



Coping with climate change: Three insights for research, intervention, and communication to promote adaptive coping to climate change



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ABSTRACT

Climate change poses a major threat to human well-being and will be the root cause of a variety of stressors in coming decades. Psychologists have an important role to play in developing interventions and communication strategies to help people understand and cope with climate change impacts. Through a review of the literature, we identify three guiding insights for strategies to promote adaptive coping and resilience to climate change stress. First, it is unlikely that one single “correct” or “best” way of communicating about adaptive coping with climate change exists, but there are established best practices communicators can follow. Second, in implementing these best practices, practitioners must attend to the impact of variability in the nature of different kinds of stress caused by climate change, as well as individual differences in how people chronically respond to stressors. Third, because individuals, communities, and ecosystems are interconnected, work on adaptive coping to climate change must address individual coping in the context of community and ecosystem resilience. These insights from psychological science can be leveraged to promote human flourishing despite increasing stressors posed by climate change.

1. Introduction

Climate change is a threat not only to ecosystems and animal life, but also to human well-being and society (IPCC, 2019; Watts et al., 2019). For example, sea-level rise is expected to contribute to the displacement of entire communities and the loss of livelihoods (Hauer, 2017; Neumann, Vafeidis, Zimmermann, & Nicholls, 2015) and also threatens places of cultural importance (e.g., recent flooding of St. Mark's Basilica in Venice; Berry, 2019). The impacts of climate change will affect people in a variety of direct and indirect ways. Effective communication about climate impacts and interventions to promote optimal adaptation are needed to help people cope—physically, psychologically, emotionally and otherwise—with the stresses associated with climate change.

Psychologists have a crucial role to play in promoting such adaptation through communication and interventions, and are already studying many aspects of human responses to climate change (e.g., Gifford, 2011; van der Werff et al., 2013; Doherty & Clayton, 2011; Hornsey, Harris, Bain, & Fielding, 2016; Hornsey & Fielding, 2020; Swim et al., 2011; Stern, 2011). Psychologists have also extensively

studied how individuals respond to and cope with environmental stress and threat (e.g., Bonanno, Brewin, Kaniasty, & Greca, 2010; Folkman & Lazarus, 1984; Folkman & Moskowitz, 2004; McCrae, 1984). Further, psychologists and clinicians have begun to study climate change-specific stress and anxiety, sometimes referred to as ‘eco-anxiety’ (e.g., Hasbach, 2015; Clayton, 2020; Clayton & Karazsia, 2020).

Thus, psychologists are uniquely positioned to improve individual resilience (i.e., the ability to cope and adapt) to climate change stress, through research and implementation of interventions and communication strategies. Here we integrate existing literature across multiple fields to provide three key insights for researchers and practitioners to consider regarding communication about climate change-induced stress and interventions to promote adaptive coping with climate change.

For the purposes of this paper, adaptive coping refers to the behaviors and cognitions that people use to successfully manage stress and maintain well-being despite stress. Some aspects of adaptive coping happen in response to a stressful experience (e.g., cognitively reframing the experience) whereas, others can be developed prior to stress exposure to reduce the impact of the stressor (e.g., resilience building, risk mitigation). Thus, adaptive coping with climate change stress involves

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KEY MESSAGES FOR COMMUNICATING AND PROMOTING ADAPTIVE COPING WITH CLIMATE CHANGE
<p>Insight 1: There is no one “correct” or “best” way of communicating about adaptive coping with climate change, but there are best practices communicators can follow.</p> <ul style="list-style-type: none"> • Provide information on risks, but pair it with information on possible solutions and strategies, and do not overstate risks to avoid denial • Acknowledge the uncertainty inherent in communication about climate risks, and promote strategies that can be used in a variety of scenarios • Use understandable visuals when communicating climate risks • Use credible messages sources, including local messengers • Create bidirectional communication about climate change and coping between impacted communities and practitioners • Use emotional appeals with caution <p>Insight 2: Practitioners must attend to variability in both climate stressors and message/intervention recipients</p> <ul style="list-style-type: none"> • Attend to and acknowledge variation in climate change impacts and recognize that the adaptiveness of different coping methods will vary depending on the nature of the stressor • Recognize the importance of individual differences in people’s threat appraisals and preferred coping styles • Use tailored messages that are appropriate given the type of climate risk, coping styles of individuals, and the context. • Make use of intervention strategies that have been used in similar contexts to promote coping and resilience • Promote flexibility in people’s coping responses and encourage self-monitoring of emotions and coping responses <p>Insight 3: Individual resilience is important, but individuals exist in communities and ecosystems with resiliencies that are interconnected.</p> <ul style="list-style-type: none"> • Understand that individual resilience is linked to resilience of the community and ecosystem – vulnerability and resilience will be influenced not only by the individual themselves, but by their community and ecosystem • Assess needs based not only on the individual in question, but also their community and ecosystem • Identify ways in which promoting individual and community resilience can bolster each other • Encourage coping as a collective, but avoid overburdening individuals or creating a diffusion of responsibility for coping with climate change

Fig. 1. Key Messages.

responses that help people to manage emotional responses, that are aimed at mitigating future risks, and that help people adapt and remain resilient in spite of changing conditions. In the context of climate change, we believe that adaptive coping is a crucial part of personal resilience.

Our aim here is to provide an overview of information that could be useful in promoting adaptive coping among people who are exposed to climate change-related risks. Some of these insights may be more applicable for clinicians, whereas others may be more applicable for communicators or policy advocates. Ultimately, all of these groups may be able to make use of these insights to help serve their goals and interests around understanding and promoting adaptive coping to climate change. Crucially, we have written this paper in a way as to make it accessible to a wide diversity of audiences and stakeholders, including readers who are both familiar and unfamiliar with the various strands of literature (e.g., climate change communication; coping and stress) we seek to bring together. In so doing, we have identified three key insights for those interested in the intersection of climate change and adaptive coping (see Fig. 1).

First, we suggest that although there is no one “correct” or “best” way to communicate about coping with climate change, there are general principles from communications research that can be applied to promote more effective communication. Second, we argue that interventions designed to increase people’s capacity to cope with the stress of climate change must be tailored to target audiences, both because climate change causes a variety of stressors and also because individuals have chronic ways of appraising and coping with stress that may influence how they will cope with climate change-related stressors. Third, we note that individual-level resilience to climate change is only one aspect of resilience; practitioners and researchers must also

consider community and ecosystem resilience and develop strategies that take these contextual factors into account.

2. Insight 1: there is no one “correct” or “best” way of communicating about adaptive coping with climate change, but there are best practices communicators can follow

The goal of improving resilience to stress is not unique to climate change communication but has been studied in domains of risk communication quite broadly, particularly related to natural hazards and public health domains. When communicating specifically about coping with projected impacts of climate change, practitioners should make use of existing, tested strategies to influence coping.

2.1. Providing information about risks by itself rarely promotes change

In the risk communication and public health literatures, researchers and practitioners find that providing information about risks is generally insufficient by itself to promote meaningful behavior change or protective action (Hardeman et al., 2002; Sellnow, Ulmer, Seeger, & Littlefield, 2008). Providing more information is not always better: too much information, and information that is highly complex, will not be recalled easily nor understood well by audiences (Jackson, 1992; Malhotra, 1982; Scammon, 1977). As with interventions to increase protective health and safety behaviors, information provision about the impacts of climate change is not, by itself, generally effective at promoting behavioral change (Campbell-Arvai, Arvai, & Kalof, 2012; Deryugina & Shurchkov, 2016; Moser, 2016). In both disaster communication and climate change communication, use of appropriate and understandable visuals to communicate information, for instance flood

maps showing at-risk areas, can promote action and increase concern (e.g., Millet et al., 2020; Houston et al., 2019; see also Chapman, Corner, Webster, & Markowitz, 2016). Although making people aware of climate change and its possible impacts is important, if we want people to be prepared to cope with the impacts of climate change, and related stress, simply informing them of this is unlikely to encourage adaptive coping.

Several questions remain regarding the optimal role of information provision in promoting adaptive coping for climate change threats. First, increasing public knowledge of how psychologists think about stress and stress responses may help people to be better able to recognize their own reactions to stress and to apply more adaptive strategies in the context of climate change stress, but further research is needed (e.g., Morrissey & Reser, 2003). Another area of potential research comes from suggestions that linking extreme weather such as flooding could motivate more climate change mitigation and adaptation (e.g., Dai, Kesternich, Löschel, & Ziegler, 2015; Ogunbode et al., 2019). Indeed, exposure to extreme weather has been linked to increased belief in climate change (Dai et al., 2015; Demski, Capstick, & Pidgeon, 2017; Albright & Crow, 2019). However, we should be cautious in contexts where messaging that includes a link to climate change could result in rejection not only of the claim that the risk relates to climate change, but also any other information about adaptation or coping. For example, other research framing disasters as related to climate change reduced willingness to help victims among climate change skeptics (Chapman & Lickel, 2016). Further research is needed to evaluate under what conditions messages that link the increase in incidence of existing hazards to climate change are helpful or harmful to the promotion of climate change resilience.

2.2. Use emotional appeals judiciously

In risk communication, fear appeals are sometimes used to promote health-protective and other risk-reducing behaviors (Rogers, 1975; Rogers & Prentice-Dunn, 1997; Witte, 1992; Tannenbaum et al., 2015). In climate change communication, attempts to evoke negative emotions have also been used (Bloodhart, Swim, & Diccio, 2019), and anxiety about climate change, in a moderate amount, is thought to motivate adaptation behavior (Reser, Morrissey, & Ellul, 2011). However, such messages must do more than provoke negative emotions; theories of fear appeals identify threat-induction as potentially motivating if people also receive information on threat severity and their personal susceptibility to the threat, as well as information that promotes efficacy (Rogers, 1975; Witte, 1992). If we want people to take steps to proactively prepare for and be ready to cope with impacts of climate change, we should talk about the associated threats, but should also provide clear information on how they might prepare to minimize the impact of the stressor (see Floyd, Prentice-Dunn, & Rogers, 2000; Tannenbaum et al., 2015; and Peters, Ruiter, & Kok, 2013). This is no easy task.

Further, there are some caveats that should be acknowledged when dealing with emotional appeals of any type. Communicators should account for the trade-off between the potential anxiety and distress these communications could create and the actual urgency of the threat. Effective climate communication should convey information about threats without creating unnecessary and potentially maladaptive distress. Fortunately, some research on learning about threats via media find that this type of risk exposure is often only weakly related to anxiety (Hopwood & Schutte, 2017; Lee & Lee, 2019; Neria & Sullivan, 2011; Pfefferbaum et al., 2014). Finally, although negative emotions may motivate action, if a stressor is portrayed as uncontrollable and excessive, people may be more likely to cope maladaptively for example by denying the risk, or by giving up attempts to do anything about it (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Further, communicators need to be cautious about overstating risks to avoid harming credibility (Bults et al., 2011). Communication attempts

aimed at eliciting specific emotions about climate change to promote public action, including coping, will not necessarily have a predictable or desired effect, and requires further study (see Chapman, Trott, Silka, Lickel, & Clayton, 2018).

2.3. Be aware of source and messaging factors

The source of a message influences the message's effectiveness (e.g., Chaiken, 1987; Petty & Cacioppo, 1984). When we communicate about climate change risks and advocate for certain forms of coping, research suggests that we should use sources that are perceived to be credible, attractive, and expert (Maddux & Rogers, 1980; Petty & Cacioppo, 1984), which includes mental health practitioners. Communicators should also work in partnership with communities to increase trust in messages and message reach within communities (Covello, 2003; Seeger, 2006). People may be more likely to listen to locals and those already part of their social network who can communicate by word-of-mouth (e.g., Burn, 1991; Herr, Kardes, & Kim, 1991). In addition to the benefits to persuasiveness, using local messengers will mean that those communicators are likely to have local knowledge that should increase contextual accuracy and relevance to the audience. Best practices for risk communication generally include being honest, having an open channel of ongoing bi-directional communication, communicating through multiple channels, being sensitive to cultural context, and meeting the informational needs of the public and media (Novak et al., 2019; Seeger, 2006; Sellnow et al., 2008). Communications around adaptive coping should similarly be concerned with these source factors.

2.4. Acknowledge uncertainty

Climate change and risk communication are often about events with some degree of unpredictability, which can make communication complex (Brashers, 2001), especially when we want to communicate effective coping techniques for a variety of possible scenarios. When there is a risk that cannot be predicted with certainty, researchers suggest communicating about several possible scenarios rather than only the worst-case scenario (Bults et al., 2011; Howe, MacInnis, Krosnick, Markowitz, & Socolow, 2019), and being clear about what is known (and not) in the face of a threat (Covello, 2003; Pidgeon & Fischhoff, 2011). Similarly, when dealing with a complex stressor such as climate change, communicators should acknowledge that there is no single solution, no one way of reducing climate risks, and no single "correct" way of adapting to or coping with those stressors. The goal of communication about these uncertain threats should be to promote a variety of approaches, and to help people recognize when to optimally use different coping strategies. We should be sure to communicate what is certain or highly probable and teach specific coping strategies to be used in those situations, or at least promote a variety of coping strategies that could be used across situations.

Finally, in implementing these best practices, interventions and communication should be sensitive to the nature of the stressor and the chronic coping styles of individuals. This issue of tailoring is highly important, and deserves its own discussion, which we address next.

3. Insight 2: Practitioners must attend to variability in both climate stressors and message/intervention recipients

The stressors brought about by climate change are varied and people are also heterogeneous with respect to their chronic stress appraisal and coping styles. These two important sources of variation combine to produce diverse responses at the individual level, requiring careful consideration by researchers and practitioners. As a result, there is no single way that we can communicate about adaptive coping to individuals, as there is no single "climate change stressor" that will impact all people in the same way. Messaging will have to be sensitive

to the variability of stresses that climate change will create. Prior reviews discuss the consequences of climate change in detail (e.g., Haines, Kovats, Campbell-Lendrum, & Corvalán, 2006; IPCC, 2014; 2018; Louis & Hess, 2008; Watts et al., 2018, 2019; Wheeler & Von Braun, 2013) and we will not be exhaustive here. However, thinking through some of the myriad ways in which climate change can create stress provides a starting point for identifying the diversity of responses people may have and the necessity of a variety of messaging techniques on the basis of these stresses.

3.1. Climate change can cause both acute and chronic stress

The effects of climate change have potential to result in acute and chronic stressors. For instance, climate change is expected to increase violent conflict and extreme weather events (e.g., Coumou & Rahmstorf, 2012; Reuveny, 2007), both of which can result in very acute stress and trauma. Exposure to disasters (such as hurricanes, floods, and extreme droughts) may cause injury and loss of life and is also related to the incidence of mental health symptoms (Norris, Friedman, & Watson, 2002, 2002b). Psychologists can offer tools previously developed to confront acute stressors such as terrorist attacks and natural disasters—e.g., deployment of rapid response teams to affected areas—to help with these acute climate impacts when they arise; moreover, the psychological community has an important role to play in preparing for such needs in advance (including development of impact-specific treatment protocols and deployment plans). Other climate impacts will present as chronic stressors. For example, learning about environmental degradation in another part of the world may be felt as a stressor by people with a strong environmental identity (Clayton, 2020); because such effects will be ongoing for the rest of the century (and beyond), they will potentially cause chronic stress for many people across the globe. In such instances, psychologists can offer other concrete tools previously developed and validated to help individuals and communities deal with ongoing, long-term stressors (e.g., cognitive behavioral therapies aimed at reducing anxiety). Climate advocates, practitioners and clinicians will all need to develop and deploy tools that can deal effectively with both types of stressors presented by climate change and will be more effective if they have developed a targeted toolkit of approaches before impacts—both acute and chronic—are widespread.

3.2. Variability in stress responses

Besides the variability in types of climate stressors, there will also be variability in individual responses and coping (e.g., Matthews & Campbell, 2009; Villada, Hidalgo, Almela, & Salvador, 2016). We cannot expect that people will react and respond in the same ways to the stresses of climate change, and some people may become anxious and stressed while others will not (Clayton & Karazsia, 2020). Characteristics of the stressor itself, the context in which it occurs, and the individual all play a part in determining responses to stress (Folkman & Lazarus, 1984; Gruen, Folkman, & Lazarus, 1988; Parkes, 1986). The same stressor could be seen as a hindrance by one person, and as a challenge by another, which will differentially motivate types of coping responses (Searle & Auton, 2014). Individual differences such as personality and worldviews can influence how a stressor is perceived (Kilby, Sherman, & Wuthrich, 2018).

There are also differences in the ways people chronically cope with stress, as people have access to different resources they might rely on to cope, including their own personal material, cognitive, and emotional resources; and resources that they can access in their communities. Depending on these resources, people may use variety of strategies when coping with different types of stressors. A common organization of types of coping is to label strategies as either problem-focused or emotion-focused (Endler & Parker, 1990). Problem-focused coping refers to coping strategies that directly address the problem causing the

stress in some way. In contrast, emotion-focused coping aims to regulate emotional responses to the problem or stressor, oftentimes including downregulation of negative feelings (Folkman & Moskowitz, 2004). Other coping strategies that have been differentiated from problem- and emotion-focused coping are meaning-focused coping, whereby the individual finds ways to connect the experience with deeper values and beliefs (Folkman, 2008), and social-focused coping, whereby the individual seeks instrumental and emotional social support to help them cope (Folkman & Moskowitz, 2004). However, other classification schemes have more categories of coping, such as Carver, Scheier, and Weintraub (1989) fourteen strategy typology, which includes use of humor, acceptance, planning, and religious coping, among others.

Some research suggests that although coping strategies may vary depending on the situation, people do have chronic coping styles that they preferentially adopt across situations (Carver & Scheier, 1994; Ptacek, Pierce, & Thompson, 2006). An individual might chronically cope by trying to directly address the problems (i.e., problem-focused, active coping), whereas others might chronically suppress negative feelings and engage in self-distracting (more passive coping strategies), while some may show more coping flexibility by using a variety of coping strategies across situations and to change strategies when the selected strategy is not working. Coping flexibility is generally associated with better well-being and adjustment (Cheng, 2001; Cheng, Lau, & Chan, 2014; Lester, Smart, & Baum, 1994). Although we are not aware of research directly investigating this, we expect that communication that encourages coping flexibility will be more effective than that which assumes that one coping approach will be optimal. People will be able to cope more adaptively if they have a variety of coping strategies they can choose from to use appropriately and flexibly given the situation.

3.3. Coping responses – sensitivity to both contextual and individual variability

Given that there are many ways that people can cope with stress in general, some coping strategies may seem intuitively more adaptive than others. For example, problem-focused coping might generally seem most adaptive because it involves attempts to mitigate the source of the stress rather than manage around that stress. However, practitioners should be cautious in their certainty about promoting certain strategies as adaptive, as adaptiveness will vary based on the nature of the stressor, and on the goals or motivations the individual has for coping. No single strategy will always be adaptive or maladaptive (Folkman & Moskowitz, 2004; Zeidner & Saklofske, 1996). We can see this in studies of responses to a variety of stressors. For example, after hurricanes Rita and Katrina, use of emotion-regulation strategies, such as substance use or using humor, were associated with higher rates of PTSD symptomology among students (Prost, Appel, & Ai, 2018). However, in different contexts, use of other types of emotion-regulation strategies including adopting positive illusions and benefit-finding are associated with better adjustment, emotional well-being, and self-esteem, at least in the short-term (e.g., students coping with academic stress, Robins & Beer, 2001; cancer patients, Taylor & Armor, 1996). Among people who have experienced the death of a partner, suppressing emotional processing within a half year of the loss is not necessarily related to delayed grief or a later worsening of depression, and could be, for some people, an adaptive way of coping with a traumatic loss (Bonanno & Field, 2001). Some research has examined how children and youth cope with climate change, finding that a variety of emotion-, meaning- and problem-focused strategies are used by this group (2013, Ojala, 2012). In one of these studies, the use of more problem-focused strategies was associated with more negative emotions, explained perhaps by a greater concern about and focus on climate change (Ojala, 2013). Ojala (2013) suggests that meaning-focused coping should be promoted, at least among this group, to encourage

more engagement in environmentalism.

These examples point to the difficulty of classifying coping responses to climate change-related stressors as adaptive or maladaptive in a universal way, and thus the need for supporting a variety of coping responses. When an individual is faced with a seemingly uncontrollable stressor, such as global climate change, using emotion-focused strategies may sometimes be more effective for that person than trying to directly reduce the stress using more active strategies (e.g., coping-environment fit, Folkman & Moskowitz, 2004). Clayton (2020) notes that different strategies of problem-, emotion-, and meaning-focused each have their potential benefits and drawbacks, in terms of both their impact on individual, and engagement in issues of environmentalism. In light of this, we suggest that different aspects of climate-change as a stressor may be simultaneously approached with different coping responses. Research could investigate the potential benefits from promoting emotion-focused coping for the “global” aspects of the stressor that are uncontrollable by individuals while simultaneously encouraging problem focused responses for “local” manifestations of climate change, some of which may be amenable to mitigation or adaptation action.

3.4. Interventions to improve coping

Although coping with climate change as a stressor may be an area that requires further exploration, coping with stress and trauma are not new areas of research. Interventions have already been developed to help people cope with a variety of stressors. Some interventions have taught people to recognize stress and offered ways to cope with different sources and types of stressors, including disaster-related stress (Morrissey & Reser, 2003), academic stress (Dolbier, Jaggars, & Steinhart, 2010; Yusuf, Nicoloro-SantaBarbara, Grey, Moyer, & Lobel, 2019), and stress related to cancer (Cheung et al., 2017; Schellekens et al., 2017). These interventions often teach mindfulness strategies, whereby participants learn to recognize and acknowledge stressful feelings, and engage in exercises like meditation or breathing practice (Schellekens et al., 2017). Other interventions advocate for proactive coping, whereby people build competencies to mitigate impacts of anticipated stress (e.g., Aspinwall, 2011; Bode, De Ridder, Kuijer, & Bensing, 2007; Thoolen, Ridder, Bensing, Gorter, & Rutten, 2009). An understudied but promising area in promotion of resilience to threats are psychological preparedness interventions (Boylan & Lawrence, 2020; Hayes, Blashki, Wiseman, Burke, & Reifels, 2018; Morrissey & Reser, 2003). The idea is that by teaching people to expect and recognize emotions that occur when they are faced with these stressors, people become better able to regulate those emotions. By communicating about climate risks and acknowledging the ways that they create stress, we may be able to encourage better coping.

The interventions described here generally have positive effects and could be adapted for climate change stressors. In considering how to apply interventions and approaches based on past research and practice, practitioners need to be sensitive to the timescale of climate change stress. Some impacts of climate change are apparent already (e.g., record-breaking temperatures in consecutive years; Su, Zhang, & Wang, 2017); but other climate projections emphasize gradual changes that compound over years to drastically alter our way of life in the far future (e.g. sea-level rise, Le Bars, Drijfhout, & de Vries, 2017). Given the nature of climate change and the combination of both acute stressors and more chronic, continuous stressors, we should teach people about the different impacts along with different strategies to cope with those stresses both through active problem-solving and through emotion-focused methods. For example, interventions which teach mindfulness practices could be used in the context of climate change to help people to recognize the emotional reactions they are having in response to climate change. Teaching people about what they can do now to proactively cope is already being done in work on promoting mitigation behaviors (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; Farrow,

Grolleau, & Ibanez, 2017). Some researchers have suggested in fact that engaging in mitigation behaviors is a way to empower people and to reduce anxiety (Clayton, 2020; Doherty, 2015). Thus, there are interventions and strategies to improve individual adaptation and coping that have already been investigated, and which seem to be effective, although more study of specific ways of coping with climate change stress is needed.

3.5. Tailor messages

Given that people may have chronic ways of coping with stress (and varying degrees of flexibility in their use of different coping responses), when communicating about coping we should aim to teach a variety of coping strategies using techniques from existing interventions, and should encourage self-monitoring and evaluation of coping strategies. In health settings, interventions which match people’s chronic coping styles are more effective at promoting coping, satisfaction, and adjustment than interventions which do not match coping styles (e.g., Fry & Wong, 1991; Martelli, Auerbach, Alexander, & Mercuri, 1987). The ways that people chronically cope will also likely influence the types of messages they will respond best to about climate change. For someone with a more active coping style, simply receiving effectively conveyed information about a climate change threat may be enough to mobilize them to take protective actions. Different and probably more elaborate communication and interventions may be needed for people who tend to rely on more passive coping strategies (e.g., denial, behavioral disengagement), whereas people who prefer social-focused strategies might benefit more from interventions that connect them with others who are faced with the same threats. Despite the potential of these ideas, we should note that research on the match between coping style and interventions is scarce, particularly in the context of climate change. Thus, we recommend more investigation of how chronic coping styles influence receptivity and impact of different messages about stressors as well as into sensitivity to individual differences in coping when interventions around climate change are being developed.

4. Insight 3: Individual resilience is important, but individuals exist in communities and ecosystems with resiliencies that are interconnected

The individual who must cope with climate change impacts does not exist in isolation. Instead, people are always embedded in a social community as well as an ecosystem that supports that person and their community. It is important for psychologists to remember this context, and that these components (i.e., person, community, ecosystem) mutually influence each other. The strengths and resources of one of these systems can improve the resilience of the others, just as vulnerabilities in a community or ecosystem increase vulnerability of the individual.

Resilience describes the ability of systems and organisms to cope with, adapt to, and develop in the face of changes, rather than an ability to maintain the status quo (Adger, 2000; Folke, 2016). A feature of resilient systems is adaptive capacity, defined as the “necessary resources for systems to adapt and learn” (p.323, Brown & Westaway, 2011). Norris, Stevens, Pfefferbaum, Wyche, and Pfefferbaum (2008) argue that being resilient requires resources which are robust (i.e., able to be used in a variety of stress-inducing situations), redundant (i.e., a diversity of resources available to prevent issues of resource dependency), and rapid (i.e., able to be accessed and used quickly). Resilience can also be described in terms of which aspect of the system it refers to, and we argue that individual, community, and ecosystem resilience are each vital components of our overall resilience to climate change.

4.1. The three legs of climate-change resilience

Resilience has been a core idea in ecosystems research on responses

to climate change (e.g., Côté & Darling, 2010). Ecological resilience refers to the capacity of a natural system to persist even when major changes occur (Holling, 1973). For instance, an ecologically resilient system may be exemplified by a stable population of animal life despite climatic changes, or the adaptation of plants to new conditions. Likewise, the idea of community resilience is growing in importance as a principle for how communities should approach climate change adaptation. Community resilience describes the ability of communities to cope with external stressors, and is influenced by social capital (e.g., social networks, place attachment), infrastructure, and vulnerabilities (Chapman, Lickel, & Markowitz, 2017). Communities with sufficient adaptive capacity (e.g., ability to adjust), cooperation, resources, community leadership, community attachment, and strong social networks will be more resilient to climatic changes (Lindberg & Swearingen, 2020).

Although individual or personal resilience has had less focus in climate change research, it has been investigated in psychological research on human development and response to stress (e.g., Compas et al., 2017; Rutter, 1987; Werner, 2000). In the context of the current paper, resilience at the individual level is determined in part by the coping ability of individuals experiencing stressors. People who are resilient will be able to navigate and respond to adversity and may show growth from climate change related experiences.

4.2. Individual, community, and ecological resiliencies are linked

These different resiliencies do not exist in isolation from each other, and we encourage thinking of the connections between them. Current work on climate change adaptation increasingly views community and ecological resilience as linked concepts that both deal with sustainability of systems, although their distinct roles and character are also recognized (Adger, 2000). Resilience of *social* systems is viewed as inherently related to *ecosystem* resilience due to human dependence on natural resources (Adger, 2000). At the same time, the ways that human society impact the environment influence ecosystem resilience at both local and global scales. We argue that individual resilience and community resilience also reciprocally influence each other. Individuals may be more resilient if they live in communities with high social capital and in communities where resources are accessible. Communities will also be more resilient if their individual members are more resilient. For instance, after experiencing a disaster, people who cope better and who are better prepared may be more able to help others like neighbors, friends, and the community at large (e.g., community responses to tornadoes; LaLone, 2012). As a result of these interconnections across levels of analysis and organization, it is important not only to be aware of, and sensitive to, ecological, community, and personal resiliencies but also to approach the issue of climate change, adaptation, and stress from the perspective that these interact to influence coping. When practitioners want to promote adaptive coping at the individual level, they must consider the social and ecological context in which a person is embedded, and how that context influences the material or psychological resources available to the person. This should also include a consideration of issues of environmental justice – the climate change impacts being felt within communities and ecosystems are often not a direct result of actions of individuals within those communities (see Agyeman, 2016; Swim & Bloodhart, 2018). Drawing out all the potential interconnections between ecosystem, community, and personal resilience is beyond the scope of this paper. We think it is particularly valuable to discuss how individual coping processes may be linked to community resilience.

4.3. The link between individual and community resilience

When individuals engage in coping efforts to lessen stress they experience from climate change, these efforts will have an impact on their community's resilience. The ways communities respond also influence

the individuals that inhabit them.

In some instances, increasing the resilience of an individual and her household may benefit the resilience of the broader community. For example, if an individual engages in resilience-building by learning disaster response skills (e.g., taking first aid courses), then they become a resource for the community by being better able to care for themselves (i.e., less reliant on the community for help) as well as others. However, other responses, although arguably adaptive for the individual, may have negative consequences for the resilience of the larger community in which that person lives. For example, hoarding of essential supplies might increase an individual person's resilience while reducing resilience within the larger community if it contributes to shortages.

The ways that communities respond to stressors also influence the individual. Some research has approached these issues by examining the outcomes of coping as a group, starting with appraisals of the stress as a shared problem and an appraisal that responsibility is shared (Lyons, Mickelson, Sullivan, & Coyne, 1998). When people cope together, there can be benefits that would not be possible for an individual coping alone, such as a shared sense of responsibility that can lessen the burden of the stress on each individual (Lyons et al., 1998). However, this type of coping may result in inequitable distribution of responsibility and risk of 'stress contagion' as the stress spreads throughout more community members (Lyons et al., 1998). Further, if people feel that they are not personally impacted or that others can address the problem without their efforts then they may shirk responsibility to cope (Folkman & Moskowitz, 2004). In the context of coping with climate change, communicators should strive to avoid messages that deny individual responsibility. However, messages should not overburden the individual, and should find ways to connect individuals within their communities so that they can cope productively together, especially in situations where collective action to address a risk or threat is the most effective (e.g., community resilience building for disaster preparedness).

5. Psychologists' roles in promoting resilience

Psychologists have an important role to play in promoting resilience at community and individual levels. Communities which are resilient to climate change are characterized by an ability to engage in collective action, high levels of social capital (e.g., strong community relationships), strong community competence (including local governance structures and processes), and resilient infrastructure (Chapman et al., 2018; Cutter et al., 2008; Norris et al., 2008). Psychologists can facilitate the bridging and linking relationships necessary to increase social capital and capacity for collective action, can help develop and evaluate meaningful interventions to increase overall community resilience, and can identify vulnerabilities within communities. For instance, psychologists can assess existing individual, community and ecosystem resilience to aid in decision-making about where intervention and communication efforts should be focused. Furthermore, because psychologists study and understand how people respond to and cope with stress, they have a key role to play in informing and preparing individuals to cope with and be resilient to climate change as a stressor.

In communication and interventions to improve coping with climate change, practitioners should assess needs not only at the individual level but also with respect to the resilience of the broader communities in which individuals are embedded. It is particularly important to develop awareness of the available resources at all levels that could be leveraged to help the individual cope. Depending on the resources available (be they social, emotional, cognitive, material, infrastructural), advocacy for different types of coping may be more or less appropriate. For example, asking people to find social support in a community that is not well-connected may not be effective, just as telling people to take steps to mitigate their climate impacts by driving less are unlikely to work if infrastructure is not in place to support such

changes in transportation behavior (e.g., lack of public transit or bicycle lanes).

Another area that deserves more exploration is whether coping well with climate impacts decreases motivation to take action to reduce the emission of greenhouse gasses. It has been argued that if people are able to cope with climatic changes that they will be unmotivated to change current behavior to mitigate climate change (Ogunbode et al., 2019). However, evidence in support of this is mixed, and more research is needed. Some studies have found that thinking about adaptation and support for adaptation policies does not necessarily predict a decrease in support for and action on mitigation strategies (Carrico, Truelove, Vandenberg, & Dana, 2015; Evans, Milfont, & Lawrence, 2014). The issue is further complicated because some strategies to proactively cope with climate change may also be ways of mitigating climate impact. For example, reducing unnecessary consumption can bolster individual resilience by increasing household financial buffers, while at the same time reducing greenhouse gas emissions.

6. Conclusion

In providing these insights, we hope to inform the research and communication efforts of those working in the domains of climate change communication and coping. Given the urgency of climate change and the need to help promote well-being, the study of risk communication to promote climate change resilience is an important area. Psychologists have an important role in this field in their potential contribution to the study of human resilience in the face of a global crisis.

Declaration of Competing Interest

None.

References

- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, 25(3), 273–291. <https://doi.org/10.1016/j.jenvp.2005.08.002>.
- Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in Human Geography*, 24(3), 347–364. <https://doi.org/10.1191/030913200701540465>.
- Albright, E. A., & Crow, D. (2019). Beliefs about climate change in the aftermath of extreme flooding. *Climatic Change*, 155(1), 1–17. <https://doi.org/10.1007/s10584-019-02461-2>.
- Aspinwall, L. G. (2011). *Future-oriented thinking, proactive coping, and the management of potential threats to health and well-being*. *The Oxford handbook of stress, health, and coping* 334–365.
- Berry, N. (2019). Venice floods: Climate change behind highest tide in 50 years, says mayor. *BBC News*. Retrieved from <https://www.bbc.com/news/world-europe-50401308>.
- Bloodhart, B., Swim, J. K., & Diccio, E. (2019). “Be worried, be VERY worried:” preferences for and impacts of negative emotional climate change communication. *Frontiers in Communication*, 3, 63. <https://doi.org/10.3389/fcomm.2018.00063>.
- Bode, C., De Ridder, D. T., Kuijter, R. G., & Bensing, J. M. (2007). Effects of an intervention promoting proactive coping competencies in middle and late adulthood. *The Gerontologist*, 47(1), 42–51. <https://doi.org/10.1093/geront/47.1.42>.
- Bonanno, G. A., & Field, N. P. (2001). Examining the delayed grief hypothesis across 5 years of bereavement. *The American Behavioral Scientist*, 44(5), 798–816. <https://doi.org/10.1177/0002764201044005007>.
- Bonanno, G. A., Brewin, C. R., Kaniasty, K., & Greca, A. M. L. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest*, 11(1), 1–49. <https://doi.org/10.1177/1529100610387086>.
- Boylan, J. L., & Lawrence, C. (2020). What does it mean to psychologically prepare for a disaster? A systematic review. *International Journal of Disaster Risk Reduction* Article 101480. <https://doi.org/10.1016/j.ijdrr.2020.101480>.
- Brashers, D. E. (2001). Communication and uncertainty management. *The Journal of Communication*, 51(3), 477–497.
- Brown, K., & Westaway, E. (2011). Agency, capacity, and resilience to environmental change: Lessons from human development, well-being, and disasters. *Annual Review of Environment and Resources*, 36, 321–342. <https://doi.org/10.1146/annurev-environ-052610-092905>.
- Bults, M., Beaujean, D. J., de Zwart, O., Kok, G., van Empelen, P., van Steenberg, J. E., ... Voeten, H. A. (2011). Perceived risk, anxiety, and behavioural responses of the general public during the early phase of the influenza A (H1N1) pandemic in the Netherlands: Results of three consecutive online surveys. *BMC Public Health*, 11(1), 2. <https://doi.org/10.1186/1471-2458-11-2>.
- Burn, S. M. (1991). Social psychology and the stimulation of recycling behaviors: The block leader approach. *Journal of Applied Social Psychology*, 21(8), 611–629. <https://doi.org/10.1111/j.15591816.1991.tb00539.x>.
- Campbell-Arvai, V., Arvai, J., & Kalof, L. (2012). Motivating sustainable food choices: The role of nudges, value orientation, and information provision. *Environment and Behavior*, 46(4), 453–475. <https://doi.org/10.1177/0013916512469099>.
- Carrico, A. R., Truelove, H. B., Vandenberg, M. P., & Dana, D. (2015). Does learning about climate change adaptation change support for mitigation? *Journal of Environmental Psychology*, 41, 19–29. <https://doi.org/10.1016/j.jenvp.2014.10.009>.
- Carver, C. S., & Scheier, M. F. (1994). Situational coping and coping dispositions in a stressful transaction. *Journal of Personality and Social Psychology*, 66(1), 184.
- Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56(2), 267–283. <https://doi.org/10.1037/0022-3514.56.2.267>.
- Chaiken, S. (1987). The heuristic model of persuasion. In M. P. Zanna, J. M. Olson, & C. P. Herman (Vol. Eds.), *Social influence: The Ontario symposium: Vol. 5*, (pp. 3–39). Hillsdale, NJ: Lawrence Erlbaum.
- Chapman, D. A., & Lickel, B. (2016). Climate change and disasters: How framing affects justifications for giving or withholding aid to disaster victims. *Social Psychological and Personality Science*, 7(1), 13–20. <https://doi.org/10.1177/1948550615590448>.
- Chapman, D. A., Corner, A., Webster, R., & Markowitz, E. M. (2016). Climate visuals: A mixed methods investigation of public perceptions of climate images in three countries. *Global Environmental Change Part A*, 41, 172–182. <https://doi.org/10.1016/j.gloenvcha.2016.10.003>.
- Chapman, D. A., Lickel, B., & Markowitz, E. M. (2017). Reassessing emotion in climate change communication. *Nature Climate Change*, 7(12), 850–852. <https://doi.org/10.1038/s41558-0170021-9>.
- Chapman, D. A., Trott, C. D., Silka, L., Lickel, B., & Clayton, S. (2018). *Psychological perspectives on community resilience and climate change: Insights, examples, and directions for future research*. *Psychology and climate change*. Academic Press 267–288. <https://doi.org/10.1016/B9780-12-813130-5.00011-4>.
- Cheng, C. (2001). Assessing coping flexibility in real-life and laboratory settings: A multimethod approach. *Journal of Personality and Social Psychology*, 80(5), 814–833.
- Cheng, C., Lau, H. P. B., & Chan, M. P. S. (2014). Coping flexibility and psychological adjustment to stressful life changes: A meta-analytic review. *Psychological Bulletin*, 140(6), 1582–1607. <https://doi.org/10.1037/a0037913>.
- Cheung, E. O., Cohn, M. A., Dunn, L. B., Melisko, M. E., Morgan, S., Penedo, F. J., ... Moskowitz, J. T. (2017). A randomized pilot trial of a positive affect skill intervention (lessons in linking affect and coping) for women with metastatic breast cancer. *Psycho-oncology*, 26(12), 2101–2108.
- Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders* Article 102263. <https://doi.org/10.1016/j.janxdis.2020.102263>.
- Clayton, S., & Karaszia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology* Article 101434. <https://doi.org/10.1016/j.jenvp.2020.101434>.
- Compas, B. E., Jaser, S. S., Bettis, A. H., Watson, K. H., Gruhn, M. A., Dunbar, J. P., ... Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A metaanalysis and narrative review. *Psychological Bulletin*, 143(9), 939–962.
- Côté, I. M., & Darling, E. S. (2010). Rethinking ecosystem resilience in the face of climate change. *PLoS Biology*, 8(7), Article e1000438. <https://doi.org/10.1371/journal.pbio.1000438>.
- Coumou, D., & Rahmstorf, S. (2012). A decade of weather extremes. *Nature Climate Change*, 2(7), Article 491496. <https://doi.org/10.1038/nclimate1452>.
- Covello, V. T. (2003). Best practices in public health risk and crisis communication. *Journal of Health Communication*, 8(S1), 5–8. <https://doi.org/10.1080/713851971>.
- Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008). A place-based model for understanding community resilience to natural disasters. *Global Environmental Change Part A*, 18(4), 598–606. <https://doi.org/10.1016/j.gloenvcha.2008.07.013>.
- Dai, J., Kesternich, M., Löschel, A., & Ziegler, A. (2015). Extreme weather experiences and climate change beliefs in China: An econometric analysis. *Ecological Economics*, 116, 310–321. <https://doi.org/10.1016/j.ecolecon.2015.05.001>.
- Demski, C., Capstick, S., Pidgeon, N., et al. (2017). Experience of extreme weather affects climate change mitigation and adaptation responses. *Climatic Change*, 140, 149–164. <https://doi.org/10.1007/s10584-016-1837-4>.
- Deryugina, T., & Shurchkov, O. (2016). The effect of information provision on public consensus about climate change. *PLoS One*, 11(4), Article e0151469. <https://doi.org/10.1371/journal.pone.0151469>.
- Doherty, T. J., & Clayton, S. (2011). The psychological impacts of global climate change. *The American Psychologist*, 66(4), 265–276.
- Dolbier, C. L., Jaggars, S. S., & Steinhardt, M. A. (2010). Stress-related growth: Pre-intervention correlates and change following a resilience intervention. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 26(2), 135–147. <https://doi.org/10.1002/smi.1275>.
- Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping: A critical evaluation. *Journal of Personality and Social Psychology*, 58(5), 844–854. <https://doi.org/10.1037/0022-3514.58.5.844>.
- Evans, L., Milfont, T. L., & Lawrence, J. (2014). Considering local adaptation increases willingness to mitigate. *Global Environmental Change Part A*, 25, 69–75. <https://doi.org/10.1016/j.gloenvcha.2013.12.013>.
- Farrow, K., Grolleau, G., & Ibanez, L. (2017). Social norms and pro-environmental behavior: A review of the evidence. *Ecological Economics*, 140, 1–13. <https://doi.org/10.1016/j.ecolecon.2017.04.017>.
- Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on

- protection motivation theory. *Journal of Applied Social Psychology*, 30(2), 407–429. <https://doi.org/10.1111/j.1559-1816.2000.tb02323.x>.
- Folke, C. (2016). Resilience (republished). *Ecology and Society*, 21(4), 44–74.
- Folkman, S. (2008). The case for positive emotions in the stress process. *Anxiety, Stress, and Coping*, 21(1), 3–14. <https://doi.org/10.1080/10615800701740457>.
- Folkman, S., & Lazarus, R. S. (1984). *Stress, appraisal, and coping*. New York: Springer Publishing Company 150–153.
- Folkman, S., & Moskowitz, J. T. (2004). Coping: Pitfalls and promise. *Annual Review of Psychology*, 55, 745–774. <https://doi.org/10.1146/annurev.psych.55.090902.141456>.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, 50(5), 992–1003. <https://doi.org/10.1037/0022-3514.50.5.992>.
- Fry, P. S., & Wong, P. T. P. (1991). Pain management training in the elderly: Matching interventions with subjects' coping styles. *Stress Medicine*, 7(2), 93–98. <https://doi.org/10.1002/smi.2460070207>.
- Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *The American Psychologist*, 66(4), 290–302.
- Gruen, R. J., Folkman, S., & Lazarus, R. S. (1988). Centrality and individual differences in the meaning of daily hassles. *Journal of Personality*, 56(4), 743–762. <https://doi.org/10.1111/j.14676494.1988.tb00475.x>.
- Haines, A., Kovats, R. S., Campbell-Lendrum, D., & Corvalán, C. (2006). Climate change and human health: Impacts, vulnerability and public health. *Public Health*, 120(7), 585–596. <https://doi.org/10.1016/j.puhe.2006.01.002>.
- Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychology & Health*, 17(2), 123–158. <https://doi.org/10.1080/088704402900136444>.
- Hasbach, P. H. (2015). Therapy in the face of climate change. *Ecopsychology*, 7(4), 205–210. <https://doi.org/10.1089/eco.2015.0018>.
- Hauer, M. E. (2017). Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change*, 7(5), 321–325. <https://doi.org/10.1038/nclimate3271>.
- Hayes, K., Blashki, G., Wiseman, J., Burke, S., & Reifels, L. (2018). Climate change and mental health: Risks, impacts and priority actions. *International Journal of Mental Health Systems*, 12(1), 28. <https://doi.org/10.1186/s13033-018-0210-6>.
- Herr, P. M., Kardes, F. R., & Kim, J. (1991). Effects of word-of-mouth and product-attribution information on persuasion: An accessibility-diagnostics perspective. *The Journal of Consumer Research*, 17(4), 454–462.
- Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4(1), 1–23. <https://doi.org/10.1146/annurev.es.04.110173.000245>.
- Hopwood, T. L., & Schutte, N. S. (2017). Psychological outcomes in reaction to media exposure to disasters and large-scale violence: A meta-analysis. *Psychology of Violence*, 7(2), 316–327. <https://doi.org/10.1037/vio0000056>.
- Hornsey, M. J., & Fielding, K. S. (2020). Understanding (and reducing) inaction on climate change. *Social Issues and Policy Review*, 14(1), 3–35. <https://doi.org/10.1111/sipr.12058>.
- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change*, 6(6), 622–626. <https://doi.org/10.1038/nclimate2943>.
- Houston, D., Cheung, W., Basolo, V., Feldman, D., Mathew, R., Sanders, B. F., ... Luke, A. (2019). The influence of hazard maps and trust of flood controls on coastal flood spatial awareness and risk perception. *Environment and Behavior*, 51(4), 347–375. <https://doi.org/10.1177/0013916517748711>.
- Howe, L. C., MacInnis, B., Krosnick, J. A., Markowitz, E. M., & Socolow, R. (2019). Acknowledging uncertainty impacts public acceptance of climate scientists' predictions. *Nature Climate Change*, 9, 863–867. <https://doi.org/10.1038/s41558-019-0587-5>.
- IPCC (2014). In Core Writing Team, R. K. Pachauri, & L. A. Meyer (Eds.). *Climate change 2014: Synthesis report. Contribution of working groups I, II and III to the Fifth assessment report of the intergovernmental panel on climate change* Geneva, Switzerland: IPCC 151 pp.
- IPCC (2018). In V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Mathews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.). *Framing and context. In: Global warming of 1.5°C. An IPCC Special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* In Press.
- IPCC (2019). In P. R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, & J. Malley (Eds.). *Climate change and Land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* In press.
- Jackson, L. D. (1992). Information complexity and medical communication: The effects of technical language and amount of information in a medical message. *Health Communication*, 4(3), 197–210. https://doi.org/10.1207/s15327027hc0403_3.
- Kilby, C. J., Sherman, K. A., & Wuthrich, V. (2018). Towards understanding inter-individual differences in stressor appraisals: A systematic review. *Personality and Individual Differences*, 135, 92–100. <https://doi.org/10.1016/j.paid.2018.07.001>.
- LaLone, M. B. (2012). Neighbors helping neighbors: An examination of the social capital mobilization process for community resilience to environmental disasters. *Journal of Applied Social Science*, 6(2), 209–237.
- Le Bars, D., Drijfhout, S., & de Vries, H. (2017). A high-end sea level rise probabilistic projection including rapid Antarctic ice sheet mass loss. *Environmental Research Letters*, 12(4), Article 044013. <https://doi.org/10.1088/1748-9326/aa6512>.
- Lee, E., & Lee, H. (2019). Disaster awareness and coping: Impact on stress, anxiety, and depression. *Perspectives in Psychiatric Care*, 55(2), 311–318. <https://doi.org/10.1111/ppc.12351>.
- Lester, N., Smart, L., & Baum, A. (1994). Measuring coping flexibility. *Psychology & Health*, 9(6), Article 409424. <https://doi.org/10.1080/08870449408407468>.
- Lindberg, K., & Swearingen, T. (2020). A reflective thrive-oriented community resilience scale. *American Journal of Community Psychology*. <https://doi.org/10.1002/ajcp.12416>.
- Louis, M. E. S., & Hess, J. J. (2008). Climate change: Impacts on and implications for global health. *American Journal of Preventive Medicine*, 35(5), 527–538.
- Lyons, R. F., Mickelson, K. D., Sullivan, M. J., & Coyne, J. C. (1998). Coping as a communal process. *Journal of Social and Personal Relationships*, 15(5), 579–605. <https://doi.org/10.1177/0265407598155001>.
- Maddux, J. E., & Rogers, R. W. (1980). Effects of source expertness, physical attractiveness, and supporting arguments on persuasion: A case of brains over beauty. *Journal of Personality and Social Psychology*, 39(2), 235–244. <https://doi.org/10.1037/0022-3514.39.2.235>.
- Malhotra, N. K. (1982). Information load and consumer decision making. *The Journal of Consumer Research*, 8(4), 419–430.
- Martelli, M. F., Auerbach, S. M., Alexander, J., & Mercuri, L. G. (1987). Stress management in the health care setting: Matching interventions with patient coping styles. *Journal of Consulting and Clinical Psychology*, 55(2), 201–207. <https://doi.org/10.1037/0022-006x.55.2.201>.
- Matthews, G., & Campbell, S. E. (2009). Sustained performance under overload: Personality and individual differences in stress and coping. *Theoretical Issues in Ergonomics Science*, 10(5), 417–442. <https://doi.org/10.1080/14639220903106395>.
- McCrae, R. (1984). Situational determinants of coping responses: Loss, threat, and challenge. *Journal of Personality and Social Psychology*, 46(4), 919–928. <https://doi.org/10.1037/0022-3514.46.4.919>.
- Millet, B., Carter, A. P., Broad, K., Cairo, A., Evans, S. D., & Majumdar, S. J. (2020). Hurricane risk communication: Visualization and behavioral science concepts. *Weather Climate and Society*, 12(2), 193–211. <https://doi.org/10.1175/WCAS-D-19-00111.1>.
- Morrissey, S. A., & Reser, J. P. (2003). Evaluating the effectiveness of psychological preparedness advice in community cyclone preparedness materials. *The Australian Journal of Emergency Management*, 18(2), 46–61.
- Moser, S. C. (2016). Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say? *Wiley Interdisciplinary Reviews Climate Change*, 7(3), 345–369. <https://doi.org/10.1002/wcc.403>.
- Neria, Y., & Sullivan, G. M. (2011). Understanding the mental health effects of indirect exposure to mass trauma through the media. *Jama*, 306(12), 1374–1375. <https://doi.org/10.1001/jama.2011.1358>.
- Neumann, B., Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future coastal population growth and exposure to sea-level rise and coastal flooding—a global assessment. *PLoS One*, 10(3), Article e0118571. <https://doi.org/10.1371/journal.pone.0131375>.
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41(1-2), 127–150. <https://doi.org/10.1007/s10464-007-9156-6>.
- Norris, F. H., Friedman, M. J., & Watson, P. J. (2002). 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health research. *Psychiatry: Interpersonal and biological processes*, 65(3), 240–260. <https://doi.org/10.1521/psyc.65.3.240.20169>.
- Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry: Interpersonal and biological processes*, 65(3), 207–239. <https://doi.org/10.1521/psyc.65.3.207.20173>.
- Novak, J. M., Day, A. M., Sopory, P., Wilkins, L., Padgett, D. R., Eckert, S., ... Alexander, N. (2019). Engaging communities in emergency risk and crisis communication: Mixed-method systematic review and evidence synthesis. *Journal of International Crisis and Risk Communication Research*, 2(1), 4–14.
- Ogunbode, C. A., Böhm, G., Capstick, S. B., Demski, C., Spence, A., & Tausch, N. (2019). The resilience paradox: Flooding experience, coping and climate change mitigation intentions. *Climate Policy*, 19(6), 703–715. <https://doi.org/10.1080/14693062.2018.1560242>.
- Ojala, M. (2012). How do children cope with global climate change? Coping strategies, engagement, and well-being. *Journal of Environmental Psychology*, 32(3), 225–233. <https://doi.org/10.1016/j.jenvp.2012.02.004>.
- Ojala, M. (2013). Coping with climate change among adolescents: Implications for subjective well-being and environmental engagement. *Sustainability*, 5(5), 2191–2209. <https://doi.org/10.3390/su5052191>.
- Parkes, K. R. (1986). Coping in stressful episodes: The role of individual differences, environmental factors, and situational characteristics. *Journal of Personality and Social Psychology*, 51(6), 1277.
- Peters, G. J. Y., Ruiters, R. A., & Kok, G. (2013). Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, 7(1), 8–31. <https://doi.org/10.1080/17437199.2012.703527>.
- Petty, R. E., & Cacioppo, J. T. (1984). Source factors and the elaboration likelihood model of persuasion. *Advances in Consumer Research*, 11, 668–672.
- Pfefferbaum, B., Newman, E., Nelson, S. D., Nitiéma, P., Pfefferbaum, R. L., & Rahman, A.

- (2014). Disaster media coverage and psychological outcomes: Descriptive findings in the extant research. *Current Psychiatry Reports*, 16(9), 464–474. <https://doi.org/10.1007/s11920-014-0464-x>.
- Pidgeon, N., & Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change*, 1(1), 35–41. <https://doi.org/10.1038/nclimate1080>.
- Prost, S. G., Appel, H. B., & Ai, A. L. (2018). Coping and post-traumatic stress after hurricanes Katrina and Rita: Racial disparities in social work student-practitioners. *Journal of Social Service Research*, 44(4), 459–469. <https://doi.org/10.1080/01488376.2018.1476296>.
- Ptacek, J. T., Pierce, G. R., & Thompson, E. L. (2006). Finding evidence of dispositional coping. *Journal of Research in Personality*, 40(6), 1137–1151. <https://doi.org/10.1016/j.jrp.2005.12.001>.
- Reser, J. P., Morrissey, S. A., & Ellul, M. (2011). The threat of climate change: Psychological response, adaptation, and impacts. In I. Weissbecker (Ed.), *Climate change and human well-being. International and cultural psychology* New York, NY: Springer. https://doi.org/10.1007/9781-4419-9742-5_2.
- Reuveny, R. (2007). Climate change-induced migration and violent conflict. *Political Geography*, 26(6), 656–673.
- Robins, R. W., & Beer, J. S. (2001). Positive illusions about the self: Short-term benefits and long-term costs. *Journal of Personality and Social Psychology*, 80(2), 340–352. <https://doi.org/10.1037/00223514.80.2.340>.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, 91(1), 93–114.
- Rogers, R. W., & Prentice-Dunn, S. (1997). Protection motivation theory. In D. S. Gochman (Ed.), *Handbook of health behavior research 1: Personal and social determinants* (pp. 113–132). Plenum Press.
- Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *The American Journal of Orthopsychiatry*, 57(3), 316–331. <https://doi.org/10.1111/j.1939-0025.1987.tb03541.x>.
- Scammon, D. L. (1977). “Information load” and consumers. *The Journal of Consumer Research*, 4(3), 148. <https://doi.org/10.1086/208690>.
- Schellekens, M. P. J., van den Hurk, D. G. M., Prins, J. B., Donders, A. R. T., Molema, J., Dekhuijzen, R., ... Speckens, A. E. M. (2017). Mindfulness-based stress reduction added to care as usual for lung cancer patients and/or their partners: A multicentre randomized controlled trial. *Psychooncology*, 26(12), 2118–2126. <https://doi.org/10.1002/pon.4430>.
- Seeger, M. W. (2006). Best practices in crisis communication: An expert panel process. *Journal of Applied Communication Research*, 34(3), 232–244. <https://doi.org/10.1080/00909880600769944>.
- Sellnow, T. L., Ulmer, R. R., Seeger, M. W., & Littlefield, R. (2008). *Effective risk communication: A message-centered approach*. Springer Science & Business Media.
- Stern, P. C. (2011). Contributions of psychology to limiting climate change. *The American Psychologist*, 66(4), 303–314. <https://doi.org/10.1037/a0023235>.
- Su, J., Zhang, R., & Wang, H. (2017). Consecutive record-breaking high temperatures marked the handover from hiatus to accelerated warming. *Scientific Reports*, 7, 43735. <https://doi.org/10.1038/srep43735>.
- Swim, J. K., Stern, P. C., Doherty, T. J., Clayton, S., Reser, J. P., Weber, E. U., ... Howard, G. S. (2011). Psychology’s contributions to understanding and addressing global climate change. *The American Psychologist*, 66(4), 241–250. <https://doi.org/10.1037/a0023220>.
- Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015). Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological Bulletin*, 141(6), 1178–1204. <https://doi.org/10.1037/a0039729>.
- Taylor, S. E., & Armor, D. A. (1996). Positive illusions and coping with adversity. *Journal of Personality*, 64(4), 873–898.
- Thoolen, B. J., Ridder, D. D., Bensing, J., Gorter, K., & Rutten, G. (2009). Beyond good intentions: The role of proactive coping in achieving sustained behavioural change in the context of diabetes management. *Psychology & Health*, 24(3), 237–254. <https://doi.org/10.1080/08870440701864504F>.
- Villada, C., Hidalgo, V., Almela, M., & Salvador, A. (2016). Individual differences in the psychobiological response to psychosocial stress (Trier Social Stress Test): The relevance of trait anxiety and coping styles. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 32(2), 90–99. <https://doi.org/10.1002/smi.2582>.
- Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Boykoff, M., ... Chambers, J. (2019). The 2019 report of the Lancet countdown on health and climate change: Ensuring that the health of a child born today is not defined by a changing climate. *Lancet*, 394(10211), Article 18361878. [https://doi.org/10.1016/S0140-6736\(19\)32596-6](https://doi.org/10.1016/S0140-6736(19)32596-6).
- Watts, N., Amann, M., Ayeb-Karlsson, S., Belesova, K., Bouley, T., Boykoff, M., ... Cox, P. M. (2018). The Lancet countdown on health and climate change: From 25 years of inaction to a global transformation for public health. *Lancet*, 391(10120), 581–630. [https://doi.org/10.1016/S01406736\(17\)32464-9](https://doi.org/10.1016/S01406736(17)32464-9).
- Werner, E. E. (2000). Protective factors and individual resilience. In S. J. Meisels, & J. P. Shonkoff (Vol. Eds.), *Handbook of early childhood intervention: 2*, (pp. 115–132).
- Wheeler, T., & Von Braun, J. (2013). Climate change impacts on global food security. *Science*, 341(6145), 508–513. <https://doi.org/10.1126/science.1239402>.
- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs*, 59(4), 329–349.
- Yusufov, M., Nicoloro-SantaBarbara, J., Grey, N. E., Moyer, A., & Lobel, M. (2019). Meta-analytic evaluation of stress reduction interventions for undergraduate and graduate students. *International Journal of Stress Management*, 26(2), 132. <https://doi.org/10.1037/str0000099>.
- Zeidner, M., & Saklofske, D. (1996). Adaptive and maladaptive coping. In M. Zeidner, & N. S. Endler (Eds.), *Handbook of coping: Theory, research, applications* (pp. 505–531). John Wiley & Sons.