophical orientation than the study participants (Moon and Blackman, 2014). We strive to be aware of this bias and have taken steps to remove it from the study, for example through using anonymised transcripts, independent coding, cross checking findings between authors, and openly discussing our biases and assumptions.

### ***Further information and context on epiphanies:***

Our core observations relate to two key concepts. Firstly, reflections on the participants’ lives as scientists and how this interacts with and intersects their emotional experience of the current state of the planet, most notably the climate crisis. Secondly, they reflect on the concept of therapy and their reaction to it. Here, we introduce each concept along with an exemplar quote for clarity.

1. **On life as a scientist**

- a) They perceive that their work is not impactful in relation to broader environmental problems, and this negatively impacts their morale:

*"I try to think what would be my contribution to the community and society and, ... in terms of my scientific contribution, it's not that great. I mean, I love what I do, and I ...don't know how much I am actually doing service to the community."*

- b) They discussed their motivation to keep working, despite an awareness of the state of the planet driving demotivation, but reference the utility of anger as a motivational force:

*"I think rage is great sometimes. Rage makes you feel powerful sometimes. But it comes and goes."*

*"I don't think I want to let go of my anger, within moderation."*

*"it's very easy to fall into this vortex, right? Of thinking about climate change as a problem and not just climate change, but... global environmental change, ecological loss."*

- c) They mentioned the role of community, the importance of collegial/institutional support, and feelings of isolation when they were absent:

*"a few female Asian students who needed some help ... we made our connections, and we talked to each other and they shared the same experiences, what happened on campus and then I realized, I'm still holding the anger. I started feeling much more constructive and much more empowered [than] when I was struggling based on my own experiences." [in reference to experiencing racism and the benefits of sharing these experiences with others]*

*"I think we expected to be strong for our students, but I feel like nobody is there for us as well."*

*"I started noticing the isolation increasing. ....after I finish my Ph.D., people [started] to automatically assume that I was so highly educated that there's no way that I could be interested in their lives or their experience, that I would find them inherently boring... If I start talking about the kind of research I've done, [there is] a distancing: there's no way that this person would be interested in me."*

- d) They reference intersectionality of race, gender and disability with their quotidian practice:

Race and gender: *"there are times that have been in the lab, ...and somebody walks in and they [have] the assumption that I'm just the student, ... and it's profound because of course that starts that sense of isolation: the fact that we're still very few women of color who are scientists."*

Race and accent: *"that was actually the biggest reason why my parents wanted me to not come out with a Texan accent because they were concerned that the combination of being black with the stigmatized accent would result in me not being able to get anywhere in life."*

Race: *"I always tell students you have to do experiments in pairs documented because as a person of color, I would be doubted, you know, if we made that great discovery."*

Race and language: *"I went through that sort of exhaustion of emotion. Last year starting with the BlackLivesMatter and anti-Asian thing and that was really tough because I've been through some of that type of experience. That is compounded with my language too. I think language actually plays a huge role in a people's perception of other people and how other people treat me and others. So when I improved my English, I felt like people started treating me a little better."*

Health/disability: *"sometime last year I had to recognize that the amount I was holding [onto] was getting so much that it was exacerbating my condition and my arthritis had been in remission since about 2013 and it came roaring back last year and I had to recognize that: the body keeps the score.... And it's a real kick in the pants to get pushed to that point, if I don't start doing something different, things are going to go downhill super, super fast."*

They also referred to a feeling of frustration with the slow pace of social change as an excuse for perpetuation of intersectionality issues: *"And we hear the same thing with climate science to race: these things take time, it takes time to change things. How much more time [do] you want. We've been [at it] for a few hundred years now. How much time do we really have, how much are you going to ask people to continue to be subjected to this crap for the sake of your comfort?"*

- e) They describe censoring themselves because of their professional role and public/familial perception of them as individuals, and how this relates to a feeling of isolation from their friends and family. There were differing views on why they choose not to talk to family about the climate crisis. On the one hand because of feeling guilty for making others feel negatively and a subsequent perception of therefore being a denialist:



*“When I talk to people I don't really say I'm a scientist because maybe I subconsciously wonder if I say I'm a scientist. People may build a wall between me and society. So I really never share that with other folks.”*

and on the other hand avoiding discussion of the difficult issue in order to avoid confrontation or conflict:

*“I'm the only academic. They're all well-educated and bright but ...they don't really understand what I do or what I think about. And I think as you become an adult in your family, your relationship with your siblings change and the climate problem is inherently one of risk management in my opinion.”*

## **2. On therapy**

a) Participants discussed the challenges associated with good mental self-care whilst

working in the environment/climate space, and the difficulty in opening up to share emotions in a group setting:

*“I deal with stuff that [can] kill, maim, hurt people all the time and that's both intellectually extremely stimulating and emotionally often pretty devastating. Um, so I just, I don't know, I just keep working in that space. ”*

One participant also mentioned feeling guilty about stepping away from their work for breaks:

*“And I might not be happy about it, but in the grand scheme of things I can just tap out and tap in whenever I feel like it. I feel a lot of guilt about that. And I don't think I'm being fair to myself and feel so much guilt about it, but I do anyway.”*

Another participant described their experiences of being emotionally open in the past, the negative impacts this openness had on them, and a mental process of considering this risk during the group therapy session:

*“I don't know about you all, but I feel somewhere between very exposed [and] scared not because of what's happening here, but because of the implications of what's happening in here. If I get [in] a group of people, as you all have probably seen, I spill everything inside of me very readily and it's not something I hold back on. I tend to [be vulnerable]. And that's bitten me so hard so many times in life. It feels like breathing in a way I haven't in a while, but also there's the rear processes, I can see it spinning back there. So I'm just trying to figure out what to do with that.”*

*"I have emotions, I have feelings, I have everything that every other human being has - [the therapy has] just allowed me to just use a day or so to just think about these feelings, but I know of course, it could... come back swinging. It's always at the back of my mind. It could be that one day the entire world is swinging at me, I hope that you'll be my friends. I'll call on you. Absolutely. Thank you. Yes, absolutely."*

*"And all we have are these short zoom sessions with the family down there, with the kids and his parents and everything. So it's a rapid fire of catching up and who's doing what and who got what grade and who's doing dance and who's doing whatever. And you catch up as much as possible and you don't really talk about things, but you're not really dealing with the emotions behind them."*

*"And now we're going down there in person. And we're going to recap three or four years of life with fires and flooding and drought and all this stuff in two weeks? Probably not. We're probably going to avoid it because we don't want to spend two weeks talking about horrible things. But that's not satisfying either."*

One participant stated that not talking about emotions in relation to their work and the climate crisis resulted in a feeling of being incomplete:

*"This is such a big part of our lives - what we work on. And it's hard to separate, I think for lots of us, work from the stuff we care about personally. And so to not talk about it at all feels a little bit like there's a whole part of me that's not part of this conversation."*

Similarly, there was a reference to a lack of emotional openness in a professional setting having a potentially damaging effect on students, who may particularly feel the need to share their emotions:

*"But we in science education, we tend to teach facts and skills, how to solve the issues, but often we don't bring humanity into science education. And I find it to be a disservice to the students and often, especially during the pandemic, what they wanted to talk about in class was not really science, but their feelings and how they can navigate through challenging times."*

- b) We observed a polite disagreement related to individuals' responsibility for and ability to drive system level change, which involved a factual correction from one participant on another. Being a subject expert in an emotional space may thus prove particularly challenging when scientists have perceptions of needing to be factually correct and unable to make mistakes in front of other experts. Although there was no evidence that this stifled

openness, participants may find group discussions difficult around their peers for this reason.

- c) Several participants referred to this being one of the first times that they had been asked about and given an opportunity to talk about how they feel about the climate crisis:

*“Um, but again, I've never, you know, much in the way that I haven't talked about my feelings about climate change with my colleagues. I haven't really talked about it with my younger relatives. So I'm saying all this without ever, ever having to talk to them about it, which is, you know, when you stop and realize that it's like, well, that's kind of silly.”*

*“And I think... I really appreciate this. [These] comments, and combined with what you just said, just I'm kind of like, ooh, I don't know if you guys feel this way, but it's actually good. I actually haven't had a discussion like this before. And it's making me realize and things. So thank you,”*

*“It was a little bit of a revelation when these guys first approached me about this project and they're like, do you talk about how you feel, working on climate change all the time? I haven't spent time thinking*

*about it. How do you talk to your colleagues and about it - we don't talk, we don't talk about it. We don't talk about how we this is making us feel. And I didn't know if that was just me, but I was also like, why don't we talk about it?”*

*“Why haven't I reflected on how it's making me feel?”*

- d) Participants supported each other emotionally and with concern when sharing difficult feelings:

*“I don't resent you. I don't resent a thing you're saying, but I'm hearing you. And that sucks that you have to feel this way. It sucks that we have to feel this way.”*

- e) Several participants discussed having negative associations with the word ‘hope’ in relation to the climate crisis:

*“I personally don't want to think about hope too much.”*

*“So, I have a complicated relationship with hope, but I do what I think is right: that may result in nothing.”*

f) Participants referred to factors that facilitated sharing emotions in a group setting:

*"I really like expressing myself in a different way other than speaking and writing. Sometimes it's just nice to do something different. I don't know, just even not thinking... It's not even thinking through what you want to communicate or what you want to draw."*

*"I'm curious about how everyone feels - I often find it easier to talk to people that I don't know about things because I just don't take it as personally."*

g) Participants in general responded very positively to the group therapy:

*"Can we do this regularly?"*

*"I really appreciate this. These comments, combined with what you just said, I'm kind of like, ooh, I don't know if you guys feel this way, but it's actually good. I actually haven't had a discussion like this before. And it's making me realize things. So thank you, FACILITATOR."*

*"We scientists, we care about humanity so much. And I was glad to be here. I was so happy to meet you guys. This is wonderful. ...Thank you, guys."*

*"I really am so impressed with people's power, passion, commitment, resilience. And that just gives me more of all of those things, too. Seeing the complexity of everybody is helpful for me when I interact with the scientific community."*

*"So hopefully I'm just going to continue to be a better human being and to learn from everyone time and again, just thank you for this experience."*

*"This was crazy. It was so crazy that everybody was willing to be so vulnerable and so introspective and to share everything, and that we all created this crazy situation that enabled everybody to do that with each other. It felt very natural and also really unlikely that that could have happened - that a collection of scientists could have been brought together and created this dynamic."*

*"I'm privileged to be sitting here with an amazing group of people. I think what came out of this conversation ...[is] the way things have been framed and reframed and picked apart and put back together again - [it] is incredibly useful."*

*"scientists tend to be really opinionated about what we do and what we think. So, I was a little afraid that might happen here. And that did not happen at all. I think we appreciated and respected each*

*other's opinions while being very opinionated. So I found that to be so respectful. ...Throughout these conversations with different opinions and stuff, I felt really supported. ...I was so glad to meet all of you guys - I really enjoyed having conversations."*

h) One participant was sceptical about the experience having been therapeutic:

*"I've never done anything like this. I don't know that this was therapy or therapeutic, particularly for me. But I'm immensely grateful for all of you and your generosity and I feel like I've put a lot of trust into each of you without knowing you. And I'm not a particularly trusting person."*

i) One participant made reference to a feeling of being weighed down by the need to consolidate the therapy session:

*"I guess I feel weight by leaving this experience. I do feel some additional weight about this - understanding how best we go forward with it and how it impacts, differently and equitably. But it's really wonderful to spend two incredibly intense days having the longest conversation of my life."*

And another was unsure how/if they would consolidate the experience:

*"I think coming out of this this last conversation, there's, at least temporarily, a little more balance to the way that I'm feeling about things, whether that will persist as I go spend time in my apartment in front of my computer instead of interacting with people, I don't know."*

Whilst another stated that they felt the experience had been exhausting:

*"Maybe I was also just very naive, but I was like, I'm game. Let's see what happens. I haven't enjoyed a lot of it. It's been exhausting."*

j) Several participants stated that they felt being emotionally open as scientists in a public space could help efforts to increase awareness and environmental behaviours in the general public:

*"[There is] almost a suggestion that if people see that climate scientists are afraid, it humanizes us in this way that allows and gives permission for everyone else to be afraid, and that fear might be galvanizing."*

*"I want to give permission to people to feel afraid and I think that's okay. But I also want to give people permission to be determined, to work out of this. And I think, for me, it's very important that people hear from scientists as well."*

k) Participants shared solutions with one another for supporting others to be motivated:

*"I'm more interested in [the] young generation's happiness and climate change is definitely one of the factors that would affect their happiness. I started teaching [a] course about meditation."*

*"I wanted to be a scientist because I thought that would be a good way to contribute to the conservation of nature but I realise that that's not what I was doing, really. I didn't feel like I was making enough contribution to that. So, as a teacher now I try to do that to young people."*

*"I told my research group, y'all were the reason I kept going, especially there in that first year of the pandemic. There are definitely times where I was just like, I got to keep it together for them."*

*"last time we taught a class we had 100 students and we asked them to just text their family and say, what [are] five questions you have about climate change? And then they brought the letter. I thought it was a powerful exercise [to] do. And then we pull together all the responses and we [gave] a very short answer that ...looks at the literature."*

l) Participants made many references to having learned new solutions to issues of motivation, motivating and supporting students, and other aspects of dealing with the emotional and professional toll of being a scientist in this field:

*"And there are both strategies and tools that can come from this conversation that will be definitely really useful to think about moving forward. And for that, I'm just really grateful. And so I see it as crafting and cultivating some relationships that I hope continue and then be more fuel for the fight."*

*"I think I learned a lot. I learned some cool things to implement in classrooms. I'm grateful for that. I'm really, really grateful to know each of you and, and I'm so glad you all do the work you do and the commitment you feel to doing it. It was interesting to see the emotional touchpoints for me throughout the weekend."*

m) Several participants made reference to the therapy session being an implicit safe space with acceptance of differences:

*"{There is an] agreement that we are entering ...this space .. treating people with dignity" and "We never said that aloud, but I think it was really heavily unspoken"*

*"I don't know all y'all politics at all or various beliefs, but it feels like we're probably [from] within a relatively small delta on some things and so we're thinking about creating a ... brave space for people to talk about things that are really hard and where ...people are going to be on very differing parts of that spectrum."*

n) One participant referred to being aware that cameras were present:

*"It is literally hard for me to walk around, make non verbal communication with other people while their camera is circling."*

### Summary

As outlined in the manuscript, the above observations relate to the following emotions and concepts: guilt, anger, motivation, self-censorship, professional objectivity, community and support, pastoral care and responsibility, trust and safety, sharing emotions and strategies, catharsis and relief, obligation, family, intersectionality with race and gender, impactfulness. These factors appeared to act antagonistically on participants' wellbeing in their professional roles, leading to feelings of isolation, demotivation, guilt and grief. Layered on top of this, their work in environmental research in the face of the climate crisis appears to have exacerbated feelings of guilt, isolation and demotivation. In the face of this, group therapy shows signs of providing positive and cathartic experiences through sharing emotions and experiences with peers, both about the challenges of their professional lives and difficulties in processing feelings about their work subjects and the climate crisis. In addition, participants benefited by sharing strategies for coping with the emotional toll of the climate crisis and supporting students in their professional pastoral duties.

