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The role of gratitude in motivating intergenerational environmental stewardship

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ABSTRACT

Many of the most pressing environmental challenges we face—from climate change to habitat and species loss—require present generations of decision-makers to act pro-socially in the best interests of future generations. One factor known to inhibit intergenerational altruism is the absence of direct reciprocal exchange between generations. Research has suggested, however, that present decision-makers can be induced to engage in intergenerational reciprocity (Wade-Benzoni, 2002). In accordance with recent studies (e.g., Watkins & Goodwin, 2019), our current investigation provides additional evidence for the role of gratitude as a powerful mechanism underlying such intergenerational decision-making. Across seven studies, we consistently show that individual differences in gratitude uniquely predict increased perceptions of responsibility for future generations. A sense of responsibility toward future generations in turn predicts: increased climate change beliefs and concern (Studies 2 A and 2 B), increased pro-environmental beliefs (Study 3 A) and environmental intentions (Study 3 B), and increased support for environmental policies (Study 4). Indirect effect tests and structural equation models support these findings. Future interventions can harness the prosocial moral emotion of gratitude to combat the temporal discount and promote intergenerational environmental decision making.

Successfully confronting the major environmental challenges we face—from climate change to resource and habitat conservation—will require massive and historically unprecedented levels of cooperation and coordination among individuals, communities, businesses and governments (e.g., Paris Climate Change Agreement, UNFCC, 2020). Such efforts will require cooperation between individuals and organizations that exist in the present and those that will exist in the future, as many of the most significant environmental challenges we face involve long time horizons and significant path dependencies (see Oreskes & Conway, 2010, for a historical review; and Hornsey & Fielding, 2020 for a recent review). These problems are particularly difficult to confront because they involve both intra- and inter-generational public goods and common resource dilemmas; moreover, intergenerational resource allocations made by present actors often take the form of a dictator game, i.e., the present generation makes choices that affect later generations with no direct, obvious input or feedback (e.g., punishment or reward imposed by future generations).

In recent years, there has been growing interest among behavioral scientists, issue advocates, and policymakers in identifying psychological mechanisms that support cooperation and inhibit selfish behavior in the context of collective action problems (see Parks, Joireman & Van Lange, 2013). Moreover, a subset of this body of research has focused specifically on factors that influence cooperation and provision of public goods across generations of decision-makers (that is, when decisions made by present actors affect the availability of public goods or common resources for future actors; Milfont & Sibley, 2011; Portney & Weyant, 1999; Wade-Benzoni & Plunkett-Tost, 2009; see Wilson et al., 2015 for a typology of such timescale "mismatches"). Within this rapidly growing literature, many researchers have focused explicitly on intergenerational cooperation in the context of environmental problems such as climate change, habitat loss and resource overconsumption (e.g., Chermak & Krause, 2002; Gardiner, 2006).

Much of the past research on motivators of intergenerational environmental decision-making has focused on three sets of factors: the stable characteristics of present decision-makers that influence intertemporal choice (e.g., time perspective, Zimbardo & Boyd, 1999; future

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orientation, Strathman, Gleicher, Boninger, & Edwards, 1994; generativity, McAdams & de St. Aubin, 1992; discounting, Hardisty & Weber, 2009); the features of the present decision-making context that constrain behavior (e.g., resource limitations; behavioral defaults; social norms, Barnett, Archuleta, & Cantu, 2019); and, the mechanisms that shape the (perceived) relationship between present and future generations (e.g., psychological distance; social identities; scope of justice; e.g., Hershfield, Bang, & Weber, 2014). This research has revealed numerous factors that shape intergenerational environmental decision-making at both the individual and collective levels, including legacy and mortality concerns (e.g., Dickinson, 2009; Hurlstone, Price, Wang, Leviston, & Walker, 2020; Wade-Benzoni, Tost, Hernandez, & Larrick, 2012; Zaval, Markowitz, & Weber, 2015), moral and social norms (e.g., Stern, Dietz, Abel, Guagnano, & Kalof, 1999), cultural values (e.g., Corner, Markowitz, & Pidgeon, 2014; Kasser, 2011), and numerous cognitive and affective heuristics (e.g., Hardisty, Johnson, & Weber, 2010; Markowitz, Slovic, Vastfjall & Hodges, 2013).

Missing in much of this past research is a recognition and exploration of the notion that intergenerational decision-making connects the present not only with the future but with the past as well: Present-day decision-makers' actions are strongly constrained and shaped by the actions of those who came before them (see, for example, the vast literature on path dependencies and environmental decision-making, e.g., Kirk, Reeves, & Blackstock, 2007). In part this is due to physical and institutional "lock-in" that occurs as decisions are made (e.g., infrastructure decisions made in the early 20th century have privileged the expansion of private automobiles ownership over public transit use decades later). However, recent research suggests that past generations' actions also influence present decision-makers' future-relevant choices through cultural and psychological mechanisms (e.g., Wade-Benzoni, 2002; Watkins & Goodwin, 2019). In the present paper, we examine a relatively unstudied, proximal psychological mechanism by which past generations' actions influence decision-makers' (positive) motivation to engage in intergenerational environmental stewardship, namely, feelings of gratitude.

1. Past generations' influence on present, intergenerational decision-making

In a series of studies conducted over the past 20 years, Wade-Benzoni and colleagues have demonstrated that reminding or telling people about "good deeds" done on their behalf by past others tends to increase intergenerational beneficence (e.g., Bang, Koval, & Wade-Benzoni, 2017; Wade-Benzoni, 2002). For example, when participants in one study read about past generations' decision to self-impose gasoline taxes—sacrificing present consumption to provide future generations cleaner air—they became more likely to themselves take on greater tax burdens to benefit future others (Wade-Benzoni, 2002). In another series of experiments, when individuals were placed in a position of power in an intergenerational context they reported a higher obligation to care for the future interests of others, thus increasing generosity towards future others (Tost, Wade-Benzoni, & Johnson, 2015). Based on these and other findings, Wade-Benzoni and her colleagues have proposed an integrative model of intergenerational decision-making that highlights the powerful influence of past actors' decisions on present actors' intergenerational decision-making (see Wade-Benzoni & Plunkett-Tost, 2009).

In their model, past generations' behaviors influence present intergenerational decisions primarily via three pathways: perceived affinity with future generations; feelings of social responsibility; and, norms of reciprocity. Affinity with future others (defined as a combination of empathy, perspective taking and perceived oneness) promotes pro-environmental decisions in part by reducing perceived distance and difference with future others. Wade-Benzoni and Plunkett-Tost (2009) suggest that felt affinity with the future can be increased by focusing individuals on their connections to past others (and their beneficent actions), thus expanding one's conception of relevant social ingroups across generations (also see Hershfield et al., 2014 for a recent example in the environmental domain). Feelings of social responsibility have similarly clear, direct effects on intergenerational beneficence and also can be increased by expanding individuals' scope of justice to include past and future others; research has suggested that people act more generously towards future others if they have a sense of responsibility and stewardship instilled in them (Wade-Benzoni, Hernandez, Medvec, & Messick, 2008).

Finally, Wade-Benzoni (2002) has found that individuals appear to "reciprocate" past generations' actions by paying forward benefits or burdens to future others. Framing their findings within the context of previous work on indirect reciprocity and intertemporal discounting (cf., Ekeh, 1974; Frederick, Loewenstein, & O'Donoghue, 2002), Wade-Benzoni and her colleagues propose that such "intergenerational reciprocity" is driven by two primary mechanisms: modeling effects (past generations' actions serve as a model of how to behave towards those in the future; closely related to "social responsibility"); and norms of reciprocity (societal norms dictate paying forward benefits received "as a matter of retrospective obligation" p. 1014). Related to both of these pathways, Wade-Benzoni also suggests that perceptions of fairness may play an important role in supporting intergenerational reciprocity.

2. An alternative mechanism: gratitude as a driver of intergenerational stewardship

In his classic article outlining the theory of reciprocal altruism, Trivers (1971) argued that gratitude was "selected [by evolution] to regulate human response to altruistic acts" (p. 49). Gratitude has also been conceptualized as a personality trait that includes the component of appreciation (Wood, Maltby, Stewart, & Joseph, 2008); McCullough, Kilpatrick, Emmons, and Larson (2001) also argued that gratitude serves both as a positive reinforcer of beneficent behavior (expressing gratitude towards a benefactor increases motivation to provide further benefits; Buck, 2004; Grant & Gino, 2010; Harpham, 2004; Komter, 2004; Moss & Page, 1972) and as a "moral motivator" (see also McCullough, Kimledorf, & Cohen, 2008). Feeling grateful is not just a "warm and fuzzy" by-product of being provided aid—it also acts to motivate reciprocal helping behavior (Emmons & Mishra, 2011; Froh, Bono, & Emmons, 2010).

Supporting these claims, McCullough, Emmons, and Tsang (2002) found positive correlations between a measure of dispositional gratitude and self-reports of prosocial behavior as well as with personality traits associated with prosociality (e.g., agreeableness, empathy; see also Saucier & Goldberg, 1998). Bartlett and DeSteno (2006) showed that experimentally induced feelings of gratitude increased subsequent helping behavior directed not only at one's previous benefactor but also towards unrelated third-parties; the authors suggest that these "indirect reciprocity" effects demonstrate a unique effect of gratitude in motivating prosocial behavior, over and above possible effects of adherence to reciprocity norms or simple positive affect (see also DeSteno, Bartlet, Baumann, Williams, & Dickens, 2010; Goei & Boster, 2005; Naito & Sakata, 2010; Tsang, 2006a; Watkins, Scheer, Ovnicek, & Kolts, 2006).

More recently and most closely related to the present research, Barnett, Van Vleet and Cantu (2019) found that gratitude as well as affect were associated with both more positive perceptions of past generations, as well as more generativity towards future generations. In addition, Watkins & Goodwin, 2019 examined how reflecting on sacrifices made by past generations, and the feelings of gratitude that such reflections can produce, may lead to increases in perceived responsibility towards future generations. The authors find that experimentally manipulating perceptions of past generations, by asking individuals to reflect on sacrifices made by said past generations, increased their perceived obligation towards future generations. These findings are in line with earlier work by Noblet, Anderson and Teisl (2015), who showed that positive retrospective assessment (i.e.,

thinking about one's positive past experience in relation to a specific issue) positively influenced respondents' support for policies relevant to the issue that they were asked to reminisce about. Although highly relevant and informative for the present work, the Watkins & Goodwin, 2019, Noblet et al. (2015) and Barnett et al. (2019) papers stop short of asking (and answering) the question of interest here. In their experiments, Watkins & Goodwin, 2019 and Barnett et al. (2019) did not examine effects of reflecting on past generations specifically within the sphere of environmental issues nor issues that are particularly relevant (and potentially devastating) for future generations (e.g., climate change). Further, it is not clear whether individuals are motivated by a sense of indebtedness, which is a construct that is related to but distinct from gratitude. Similarly, although focused on issues of environmental conservation, Noblet et al. (2015) stop short of examining underlying psychological mechanisms (e.g., gratitude) driving their observed effects.

Taken together, these results and past theorizing suggest that gratitude may play an important—but as-of-yet underappreciated—role in motivating intergenerational beneficence, including pro-environmental action. We see at least two pathways by which gratitude may support pro-environmental behavior on behalf of future others. First, gratitude fosters indirect reciprocal helping behavior (cf., Bartlett & DeSteno, 2006; Nowak & Roch, 2007; Trivers, 1971). Recent research finds that intergenerational beneficence is similarly increased by knowledge of the positive deeds performed on our behalf by past generations (Wade--Benzoni, 2002), suggesting a possible role for gratitude in promoting "intergenerational reciprocity" (in part by promoting a sense of shared, intergenerational responsibility). Second, gratitude builds social cohesion and capital (cf., Putnam, 2000) by increasing trust (Dunn & Schweitzer, 2005; Fredrickson, 2004), supporting the formation of interpersonal bonds (Algoe, Haidt, & Gable, 2008) and promoting cooperation among unrelated individuals (DeSteno et al., 2010). Gratitude may thus help individuals and communities to overcome collective action problems, of which intergenerational issues such as climate change are paradigmatic examples (Gardiner, 2006; Pendergraft, 1998).

3. Distinguishing gratitude from indebtedness

Although gratitude in response to good deeds performed on our behalf is a common response, it is not the only possible affective reaction to such situations. Instead, people sometimes experience negative feelings of indebtedness when they recognize the benefits that others have provided to them. Greenberg (1980) defined indebtedness as "a state of obligation to repay another, which arises from the norm of reciprocity" (p. 200) and which is associated with negative emotions, including discomfort and uneasiness (Tsang, 2006b; Roberts, 2004 adds other related emotions including resentment and guilt). Although gratitude and indebtedness have often been conflated in psychological and other literatures, recent experimental work has consistently shown that the two constructs can be distinguished in their causes and consequences (e.g., Goei & Boster, 2005; Naito & Sakata, 2010; Tsang, 2006b). For example, stronger expectations of return increase indebtedness but decrease gratitude (Watkins et al., 2006); in contrast, the intentions of the benefactor (e.g., benevolent vs. ulterior) affect gratitude but not indebtedness (Tsang, 2006b). More importantly in the present context, gratitude motivates prosociality and approach tendencies (Fredrickson, 2004; see below), whereas feelings of indebtedness tend to promote rigid 'tit-for-tat' reciprocal behavior (Greenberg, 1980) and avoidance (much as anticipation of being asked to provide aid reduces empathy, cf., Shaw, Batson, & Todd, 1994). Thus in an effort to further differentiate gratitude from indebtedness, and to rule out alternative explanations (i.e., indebtedness can increase intergenerational concern) we also focused on the role of this individual difference.

4. Hypotheses and overview of present research

Based on previous research, we predicted that gratitude would correlate positively with and predict measures of perceived responsibility towards future generations (H1), which in turn would predict greater concern about intergenerational environmental issues (H2). Finally, we predicted that effects of gratitude would be greater than those of perceptions of past generations as positive (or negative) (H3a) and feelings of indebtedness (a negatively-valenced emotion closely related to gratitude, see Naito & Sakata, 2010 or Tsang, 2006 for an overview; H3b). We tested these hypotheses in a series of seven studies, using a variety of measures to explore the unique role that gratitude plays in motivating perceptions of responsibility towards future generations and expressions of intergenerational environmental stewardship.

From the seven studies included in this investigation, 3 were correlational (Studies 1 A, 1 B, 3 A) and four were experiments (2 A, 2 B, 3 B, 4). The experimental studies originally attempted to examine how perceptions of past generations can influence generativity for future generations. In each study, the experimental manipulation was not successful in altering perceptions of past generations. These measures are not presented in the studies. Further, all the measures included in the correlational studies were not impacted by the manipulation in any way.

5. Studies 1 A and 1 B

The purpose of the first two studies was to rule out alternative explanations for our hypothesized effect. In particular, we hypothesized that it is not whether one views a previous generation positively or negatively (Study 1 A) nor individual differences in indebtedness (Study 1 B) that relate to greater perceived responsibility for future generations. Rather, it is one's expressed gratitude that relates to greater perceived responsibility towards future generations.

6. Methods

6.1. Participants

6.1.1. Study 1 A

For Study 1 A data were obtained from Amazon Mechanical Turk (MTurk). Studies have shown that data collection from MTurk produced valid and reliable data (Buhrmester, Kwang, & Gosling, 2011; Rouse, 2015). Data were collected from 441 participants. After applying exclusion criteria (participants were excluded if they were not U.S. American: $n = 41$; multivariate outliers based on an h value > 0.079: $n = 6$), the final sample consisted of 402 participants. Details about the demographic characteristics of each study can be found in Table 1.

6.1.2. Study 1 B

The Study 1 B sample was obtained from students at a large U.S. public university. Participants signed up for the study online via SONA and received a research credit for their participation in the study. Data were collected from 681 participants. After applying the same criteria as Study 1 A, 18 participants were excluded, resulting in a sample of 663 participants.

Measures. Both studies displayed the same measures, with the exception of the measure of gratitude and indebtedness which were only displayed in Study 1 B. These measures were presented in a randomized order and were part of a larger survey (see Supplementary Materials for more details). For further details about how items were coded (e.g., reverse coding of items) see the Supplementary Materials.

Perceptions of past generation. Positive views of past generations were measured as the mean of 7 items (on 1–5 Likert scale, with higher scores dictating greater experience of the specific emotion) capturing how participants felt about previous generations. These emotions were: thankful, obligated, appreciative, indebted, happy, grateful, and proud (for both studies a >0.70). Negative emotions were captured with the

Table 1
Overview of and post hoc sensitivity analyses for the seven studies.

Study number	Sample type	Study type	N	N_{female}	N_{white}	$M_{politics}$	$M_{education}$	M_{age}	Sensitivity Analyses ($a = .05$, power = 0.80, two tailed)	
									Upper and Lower Critical r	Correlation ρ H1
1A	MTurk	Correlational	408	263 (64%)	333 (82%)	4.36	4.02	36.63	−/+ .10	.14
1B	Student	Correlational	679	441 (65%)	525 (79%)	0.39	students	19.51	−/+ .07	.11
2A	MTurk	Experimental (null)	459	306 (66%)	388 (85%)	4.49	4.04	23.98	−/+ .09	.13
2B	MTurk	Experimental (null)	350	218 (62%)	301 (86%)	4.43	3.96	24.20	−/+ .10	.15
3A	MTurk	Correlational	359	228 (63%)	293 (82%)	4.35	4.08	23.71	−/+ .10	.15
3B	MTurk	Experimental (null)	334	187 (56%)	293 (88%)	4.54	4.24	23.38	−/+ .11	.15
4	MTurk	Experimental (null)	557	283 (51%)	467 (84%)	4.59	4.00	20.71	−/+ .08	.12

Note: political beliefs were measured as the sum of individual beliefs about social and economic, issues (min = 1, max = 7). Exception to this, are Study 1 B in which political beliefs were measured on a −2 to 2 scale (5-point scale) and Study 4 for which one item captured political ideology in general. Across studies higher values signify endorsement of liberal beliefs. Educational level was measured on a 1–8 scale, with higher scores signifying greater educational attainment.

mean of 4 items: resentful, angry, disappointed, and sad (for both studies a >0.70).

Responsibility towards future generations. We operationalized responsibility towards future generations by using four items. Scores for all of the items for both of these two measures ranged from −3 to +3, similar to a 7 point Likert scale, with higher scores portraying greater responsibility towards future generations. In detail these were: "My generation needs to look after itself first and worry about future generations second,"; "I'm willing to sacrifice in my own life (e.g., buy less stuff), if it will help people living in the future (assuming other people are willing to sacrifice as well),"; "People living today have an obligation to protect future generations, even if it means tightening our belts now," and "To what extent do you truly feel it is your personal responsibility to save resources for future generations, even if it means making do with less in your own life?" (for both studies a >.70).

Gratitude and indebtedness. Trait gratitude was measured with using the GQ-6 (McCullough et al., 2002; e.g., "I am grateful to a wide variety of people") (a = 0.78). Indebtedness was measured with six items as well (e.g., "If someone saves your life, you are forever in their debt"), and the construct was created by the research team and was modelled in the same way that the GQ-6 was (a = 0.60). Both measures were displayed on a 1–7 Likert scale, with higher scores reflecting greater gratitude and indebtedness respectively.

7. Results

For all studies included in the manuscript, results were estimated with and without any exclusions, per the journal's policy for non-preregistered exclusion criteria. Results for the analyses without the exclusions were highly similar and consistent, and can be found in the Supplementary Materials.

In support of hypothesis, and replicating recent findings (Watkins & Goodwin, 2019), gratitude was significantly positively associated with responsibility towards future generations (r = 0.16, $p < .001$). For a closer look at these correlations see Tables 2 and 3. Further, bivariate correlations supported hypothesis 3a, as perceptions of past generations were unrelated (Study 1 B) or very weakly related (Study 1 A) with perceived responsibility for future generations. Similar results were found for hypothesis 3 b, as indebtedness was not significantly correlated with responsibility towards future generations.

Table 2
Correlations and descriptive statistics for Study 1 A.

	Negative past generation views	Positive past generation views	Future generation responsibility
Negative past generation views	–		
Positive past generation views	–.46***	–	
Future generation responsibility	-.09	.11*	–
Mean (*SD*)	3.32 (0.49)	2.07 (0.57)	2.52 (0.99)

Note: *$p < .05$, ***$p < .001$.

8. Discussion

Studies 1 A and 1 B replicated previous findings by showing that differences in trait gratitude are significantly associated with differences in perceived responsibility towards future generations. Further, the results also extended past findings by showing that feelings of gratitude, rather than general feelings of positivity or negativity towards past generations individual differences in indebtedness, predict people's sense of responsibility towards future generations. Studies 2 A and 2 B aimed to examine hypothesis 2 (i.e., gratitude will predict concern about intergenerational environmental issues through the pathway of higher perceived responsibility towards future generations), with a particular focus on the issue of climate change.

8.1. Studies 2 A and 2 B

The next series of studies aimed to both replicate past findings on the role of gratitude as a force that can increase intergenerational concern and to extend such findings by examining this relationship within the context of climate change, while also ruling out alternative explanations (i.e., indebtedness).

9. Methods

9.1. Participants

For Study 2 A, 531 participants were surveyed via MTurk. After applying the same exclusion criteria as the previous studies (nationality and multivariate exclusion) 459 remained. For Study 2 B, 383 participants were surveyed via MTurk. After applying the same exclusion criteria as the previous studies (nationality and multivariate exclusion) 350 remained.

10. Materials

Both studies included the same measures. These measures were presented in a randomized order and were part of a larger survey (see Supplementary Materials for more details).

Gratitude and indebtedness. The same 6-item measures of gratitude (Study 2 A = 0.86; Study 2 a = 0.82) and indebtedness (Study 2 A = 0.66; Study 2 B a = 0.61) as Studies 1 A and 1 B were displayed.

Responsibility towards future generations. The same 4-item measure of perceived responsibility towards future generations was included in the study (Study 2 A = 0.74; Study 2 B a = 0.82).

Climate change concerns. Climate change beliefs were examined in two ways: (1) Belief that climate change is real, measured with the

Table 3
Correlations and descriptive statistics for Study 1 B.

	Gratitude	Indebtedness	Future generation responsibility	Negative past generation views	Positive past generation views
Gratitude	–				
Indebtedness	.11**	–			
Future generation responsibility	.16***	-.01	–		
Negative past generation views	–.16***	.01	.03	–	
Positive past generation views	.16***	.04	–.04	–.23***	–
Mean (SD)	1.87 (0.93)	0.49 (0.87)	4.32 (0.93)	2.21 (0.74)	3.09 (0.72)

question "Do you think that climate change is happening?" with answers captured as "no," "unsure," and "yes." (2) Climate change concerns, which were measured with three items, on a 1–5 Likert scale, with higher scores signifying greater concern. These were: "Overall, how concerned are you about the possible effects of global warming?", "Do you personally feel a moral obligation to respond to climate change (e.g., reduce your energy use)?", and "How important or unimportant is the issue of climate change to you personally?" (Study 2 A: a = 0.92; Study 2 B: a = 0.94).

11. Results

For both samples, significant positive correlations were observed for trait gratitude and perceived responsibility towards future generations, further supporting the findings of Study 2 B. Gratitude was only weakly associated with climate change concern in both studies, and not associated with beliefs that climate change is real. Indebtedness was significantly and negatively associated with the belief that climate change is real only in Study 2 A. Most importantly, perceived responsibility towards future generations was significantly and positively correlated with both the belief that climate change is real, and concern about climate change in both studies. For a closer look at these correlations see Table 4.

To examine the indirect effect of gratitude on climate change concern, and the belief that climate change is real simultaneously, through the pathway of perceived responsibility towards future generations, two structural equation models were computed. As our exogenous variable we utilized trait gratitude. As our endogenous variables we used perceived responsibility towards future generations followed by climate change acceptance and concern.

For Study 2 A, the model's chi square was not significant, $\chi 2$ (2) = 5.03, p = .081. The incremental fit indexes further supported the good fit of the model: CFI = 0.99; NFI = 0.98, RMSEA = 0.06; SRMR = 0.03. All pathways in the model were significant (ps < .001) and in the expected direction.

For Study 2 B, the model's chi square was also not significant, $\chi 2$ (2) = 0.96, p = .617. Once again, the incremental fit indexes indicated a good fit for the model: CFI = 1.00; NFI = 1.00; RMSEA < 0.001; SRMR = 0.01. For this model all pathways were significant as well (ps ranging from <0.01 to < 0.001) and in the expected direction. Both models are displayed in Fig. 1.

12. Discussion

Studies 2 A and 2 B further confirmed our hypothesis that gratitude would predict increased intergenerational environmental concern. Environmental concern in this study was defined as increased acceptance of climate change as a phenomenon, as well as increased concern for climate change. Studies 3 A and 3 B aimed to replicate these findings and extend them by examining broader environmental intentions as well as beliefs about the relationship between humans and nature.

12.1. Studies 3 A and 3 B

The next set of studies aimed to both conceptually replicate the findings of Studies 2 A and 2 B and extend them by investigating whether trait gratitude would predict increased pro-environmental beliefs (Study 3 A) and increased environmental intentions (Study 3 B), through the mechanism of perceived responsibility towards future generations.

13. Methods

13.1. Participants

For Study 3 A, data were collected via MTurk. After applying the same exclusion criteria as the previous studies, 334 participants remained (4 excluded, 1.18% exclusion rate). For Study 3 B, data were collected via MTurk as well. After applying the same criteria as the previous studies, 359 participants remained (4 excluded, 1.10% exclusion rate).

14. Materials

Both studies displayed the same measures with the exception of the environmental outcome. These measures were presented in a randomized order and were part of a larger survey (see Supplementary Materials for more details).

Gratitude and indebtedness. The same 6-item measures of gratitude (Study 3 A: a = 0.83; Study 3 B: a = 0.84) and indebtedness (Study 3 A: a = 0.64; Study 3 B: a = 0.63) as the previous studies were displayed.

Responsibility towards future generations. The same 4-item measure of perceived responsibility towards future generations was included in the study (Study 3 A: a = 0.81; Study 3 B: a = 0.74).

Environmental Outcomes. For Study 3 A pro-environmental beliefs were captured with the short version of the New Ecological Paradigm

Table 4
Correlations and descriptive statistics for Studies 2 A (bottom left) and 2 B (top right).

	Future generation responsibility	Indebtedness	Gratitude	Climate Change Belief	Climate Change Attitudes
Future generation responsibility	–	.04	.38***	.14**	.39***
Indebtedness	-.04	–	.06	.03	.10
Gratitude	.29***	.12*	–	.01	.13*
Climate Change Belief	.25***	–.11*	-.03	–	.59***
Climate Change Attitudes	.45***	–.01	.10*	.55***	–
Study 2 A: Mean (SD)	4.07 (1.00)	4.85 (0.95)	5.66 (1.08)	2.62 (0.68)	2.95 (1.13)
Study 2 B: Mean (SD)	4.40 (0.97)	4.85 (0.90)	5.72 (0.98)	2.61 (0.71)	3.00 (1.17)

Note: *$p < .05$, **$p < .01$, ***$p < .001$.

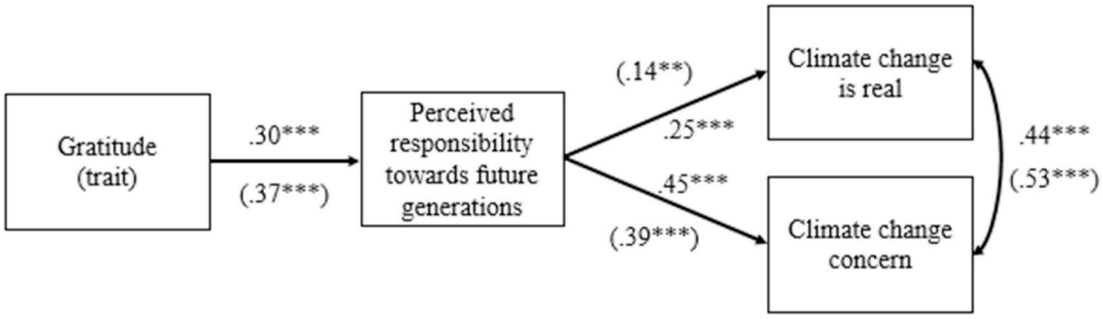

Fig. 1. Path models (proc calis, SAS version 9.4) for Study 2 A and 2 B (numbers in parentheses). Path coefficients depict unstandardized weights.

Scale (Stern, Dietz, & Guagnano, 1995, p. 5 items; e.g., "The so-called ecological crisis facing humankind has been greatly exaggerated"; a = 0.85). For Study 3 B pro-environmental intentions were captured with 5 items adapted from Feygina et al., 2009 (e.g., "I intend to use only recyclable and reusable products from now on"; a = 0.88).

15. Results

15.1. Trait gratitude was once again positively correlated with perceptions of responsibility

Towards future generations for both samples. Perceived responsibility towards future generation was positively correlated with pro-environmental intentions as well as pro-environmental beliefs captured with the NEP short version scale. Trait gratitude and indebtedness were both correlated with increased pro-environmental beliefs and proenvironmental intentions. These results can be found in Table 5.

Two indirect effect tests were conducted to examine the effect of gratitude on pro-environmental beliefs (Study 3 A) and intentions (Study 3 B), through the mechanism of perceived responsibility towards future generations. Both indirect effects were significant and in the expected direction. Results are displayed in Fig, 2a and b.

16. Discussion

The current set of studies both conceptually replicated those of Studies 2 A and 2 B and expanded on the previous results by correlationally linking perceived responsibility towards future generations with both pro-environmental beliefs and intentions. The last study aimed to once again replicate the correlation of trait gratitude and perceived responsibility towards future generations. It also aspired to examine whether perceived responsibility towards future generations would significantly predict increased support for pro-environmental policies and strategies.

Table 5
Correlations and descriptive statistics for Studies 3 A (bottom left) and 3 B (top right).

	Gratitude	Indebtedness	Future generation responsibility	Environmental Intentions
Gratitude	–	.05	.30***	.12*
Indebtedness	.05	-	.01	.11*
Future generation responsibility	.30***	.17**	-	.31***
Environmental Paradigm	.13*	.14*	.51***	-
Study 3 A: Mean (SD)	5.58 (1.00)	4.82 (0.93)	4.48 (1.07)	4.40 (1.08)
Study 3 B: Mean (SD)	5.64 (1.03)	4.85 (0.91)	4.27 (1.00)	4.55 (2.02)

Note: *$p < .05$, **$p < .01$, ***$p < .001$.

16.1. Study 4

The final study aimed to conceptually replicate the previous findings with a different outcome: policy support for environmental issues. This outcome was selected to provide external validity for the effect noted in the previous studies.

17. Methods

17.1. Participants

Data were collected via MTurk. After applying the same exclusion criteria as the previous studies, 557 participants remained in the final sample (6 participants excluded, 1.07% exclusion rate).

18. Materials

Gratitude and indebtedness. The same 6-item measures of gratitude (a = 0.85; M = 5.11, SD = 1.07) and indebtedness (a = 0.60; M = 4.82, SD = 0.88) as the previous studies were displayed.

Responsibility towards future generations. The same 4-item measure of perceived responsibility towards future generations was included in the study (a = 0.81; M = 4.60, SD = 0.92).

Policy support for environmental issues. Five items were generated to capture differences in policy support for environmental issues. Specifically, these items focused on policies that would aid in the transition to clean renewable energy. In detail, these were: "would you sign an online petition asking Congress and major energy-sector businesses to invest more heavily in clean energy technology research and development?"; "would you sign up to receive weekly e-newsletters about the issue so that I can keep up to date on new developments?"; "would you sign a pledge to decrease my use of dirty energy and increase my use of clean energy, if it is possible to do so where I live (e.g., many utilities in the U.S. have "clean energy" programs that homeowners and renters can sign up for)?"; "would you volunteer to contact state and local politicians to keep this issue fresh in their minds?"; and "would you receive training on how to talk effectively with friends and family about this issue?" These items had good reliability (a = .77; M = 4.56, SD = 0.88).

19. Results

Replicating the results of our previous studies, trait gratitude was positively correlated with increased responsibility towards future generations: r = 0.34, $p < .001$, while indebtedness had a weak albeit positive correlation: r = 0.09, $p = .042$. Increased perceived responsibility towards future generations was in turn correlated with higher support for environmental policies, r = 0.30, $p < .001$. Trait gratitude was not significantly correlated with policy support for environmental policies (r = 0.07, $p = .094$) and neither was indebtedness (r = 0.05, $p = .239$).

An indirect effect test, with trait gratitude as the predictor, perceived

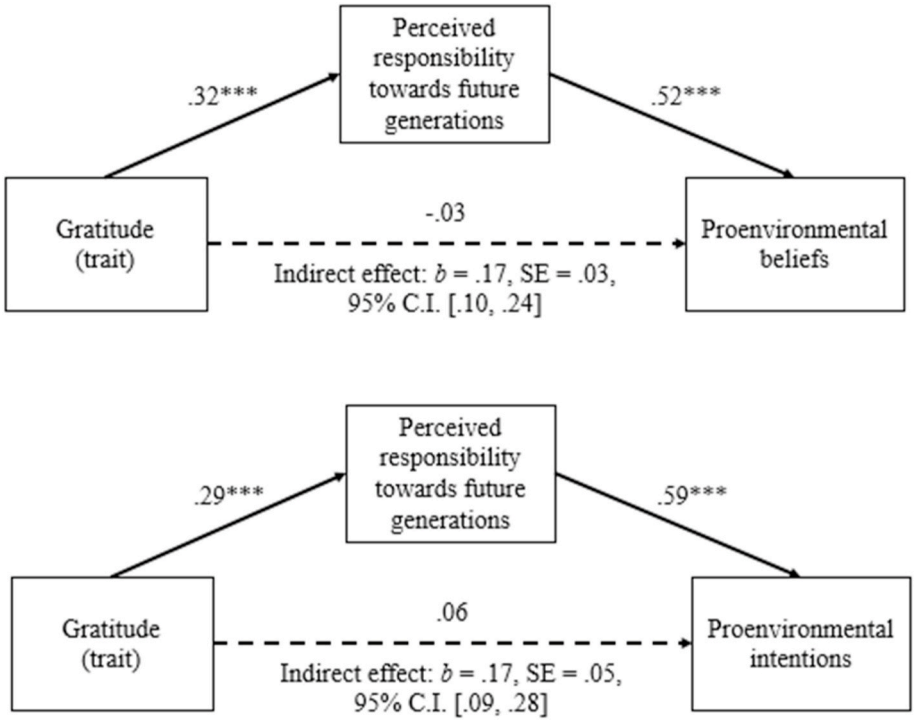

Fig. 2. a(top) and 2 b (bottom). Indirect effect tests (proc calis, SAS version 9.4) for the effect of trait gratitude on proenvironmental beliefs (Study 3 A), and proenvironmental intentions (Study 3 B), through the pathway of perceived responsibility towards future generations. Dashed arrows depict non-significant paths.

responsibility towards future generations as the mediator, and policy support for environmental issues as the outcome variable, yielded a significant indirect effect. All paths except for the direct effect were significant and in the expected direction (see Fig. 3).

19.1. Gratitude not indebtedness

In all studies except for Study 1 A, trait indebtedness was also measured, in an effort to examine whether gratitude but not indebtedness would be the driving force behind intergenerational pro-environmental behavior. Across the six studies in which both gratitude and indebtedness were included as measures, gratitude was consistently positively associated with increased perceived responsibility towards future generations (rs ranging from 0.17 to 0.38, all ps $< .001$), whereas indebtedness was unrelated with responsibility towards future generations in four out of six studies. In the two studies that it was related, this correlation was significantly weaker than that of gratitude with perceived responsibility towards future generations, based on a Fisher's Z comparison. These correlation coefficients and correlation comparisons can be found in Table 6.

Meta-Analysis of the Relationship between Gratitude, Indebtedness and Perceived Responsibility Towards Future Generations.

We further sought to investigate the association of trait gratitude and indebtedness with perceived obligation towards future generations across the five studies in which all three measures were included. This approach was in line with recent calls to evaluate one's investigation by conducting meta-analysis within a manuscript (Goh, Hall, & Rosenthal, 2016). Overall, across the five studies gratitude was associated with increased perceived obligation toward future others: Mean r = 0.27, SE = 0.02, Z = 12.81, $p < .001$, 95% C.I. [0.23, 0.31]. Further, indebtedness was not significantly associated with perceived obligation towards future generations: Mean r = 0.02, SE = 0.02, Z = 1.14, $p = .252$, 95% C.I. [-0.02, 0.07].

19.2. General discussion

Across seven studies, a unique, positive relationship between gratitude and intergenerational environmental concern consistently emerged. We found that trait gratitude related positively to perceptions of responsibility towards future others (supporting H1), concern about

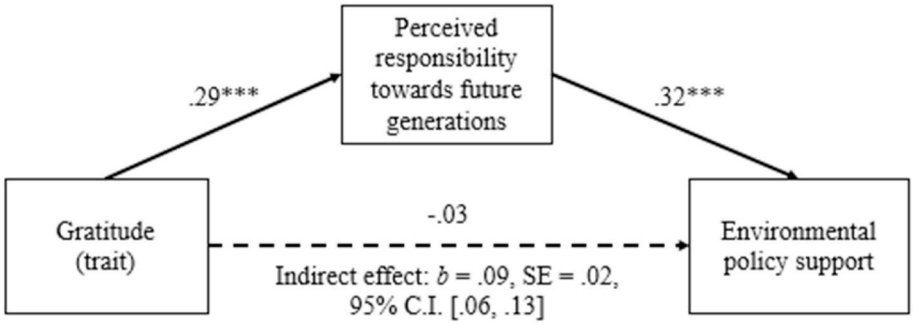

Fig. 3. Indirect effect test (proc calis, SAS version 9.4) for the effect of trait gratitude on environmental policy support through the pathway of perceived responsibility towards future generations (Study 4). Dashed arrows depict non-significant paths.

Table 6
Bivariate correlation coefficients and Fisher's Z comparisons for the relationship between perceived responsibility towards future generations with trait gratitude and indebtedness for each study.

Study number	*N*	$r_{gratitude}$	$r_{indebtedness}$	Fisher's z	two-tailed p	one-tailed p
1 B	678	.17***	-.01	3.15	.002	<.001
2 A	459	.29***	-.04	3.90	<.001	<.001
2 B	350	.38***	.04	4.74	<.001	<.001
3 A	334	.30***	.17**	1.77	.077	.038
3 B	358	.30***	.04	3.59	<.001	<.001
4	557	.34***	.09*	4.39	<.001	<.001

Note: *$p < .05$, **$p < .01$, ***$p < .001$.
Stylianos Syropoulos: Conceptualization, Formal analysis, Methodology, Visualization, Software, Validation, Writing - original draft; Writing - review & editing.
Hanne Watkins: Conceptualization, Writing - original draft; Writing - review & editing.
Azim Shariff: Data curation, Supervision, Investigation.
Sara Hodges: Data curation, Supervision, Investigation.
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environmental issues, as well as various indicators of intergenerational environmental stewardship, albeit weakly so. The current line of investigation also examined potential alternative correlates of intergenerational reciprocity, with our results providing consistent evidence that neither positive or negative views of past generations (Studies 1 A and 1 B) nor indebtedness (Studies 1 B–4) substantially predict responsibility for future generations.

The present research extends extant theory and research on gratitude (e.g., Bartlett & DeSteno, 2006; Tsang, 2006a) in two key ways. First, we have demonstrated that gratitude may play a role in linking past, present and future generations in possible "chains of prosociality." By providing this link we both replicated recent works on gratitude (Watkins & Goodwin, 2019) and further expanded on such works by ruling out alternative explanations and providing evidence for the potential of gratitude to elicit pro-environmental beliefs, intentions and behaviors. Second, our research is one of the few that we know of to examine, and demonstrate, a link between gratitude and pro-environmental engagement. As such, we add to the growing body of research that highlights the positive role gratitude plays across a number of personal and social domains (e.g., Cousin, Redwine, Bricker, Kip, & Buck, 2020; Cregg & Cheavens, 2020). Second, we contend that indebtedness does not act as in the same prosocial manner as gratitude. Indebtedness was only significantly correlated with perceived responsibility towards future generations in two out of six studies. In both of these studies, gratitude's association with perceived responsibility towards future others was significantly greater than that of indebtedness. Thus, we believe that our study also lends credence to extant claims about feelings of indebtedness promoting rigid 'tit-for-tat' reciprocal behaviors (Greenberg, 1980) and not necessarily intergenerational reciprocity. Future investigations should explore this claim further by experimentally priming indebtedness in an effort to test whether individuals who are induced to feel indebtedness express greater intergenerational reciprocity.

The findings presented above are necessarily preliminary given the nature of the research methods we used. Still, our findings appear to fit well with past research on the role of gratitude in motivating upstream reciprocity, cooperation among strangers and the development of strong interpersonal bonds and community (social) resources (e.g., Algoe et al., 2008; DeSteno et al., 2010; Fredrickson, 2004; Nowak & Roch, 2007). Moreover, by examining the effects of gratitude in the intergenerational context—in which there is no possible expectation of interaction either with one's benefactors or potential beneficiaries—the present work appears to provide further evidence that gratitude works to promote prosocial action and attitudes outside the confines of what we traditionally think of as "reciprocity" (e.g., Gouldner, 1960). That is, the present research supports Fredrickson's (2004) claim that gratitude has positive consequences for social interaction and the building of social resources that appear to be (nearly) totally divorced from its role in motivating reciprocal behavior.

The present research also appears to directly support Simmel's (1908/1996) contention that gratitude serves a "moral memory" function within and perhaps across individuals: Feeling grateful (but not indebted) towards past others for benefits they bestowed upon us bolsters the perception that one is personally responsible for the well-being of future others. Importantly, these effects were distinct from the previously demonstrated connection between generalized (personal) future-orientation and willingness to take action on behalf of future others (e.g., in the environmental domain; see Joireman, van Lange, & van Vugt, 2004; Strathman et al., 1994). Taken together with past findings implicating the experience of gratitude in building interpersonal trust (e.g., Dunn & Schweitzer, 2005), the present research suggests that gratitude may play an important and perhaps unique role in fostering cooperation within and between generations in the face of collective action problems, such as climate change, which require both individuals and communities to overcome short-term interests in order to generate long-term benefits (Ostrom, 2000).

19.3. Implications for intervention development

The present research holds important implications for the design of novel interventions aimed at increasing the incidence of future-oriented pro-environmental behavior. Past work has already shown that increasing individuals' daily experiences of gratitude improves physical health, subjective well-being, relationship satisfaction and maintenance, prosocial behavior and a number of other positive outcomes (e.g., Emmons & McCullough, 2003; McCullough et al., 2001). At least within the context of contemporary American culture, our findings potentially suggest that inculcating the experience and expression of gratitude, in this case towards past generations, may also work to increase present generations' concern for and beneficent behavior on behalf of future generations. Such interventions might be particularly effective in enhancing engagement with intergenerational issues (such as climate change) in part by providing a psychological buffer against the oftentimes highly aversive nature of information about such problems (see related work by Sparks, Jessop, Chapman, & Holmes, 2010).

In addition to directly increasing feelings of gratitude towards past generations (e.g., through the use of reflection techniques, such as writing tasks, e.g., Watkins & Goodwin, 2019), another possible direction for intervention development will involve integrating gratitude-based message frames into communications strategies and persuasive appeals. For example, messages aimed at increasing public concern over and engagement with climate change might include references to sacrifices made by past generations on behalf of present generations or to past generations' intention to leave a viable world to their descendants (even if they came up short). Given the generally positive view that Americans hold of gratitude as a virtue (Gallup, 1998), it seems possible that gratitude-based message frames may be especially effective in circumventing problems associated with political polarization on many pressing intergenerational issues (McCright & Dunlap, 2011). This is supported by our current results, as in the studies in which we measured gratitude (Studies 1B-4), political beliefs were unrelated with gratitude in four studies (Studies 1 B, 2 B, 3 A, 3 B), and weakly negatively correlated with gratitude in two studies (Study 2 A: $r = -0.11$, and Study 4: $r = -0.09$, $ps < .05$).

19.4. Limitations and future directions

The empirical research presented here has a number of limitations that should be addressed by future research. First, the use of internet samples (MTurk) and methods clearly limits our ability, at this point, to generalize from the present findings to other populations and contexts. Across our samples, participants race was primarily white (with percentages ranging from 79% to 88%). Future research should investigate whether individuals from other racial and ethnic backgrounds exhibit the association between gratitude and responsibility towards future generations at the same degree. A further limitation of the present work is that four out of the seven studies originally attempted to manipulate perceptions of past generations. These null results could be due to the manipulations being weak in their effects, as the issues chosen for each study were not particularly salient to participants' minds. For example, Study 3 A attempted to manipulate perceptions of past generation by presenting them with information about previous generations' sacrifice for preserving national parks, while Studies 3 B and 4 asked participants to freely reflect on past generations with no particular theme in mind. Study 4 in turn asked participants to think about past decisions regarding implementation of gasoline taxes. Although those results were not significant, the consistent investigation of how individual differences in gratitude predict greater responsibility for future generation is still a noteworthy finding as it both replicates recent findings on the subject (Watkins & Goodwin, 2019), and extends such findings by linking gratitude with different pro-environmental outcomes, such as climate change concern and acceptance, pro-environmental beliefs and intentions, and support for environmental policies and strategies, while also ruling out alternative explanations for these findings. In hindsight, an additional reason as to why experimental manipulations did not significantly alter scores on gratitude could be attributed to our use of a dispositional measure of gratitude rather than a state measure of gratitude.

Future research should expand on the present findings, by measuring whether or not results are different when prosocial behavior is directed towards contemporaries, rather than future generations. Finally, although the current studies demonstrated a highly consistent correlation between gratitude and intergenerational stewardship, they do not provide definitive evidence that gratitude is an underlying mechanism by which transmission of beneficence across generations occurs. Successfully manipulating gratitude could shape future interventions aiming to reduce temporal discounting and increase intergenerational environmental concern, as well as support for intergenerational environmental decision making. Moreover, although our studies clearly suggest that indebtedness does not or only weakly relates to greater perceived obligation towards future others, it is important to note that our measure of indebtedness had relatively low reliability (αs ranging from .60 to .66). Thus, future research should both replicate the current findings with a more comprehensive measure of indebtedness and also seek to experimentally manipulate indebtedness to test these claims causally.

As with any new topic of study, there is clearly a need for continued research in numerous directions. Some of these unresolved questions and future directions have already been mentioned above, including: examining the role of past-oriented gratitude in other cultures; and testing various intervention designs to see if gratitude can be used in "real world" settings to enhance prosocial action towards future others. Perhaps the most pressing need is to establish whether or not feelings of gratitude towards past others play a direct causal role in shaping intergenerational decision-making, which will require further experimental work.

20. Conclusion

Much of the multidisciplinary literature on intergenerational ethics and decision-making has focused on the present and the future. Yet it is clear that our (i.e., the present generation's) decisions regarding the intergenerational issues we face—from climate change to global pandemics to maintaining critical infrastructure—are shaped by the actions and intentions of past generations, not only because past decisions constrain the options available to present decision-makers but also because they shape our perceptions of responsibility towards the future. Here, we have proposed that the construct of gratitude, but not indebtedness, helps us to understand how this latter process occurs, and in seven studies we have provided evidence that those who feel grateful but not indebted in their lives exhibit greater levels of concern and care for future generations. Future research will clarify the extent to which gratitude plays a causal role in the transmission of beneficence across generations and whether gratitude-based interventions may be effective in increasing the present generation's willingness to act on behalf of future others.

Research ethic statement

This study received ethical approval from Institutional Review Board of the University of Oregon.

Author statement

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2020.101517.

References

Algoe, S., Haidt, J., & Gable, S. (2008). Beyond reciprocity: Gratitude and relationships in everyday life. *Emotion, 8*, 425–429. https://doi.org/10.1037/1528-3542.8.3.425

Bang, H. M., Koval, C. Z., & Wade-Benzoni, K. A. (2017). It's the thought that counts over time: The interplay of intent, outcome, stewardship, and legacy motivations in intergenerational reciprocity. *Journal of Experimental Social Psychology, 73*, 197–210. https://doi.org/10.1016/j.jesp.2017.07.006

Barnett, M. D., Archuleta, W. P., & Cantu, C. (2019). Politics, concern for future generations, and the environment: Generativity mediates political conservatism and environmental attitudes. *Journal of Applied Social Psychology, 49*(10), 647–654. https://doi.org/10.1111/jasp.12624

Bartlett, M., & DeSteno, D. (2006). Gratitude and prosocial behavior: Helping when it costs you. *Psychological Science, 17*, 319–325. https://doi.org/10.1111/j.1467-9280.2006.01705.x

Buck, R. (2004). The gratitude of exchange and the gratitude of caring: A developmental-interactionist perspective of moral emotion. In R. Emmons, & M. McCullough (Eds.), *The psychology of gratitude* (pp. 100–122). Oxford: Oxford University Press.

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science, 6*(1), 3–5. https://doi.org/10.1177/1745691610393980

Chermak, J. M., & Krause, K. (2002). Individual response, information, and intergenerational common pool problems. *Journal of Environmental Economics and Management, 43*(1), 47–70. https://doi.org/10.1006/jeem.2000.1173

Corner, A., Markowitz, E., & Pidgeon, N. (2014). Public engagement with climate change: The role of human values. *Wiley Interdisciplinary Reviews: Climate Change, 5*(3), 411–422. https://doi.org/10.1002/wcc.269

Cousin, L., Redwine, L., Bricker, C., Kip, K., & Buck, H. (2020). Effect of gratitude on cardiovascular health outcomes: A state-of-the-science review. *The Journal of Positive Psychology*. https://doi.org/10.1080/17439760.2020.1716054. Advance Online Publication.

Cregg, D. R., & Cheavens, J. S. (2020). Gratitude interventions: Effective self-help? A meta-analysis of the impact on symptoms of depression and anxiety. *Journal of happiness studies: An interdisciplinary forum on subjective well-being*. https://doi.org/10.1007/s10902-020-00236-6

DeSteno, D., Bartlet, M., Baumann, J., Williams, L., & Dickens, L. (2010). Gratitude as moral sentiment: Emotion-guided cooperation in economic exchange. *Emotion, 10*, 289–293. https://doi.org/10.1037/a0017883

Dickinson, J. L. (2009). The people paradox: Self-esteem striving, immortality ideologies, and human response to climate change. *Ecology and Society, 14*(1). https://doi.org/10.5751/es-02849-140134

Dunn, J., & Schweitzer, M. (2005). Feeling and believing: The influence of emotion on trust. *Journal of Personality and Social Psychology, 88*, 736–748. https://psycnet.apa.org/doi/10.1037/0022-3514.88.5.736.

Ekeh, P. (1974). *Social exchange theory*. Cambridge, MA: Harvard University Press.

Emmons, R., & McCullough, M. (2003). Counting blessings versus burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology, 84*, 377–389. https://doi.org/10.1037/0022-3514.84.2.377

Emmons, R. A., & Mishra, A. (2011). Why gratitude enhances well-being: What we know, what we need to know. In K. M. Sheldon, T. B. Kashdan, & M. F. Steger (Eds.), *Series in positive psychology. Designing positive psychology: Taking stock and moving forward* (pp. 248–262). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195373585.003.0016.

Feygina, I., Jost, J. T., & Goldsmith, R. E. (2010). System justification, the denial of global warming, and the possibility of "system-sanctioned change. *Personality and Social Psychology Bulletin, 36*(3), 326–338. https://doi.org/10.1177/0146167209351435

Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature, 15*, 351–401. www.jstor.org/stable/2698382.

Fredrickson, B. (2004). Gratitude, like other positive emotions, broadens and builds. In R. Emmons, & M. McCullough (Eds.), *The psychology of gratitude* (pp. 145–166). Oxford: Oxford University Press.

Froh, J., Bono, G., & Emmons, R. (2010). Being grateful is beyond good manners: Gratitude and motivation to contribute to society among early adolescents. *Motivation and Emotion, 34*, 144–157. https://doi.org/10.1007/s11031-010-9163-z

Gallup, G. (1998). *Thankfulness: America's saving grace*. Paper presented at the National Day of Prayer Breakfast (Dallas, TX).

Gardiner, S. (2006). A perfect moral storm: Climate change, intergenerational ethics and the problem of moral corruption. *Environmental Values, 15*, 397–413. https://doi.org/10.3197/096327106778226293

Goei, R., & Boster, F. (2005). The roles of obligation and gratitude in explaining the effect of favors on compliance. *Communication Monographs, 72*, 284–300. https://doi.org/10.1080/03637750500206524

Goh, J. X., Hall, J. A., & Rosenthal, R. (2016). Mini meta-analysis of your own studies: Some arguments on why and a primer on how. *Social and Personality Psychology Compass, 10*(10), 535–549. https://doi.org/10.1111/spc3.12267

Gouldner, A. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review, 25*, 161–178. https://www.jstor.org/stable/2092623.

Grant, A., & Gino, F. (2010). A little thanks goes a long way: Explaining why gratitude expressions motivate prosocial behavior. *Journal of Personality and Social Psychology, 98*, 946–955. https://psycnet.apa.org/doi/10.1037/a0017935.

Greenberg, M. (1980). A theory of indebtedness. In K. Gergen, M. Greenberg, & R. Willis (Eds.), *Social exchange: Advances in theory and research*. New York, NY: Plenum.

Hardisty, D. J., Johnson, E. J., & Weber, E. U. (2010). A dirty word or a dirty world?: Attribute framing, political affiliation, and query theory. *Psychological Science, 21*(1), 86–92. https://doi.org/10.1177/0956797609355572

Hardisty, D. J., & Weber, E. U. (2009). Discounting future green: Money versus the environment. *Journal of Experimental Psychology: General, 138*(3), 329–340. https://doi.org/10.1037/a0016433

Harpham, E. (2004). Gratitude in the history of ideas. In R. Emmons, & M. McCullough (Eds.), *The psychology of gratitude* (pp. 19–36). Oxford: Oxford University Press.

Hershfield, H. E., Bang, H. M., & Weber, E. U. (2014). National differences in environmental concern and performance are predicted by country age. *Psychological Science, 25*(1), 152–160. https://doi.org/10.1177/0956797613501522

Hornsey, M. J., & Fielding, K. S. (2019). Understanding (and reducing) inaction on climate change. *Social issues and policy review*. Advanced online publication. https://doi.org/10.1111/sipr.12058

Hurlstone, M., Price, A., Wang, S., Leviston, Z., & Walker, I. (2020). Activating the legacy motive mitigates intergenerational discounting in the climate game. *Global environmental change-human and policy dimensions*. https://doi.org/10.1016/j.gloenvcha.2019.102008

Joireman, J., van Lange, P., & van Vugt, M. (2004). Who cares about the environmental impact of cars? Those with an eye toward the future. *Environment and Behavior, 36*, 187–206. https://doi.org/10.1177/0013916503251476

Kasser, T. (2011). Cultural values and the well-being of future generations: A cross-national study. *Journal of Cross-Cultural Psychology, 42*(2), 206–215. https://doi.org/10.1177/0022022110396865

Kirk, E. A., Reeves, A. D., & Blackstock, K. L. (2007). Path dependency and the implementation of environmental regulation. *Environment and Planning C: Government and Policy, 25*(2), 250–268. https://doi.org/10.1068/c0512j

Komter, A. (2004). Gratitude and gift exchange. In R. Emmons, & M. McCullough (Eds.), *The psychology of gratitude* (pp. 195–212). Oxford: Oxford University Press.

Markowitz, E. M., Slovic, P., Västfjäll, D., & Hodges, S. D. (2013). Compassion fade and the challenge of environmental conservation. *Judgment and Decision Making, 8*(4), 397–406. https://econpapers.repec.org/article/jdmjournl/.

McAdams, D., & de St Aubin, E. (1992). A theory of generativity and its assessment through self-report, behavioral acts, and narrative themes in autobiography. *Journal of Personality and Social Psychology, 62*, 1002–1015. https://doi.org/10.1037/0022-3514.62.6.1003

McCright, A., & Dunlap, R. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001-2010. *The Sociological Quarterly, 52*, 155–194. https://doi.org/10.1111/j.1533-8525.2011.01198.x

McCullough, M., Emmons, R., & Tsang, J. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology, 82*, 112–127. https://psycnet.apa.org/doi/10.1037/0022-3514.82.1.112.

McCullough, M., Kilpatrick, S., Emmons, R., & Larson, D. (2001). Is gratitude a moral affect? *Psychological Bulletin, 127*, 249–266. https://doi.org/10.1037/0033-2909.127.2.249

McCullough, M., Kimledorf, ., & Cohen, A. (2008). An adaptation for altruism? The social causes, social effects and social evolution of gratitude. *Current Directions in Psychological Science, 17*, 281–285. https://doi.org/10.1111/2Fj.1467-8721.2008.00590.x

Milfont, T., & Sibley, C. (2011). Exploring the concept of environmental generativity. *International Journal of Hispanic Psychology, 4*, 21–30.

Moss, M., & Page, R. (1972). Reinforcement and helping behavior. *Journal of Applied Social Psychology, 2*, 360–371. https://doi.org/10.1111/j.1559-1816.1972.tb01287.x

Naito, T., & Sakata, Y. (2010). Gratitude, indebtedness, and regret on receiving a friend's favor in Japan. *Psychologia, 53*, 179–194. https://psycnet.apa.org/doi/10.2117/psysoc.2010.179.

Nowak, M., & Roch, S. (2007). Upstream reciprocity and the evolution of gratitude. *Proceedings of the Royal Society B: Biological Sciences, 274*, 605–610. https://doi.org/10.1098/rspb.2006.0125

Oreskes, N., & Conway, E. M. (2010). *Merchants of doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. New York: Bloomsbury Press.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives, 14*, 137–158. https://doi.org/10.1257/jep.14.3.137

Pendergraft, C. (1998). Human dimensions of climate change: Cultural theory and collective action. *Climatic Change, 39*, 643–666. https://doi.org/10.1023/A:1005323809980

Portney, P., & Weyant, J. (1999). *Discounting and intergenerational equity*. Washington, DC: Resources for the Future.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community*. New York, NY: Simon & Schuster.

Roberts, R. (2004). The blessings of gratitude: A conceptual analysis. In R. Emmons, & M. McCullough (Eds.), *The psychology of gratitude* (pp. 58–78). Oxford: Oxford University Press.

Rouse, S. V. (2015). A reliability analysis of Mechanical Turk data. *Computers in Human Behavior, 43*, 304–307. https://doi.org/10.1016/j.chb.2014.11.004

Saucier, G., & Goldberg, L. (1998). What is beyond the big five? *Journal of Personality, 66*, 495–524. https://doi.org/10.1111/1467-6494.00022

Shaw, L., Batson, C., & Todd, R. (1994). Empathy avoidance: Forestalling feelings for another in order to escape the motivational consequences. *Journal of Personality and Social Psychology, 67*, 879–887. https://psycnet.apa.org/doi/10.1037/0022-3514.67.5.879.

Simmel, G. (1908/1996). Faithfulness and gratitude. In A. Komter (Ed.), *The gift: An interdisciplinary perspective* (pp. 39–48). Amsterdam: Amsterdam University Press.

Sparks, P., Jessop, D., Chapman, J., & Holmes, K. (2010). Pro-environmental actions, climate change, and defensiveness: Do self-affirmations make a difference to people's motives and beliefs about making a difference? *British Journal of Social Psychology, 49*, 553–568. https://doi.org/10.1348/014466609X471976

Stern, P. C., Dietz, T., Abel, T. D., Guagnano, G., & Kalof, L. (1999). *A value-belief-norm theory of support for social movements: The case of environmentalism*. Huxley College on the Peninsulas Publications. https://cedar.wwu.edu/hcop_facpubs/1.

Stern, P. C., Dietz, T., & Guagnano, G. A. (1995). The new ecological paradigm in social-psychological context. *Environment and Behavior, 27*(6), 723–743. https://doi.org/10.1177/0013916595276001

Strathman, A., Gleicher, F., Boninger, D., & Edwards, C. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology, 66*(4), 742–752. https://psycnet.apa.org/doi/10.1037/0022-3514.66.4.742.

Tost, L. P., Wade-Benzoni, K. A., & Johnson, H. H. (2015). Noblesse oblige emerges (with time): Power enhances intergenerational beneficence. *Organizational Behavior and Human Decision Processes, 128*, 61–73. https://doi.org/10.1016/j.obhdp.2015.03.003

Trivers, R. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology, 46*, 35–57. http://www.jstor.org/stable/2822435?origin=JSTOR-pdf.

Tsang, J. (2006a). Gratitude and prosocial behavior: An experimental test of gratitude. *Cognition & Emotion, 20*, 138–148. https://doi.org/10.1080/02699930500172341

Tsang, J. (2006b). The effects of helper intention on gratitude and indebtedness. *Motivation and Emotion, 30*, 199–205. https://psycnet.apa.org/doi/10.1007/s11031-006-9031-z.

United Nations Framework Convention on Climate Change. (2020). *The Paris agreement*. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

Wade-Benzoni, K. (2002). A golden rule over time: Reciprocity in intergenerational allocation decisions. *Academy of Management Journal, 45*, 1011–1028. https://psycnet.apa.org/doi/10.2307/3069327.

Wade-Benzoni, K. A., Hernandez, M., Medvec, V., & Messick, D. (2008). In fairness to future generations: The role of egocentrism, uncertainty, power, and stewardship in judgments of intergenerational allocations. *Journal of Experimental Social Psychology, 44*(2), 233–245. https://doi.org/10.1016/j.jesp.2007.04.004

Wade-Benzoni, K., & Plunkett-Tost, L. (2009). The egoism and altruism of intergenerational behavior. *Personality and Social Psychology Review, 13*, 165–193. https://doi.org/10.1177/2F1088868309339317

Wade-Benzoni, K. A., Tost, L. P., Hernandez, M., & Larrick, R. P. (2012). It's only a matter of time: Death, legacies, and intergenerational decisions. *Psychological Science, 23*(7), 704–709. https://doi.org/10.1177/0956797612443967

Watkins, H. M., & Goodwin, G. P. (2019). Reflecting on sacrifices made by past generations increases a sense of obligation towards future generations. *Personality and Social Psychology Bulletin, 46*(7), 995–1012. https://doi.org/10.1177/0146167219883610

Watkins, P., Scheer, J., Ovnicek, M., & Kolts, R. (2006). The debt of gratitude: Dissociating gratitude and indebtedness. *Cognition & Emotion, 20*, 217–241. https://doi.org/10.1080/02699930500172291

Wood, A., Maltby, J., Stewart, N., & Joseph, S. (2008). Conceptualizing gratitude and appreciation as a unitary personality trait. *Personality and Individual Differences, 44*, 621–632. https://psycnet.apa.org/doi/10.1016/j.paid.2007.09.028.

Zaval, L., Markowitz, E. M., & Weber, E. U. (2015). How will I Be remembered? Conserving the environment for the sake of one's legacy. *Psychological Science, 26*(2), 231–236. https://doi.org/10.1177/0956797614561266

Zimbardo, P., & Boyd, J. (1999). Putting time in perspective: A valid, reliable individual-differences metric. *Journal of Personality and Social Psychology, 77*, 1271–1288. https://psycnet.apa.org/doi/10.1037/0022-3514.77.6.1271.