Climatic Change (2017) 140:165–178
DOI 10.1007/s10584-016-1830-y

Why aren't we taking action? Psychological barriers to climate-positive food choices

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Received: 24 January 2016 / Accepted: 6 October 2016 / Published online: 15 October 2016

Abstract The environmental attitude-behavior gap has been extensively studied, but no research has examined a wide range of barriers to climate change mitigation. Inspired by Gifford's (2011) seven categories of psychological barriers to climate change mitigation and adaptation, we examined the role of 36 barriers on climate-positive food-choice intentions. Of the 36, 29 were significantly related to weaker intentions. Exploratory factor analysis revealed that the barriers cluster into four factors (Denial, Interpersonal Influences, Conflicting Goals and Aspirations, and Tokenism). Confirmatory factor analysis validated both the four-factor model and the rational seven-factor model proposed earlier. All factors except Interpersonal Influence are related to fewer food-choice intentions, illustrating the value of understanding psychological barriers for pro-environmental intentions.

The consensus among climate scientists, and the cumulative physical evidence, is that climate change is occurring and that post-industrial increase in global greenhouse gas (GHG) emissions can largely be attributed to human activities. To prevent an increase in global temperature rise greater than 2 °C over pre-industrial levels, reduction of anthropogenic GHG emissions is urgently necessary (Intergovernmental Panel on Climate Change 2007).

A rapidly growing body of literature suggests that citizen mobilization, through aggregated environmentally significant behaviors, is an essential component for global GHG emission reduction (e.g., Bandura 2007; Corbett 2006; Stern 2000). One crucial task of psychologists is to identify and understand barriers that limit behavioral change (Gifford 2008; Swim 2010). To foster this, the current study investigated the connections between a range of psychological barriers and a specific ameliorative behavioral intention—sustainable food choices.

1 Food and climate change impacts

Low-carbon transportation and sustainable buildings have been major action areas for meeting GHG reduction targets for governments and other campaigns. However, the need for deep cuts in

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emissions has become more pressing for the global food system. In recent decades, global food production has expanded with industrial-based processes in order to meet accelerating food demands (Pelletier and Tyedmers 2010). These processes not only place a strain on depleting natural resources, but also contribute 19 to 29 % of GHG emissions (Vermeulen et al. 2012). Several factors contribute to food's climate impacts, including the energy used for its production, distribution, storage, waste disposal, and the use of synthetic pesticides and fertilizers. Livestock production emits 7.8 billion tons of carbon dioxide (CO_2) per year, accounting for 18 % of global GHG emissions (Food and Agricultural Organization of the United Nations 2006). The livestock sector also occupies about 30 % of the terrestrial surface on Earth (Ramankutty et al. 2008), generates significant volumes of water pollution, and exacerbates deforestation and land degradation. If the current agricultural trends continue, food production emissions alone will exceed global warming limit of 2 °C by 2050 (Hedenus et al. 2014).

Although sustainable agricultural practices should be regulated by policies, individual consumers can further decelerate local and global environmental impacts by adopting more sustainable consumption habits. Clearly, a wide range of effective mitigation options is feasible for individuals. For example, reduced meat-based consumption could reduce mitigation costs by 50 % (Stehfest et al. 2009). Yet, more than currently adopted measures are necessary to lessen the adverse effects of climate change.

2 Psychological barriers to inaction

Undeniably, many people are concerned about climate change, but nevertheless often engage in behaviors that are detrimental to the environment or fail to engage in ameliorative actions. This attitude-behavior gap is a topic of ongoing research interest. Broadly, environmental attitudes are relatively poor predictors of pro-environmental behavior (Hines et al. 1987; Staats 2003). However, when barriers or facilitators of behaviors are factored into estimates, the correlation between attitudes and behavior is substantially strengthened (e.g., Corraliza and Berenguer 2000; Kaiser and Gutscher 2003).

A variety of psychological (as opposed to structural) barriers have been identified (e.g., Lorenzoni et al. 2007; Kollmuss and Agyeman 2002). For example, Blake (1999) argued that many models of behavior are limited because they fail to consider three major constraints on environmental actions: individuality (e.g., conflicting attitudes), responsibility (failure to assume personal responsibility to take actions), and practicability (lack of time, money, facilities, and information). Drawing on qualitative data, Lorenzoni et al. (2007) found that the members of UK public perceived two main levels of barriers to climate change engagement—at the individual level (e.g., lack of knowledge and skepticism) and at the societal level (e.g., lack of political actions on climate change). In an attempt to summarize several influential theoretical frameworks on the attitude-behavior gap, Kollmuss and Agyeman (2002) developed a conceptual model that demonstrates the complexity of factors that may hinder pro-environmental behavior. These factors were demographics, internal factors (e.g., environmental conscience, locus of control), and external factors (e.g., availability of infrastructure and financial constraints).

In a recent review of psychological barriers, Gifford (2011) proposed that climate change mitigation and adaptation may be hindered by almost three dozen of them ("the dragons of inaction") that fall into seven categories. The first category is limited cognition about the problem. Constrained by limited cognitive capacity, humans often make decisions that are irrational, short-term, and self-focused. Thus, pro-environmental behaviors may be hindered

by environmental numbness (Gifford 1976), uncertainty (Messick et al. 1988), judgmental discounting (e.g., Uzzell 2000), optimism bias (Gifford et al. 2009), and a lack of perceived self-efficacy (e.g., Kaiser and Gutscher 2003).

The second category consists of ideologies and worldviews that are incompatible with pro-environmental goals. Mitigative inactions can be conditioned by beliefs about capitalism (e.g., Heath and Gifford 2006), technosalvation (e.g., Terwel et al. 2009), suprahuman powers (e.g., the belief that the Mother Nature will restore itself), and system justification, or the tendency to defend one's socioeconomic status (Feygina et al. 2010).

The third category involves comparison with others. According to Festinger (1954), individuals judge the appropriateness of their actions by comparing their own to those of others (e.g., Heath and Gifford 2002), and adjust their behaviors to comply with the dominant social norms (Schultz et al. 2007). Negative sustainability norms (e.g., car use), perceived inequality (Aquino et al. 1992), and the fear of being exploited (Kerr 1983) can easily serve as justifications for inaction (Chen and Gifford 2015).

The fourth category includes sunk costs, which refer to prior investments or routines that are difficult to abandon. Individuals may be reluctant to give up significant but environmentally harmful financial investments (Knox and Inkster 1968), established behavioral habits (Aarts and Dijksterhuis 2000), and environmentally incompatible goals and aspirations (Lindenberg and Steg 2007).

The fifth category, discredence, includes general disbelief and distrust in experts and authorities. Discredence ranges from dismissal of scientific evidence (Opotow and Weiss 2000) to reactance against mitigative solutions that appear to threaten one's freedom (Brehm 1966).

The sixth category includes six types of perceived risk associated with environmental behavioral changes (Schiffman et al. 2006). One example might be purchasing an electric vehicle, which has potential risks such as lack of functionality (e.g., lack of charging infrastructure), social costs (e.g., loss of social status), and psychological risk (e.g., teasing or criticism).

The final barrier category is limited behavior, that is, the adoption of environmental actions with inadequate impacts (Gifford 2011). One form is tokenism, or the practice of making symbolic or inconsequential mitigative efforts over more effective actions. Another is the rebound effect, or Jevons' Paradox (Jevons 1865), which occurs when the gains from a relative short-term efficiency (e.g., purchasing LED light bulbs) are diminished or offset by subsequent less-sustainable behaviors (e.g., leaving the lights on longer).

3 The present study

Our main objective was to examine psychological barriers that may limit mitigative food choice intentions (MFCI), with a secondary goal of developing a scale to measure the chief components of the barriers. We begin our inquiry with 36 individual psychological barriers adapted from Gifford (2011). Accordingly, three hypotheses were proposed. The first was that each of the 36 individual perceived barriers will be associated with fewer mitigative food choice intentions. The second was that these 36 barriers can be empirically reduced to a simpler set of basic dimensions, given that some barriers may be related to each other (e.g., perceived financial risks may be associated with conflicting goals). The discovery of a parsimonious empirical structure would be advantageous for theory and future research. The third was that the combined barrier dimensions would predict MFCI. We predicted that the more barrier dimensions that participants experience, the less likely they will report intentions to make sustainable food choices.

4 Method

4.1 Overview

The study was conducted as an online survey with Canadian community members. Participant recruitment and data collection were facilitated by Qualtrics' panel services. They were invited to a study that examines environment-related decision-making and paid 75 cents. A pilot "soft launch" of the survey was conducted to ensure its feasibility and clarity. Then, the main survey was structured to query the respondents' (a) intentions to adopt a series of mitigative food choices, (b) perceived barriers, and (c) demographics (gender, age, education, household income, and type of residence neighborhood).

4.2 Participants

The 251 participants (118 male and 133 female) ranged in age from 19 to 81 ($M = 48.63$, $SD = 16.54$). Most respondents (75 %) had more than a high school education, lived in an urban area (56 %), and had an annual household income between C$41,000 to $60,000 (49.4 %).

4.3 Measures

Behavioral food choice intentions Six items concerned intentions to engage in mitigative food choices within the next month: Purchase organically grown food, not purchase locally grown food (reversed), eat less meat, not reduce how often to dine at restaurants (reversed), increase consideration of the environmental impact of their food, and purchase food that has less packaging. The participants rated their degree of agreement with each item on a 7-point Likert scale (1 = "strongly disagree" to 7 = "strongly agree"). Cronbach's alpha for this scale was .70.

Psychological barriers Thirty-six potential barriers were presented as to why one might not choose locally grown, home-cooked, meatless, organic food (see Table 1). These were based on Gifford's (2011) seven categories of psychological barriers, which encompassed 29 "dragons of inaction" that hinder climate change mitigation, with seven added or adapted for the food-choices context. The participants rated the extent to which each barrier limits their mitigative choices, on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree").

5 Results

5.1 Descriptive statistics

Items on each scale were summed and averaged. Table 1 reports the means, standard deviations, and correlations with MFCI. The internal consistency reliability of the full barriers scale was excellent ($\alpha = .93$).

The participants reported moderate levels of mitigative food choice intentions ($M = 4.34$, $SD = 1.13$) on the 7-point scale. Among the 6 choices, participants most intended to purchase food with less packaging ($M = 5.21$; $SD = 1.54$) and to more often purchase locally grown food ($M = 4.78$, $SD = 1.83$).

Table 1 Means, standard deviations, and pearson correlations of barrier items with mitigative food choice intentions

	Barrier items	*M*	*SD*	*r*	95 % CI
1.	There's no need to make these changes because I'm not convinced that a serious environmental problem even exists.	2.06	1.13	–.42**	[-0.5, -0.3]
2.	The pro-environmental behaviours that I currently engage in make further changes unnecessary.	2.54	1.03	–.074	[-0.2, 0.1]
3.	I just tune out when it comes to hearing about climate change or thinking about what sort of changes I could make in my own life.	2.09	1.05	–.44**	[-0.5, -0.3]
4.	There's so much information out there that I've stopped paying attention to all of the possible changes that I should make, including these.	2.46	1.11	–.34**	[-0.4, -0.2]
5.	I'm content with the extent to which my current choices reflect who I am as a person.	3.39	1.04	–.15*	[-0.3, 0.0]
6.	Environmental problems are more serious in other places, and so I don't need to change.	2.06	1.04	–.40**	[-0.5, -0.3]
7.	I can't change because I'm invested in my current lifestyle.	3.25	2.17	–.05	[-0.2, 0.1]
8.	Making these changes would be criticized by those around me.	2.98	2.25	.01	[-0.1, 0.1]
9.	There's not much point in me making changes like these because I feel confident in the ability of technological innovators to help solve climate change.	3.07	2.15	–.15*	[-0.3, 0.0]
10.	There is no pressing need to change because the natural cycles of the earth are beyond our control.	3.12	2.05	–.05	[-0.2, 0.1]
11.	If I made the necessary changes, I probably would be embarrassed when others noticed what I was doing.	2.86	2.25	–.10	[-0.2, 0.0]
12.	I'm too busy to think about making these changes right now.	3.12	2.15	–.10	[-0.2, 0.0]
13.	I'm worried that others will criticize me for making these changes.	1.54	.86	–.17*	[-0.3, 0.0]
14.	It's too difficult for me to make these changes.	2.25	1.08	–.26**	[-0.4, -0.1]
15.	I haven't paid much attention to this issue.	2.31	1.10	–.46**	[-0.6, -0.4]
16.	I haven't done this mainly because changing involves some risk.	1.90	.90	–.15*	[-0.3, 0.0]
17.	My environmental actions already make enough of a difference.	2.54	1.00	–.16*	[-0.3, 0.0]
18.	I've put a lot of time and effort into my current lifestyle, and so I don't want to change.	2.10	1.02	–.36**	[-0.5, -0.2]
19.	I don't think changing this will have much impact around here.	2.43	1.18	–.48**	[-0.6, -0.4]
20.	Even if most people made these changes it wouldn't help enough.	2.34	1.18	–.41**	[-0.5, -0.3]
21.	Society as it is now is working fine for me, and I'm worried that changes like these might somehow compromise that.	1.96	1.00	–.29**	[-0.4, -0.2]
22.	I have spent quite a bit of money on my current choices, so I would lose too much if I changed now.	1.97	.98	–.28**	[-0.4, -0.2]
23.	I'm satisfied with my current way of doing things.	3.09	1.12	–.37**	[-0.5, -0.3]

Table 1 (continued)

	Barrier items	*M*	*SD*	*r*	95 % CI
24.	I'm confident that things will get better with time, and so I don't see much point in making these changes.	2.08	1.06	–.46**	[-0.6, -0.4]
25.	I'm concerned that these changes will take up too much of my time.	2.20	1.13	–.22**	[-0.3, -0.1]
26.	When I have taken some step to help the environment, I think it is a good idea to reward myself.	2.56	1.12	.10	[0.0, 0.2]
27.	There's no need to change because the current "environmental crisis" has been exaggerated.	2.02	1.14	–.41**	[-0.5, -0.3]
28.	I'm unsure that these changes would be an improvement over my current choices.	2.59	1.15	–.42**	[-0.5, -0.3]
29.	Even if I decided to make these changes, there would be too many other obstacles to overcome.	2.45	1.07	–.32**	[-0.4, -0.2]
30.	I haven't heard convincing arguments for why I should make these changes.	2.42	1.25	–.52**	[-0.6, -0.4]
31.	Honestly, I don't think that the "problem" that this would solve is actually a problem.	2.14	1.20	–.40**	[-0.5, -0.3]
32.	The fate of the human race is out of our hands, so there is no reason for me to change.	1.98	1.06	–.32**	[-0.4, -0.2]
33.	I wouldn't consider making these changes because they are inconsistent with my political views.	1.73	.95	–.25**	[-0.4, -0.1]
34.	Making these changes is hard because they might compromise my safety.	1.83	.98	–.23**	[-0.4, -0.1]
35.	Humankind cannot make a difference when it comes to saving the earth, so there is no point for me to change.	1.76	.96	–.34**	[-0.4, -0.2]
36.	Only fake experts promote these changes.	1.81	1.00	–.35**	[-0.5, -0.2]

36-item 5-point scale ($\alpha = .93$), from 1 = Strongly disagree to 5 = Strongly agree; *$p < .05$, **$p < .01$

The mean barrier ratings was slightly below the midpoint (across all barriers, $M = 2.36$, $SD = .69$). Of the 36 items, the three strongest reported barriers were that participants were content with the extent to which their current choices reflected who they are ($M = 3.39$, $SD = 1.04$), that they were invested in their current lifestyle ($M = 3.25$, $SD = 2.17$), and that they were too busy to think of changes ($M = 3.12$, $SD = 2.15$).

5.2 Hypothesis testing

Hypothesis 1: psychological barriers predict mitigative food choice intentions The barriers, averaged across all items, were negatively correlated with MFCI, $r = -.49$, $p < .001$. Of the 36 barrier items, 29 were negatively correlated with MFCI: five at the .05 level of significance and 24 at the .01 level. Therefore, the first hypothesis was confirmed for 81 % of the barriers. Intentions were most strongly (and negatively) correlated with item 19 ("I don't think changing this will have much impact around here"), $r = -.48$, item 15 ("I haven't paid much attention to this issue"), $r = -.46$, and item 24 ("I'm confident that things will get better with time, and so I don't see much point in making these changes"), $r = -.46$, all $ps < .01$.

Hypothesis 2: the psychological barriers form meaningful dimensions To determine whether the 36 barriers form a parsimonious structure, a principal component analysis was performed with parallel analysis and Velicer's minimum average partial (MAP) test (O'Connor 2000). Three-, four-, and five-factor solutions were examined. The four-factor solution with varimax rotation was chosen partly on psychometric bases and partly because it provided the most meaningful interpretation. As a criterion for statistically meaningfulness, we used a cut-off loading of 0.5 (Stevens 2002) and deleted items that appeared low in construct validity. The first factor explained 36 % of the variance, the second explained 6 %, the third explained 4 %, and the fourth explained 3 %. Thus, the four factors explained about half of the variance (49 %). Therefore, hypothesis 2 was supported. Table 2 presents the factor loadings.

Factor I was named Denial, based on high loadings of 5 items: denial that climate change is a problem (item 31), doubt about the existence of climate change (item 1), the belief that

Table 2 Factor loadings for the 4 barrier dimensions ($N = 251$)

Items	F^1	F^2	F^3	F^4
35. Humankind cannot make a difference when it comes to saving the earth, so there is no point for me to change.	.82	.27	.14	.12
27. There's no need to change because the current "environmental crisis" has been exaggerate	.70	.11	.46	.17
31. Honestly, I don't think that the "problem" that this would solve is actually a problem.	.72	.25	.46	.21
36. Only fake experts promote these changes.	.70	.28	.34	.17
1. There's no need to make these changes because I'm not convinced that a serious environmental problem even exists.	.66	.12	.48	.20
11. If I made the necessary changes, I probably would be embarrassed when others noticed what I was doing.	.25	.13	.00	.80
8. Making these changes would be criticized by those around me.	.08	.19	.05	**.77**
14. It's too difficult for me to make these changes.	.09	.74	.15	.17
29. Even if I decided to make these changes, there would be too many other obstacles to overcome.	.30	.69	.24	.21
16. I haven't done this mainly because changing involves some risk.	.33	.66	.04	.36
25. I'm concerned that these changes will take up too much of my time.	.36	.66	.07	.24
22. I have spent quite a bit of money on my current choices, so I would lose too much if I changed now.	.34	.63	.13	.21
5. I'm content with the extent to which my current choices reflect who I am as a person.	.06	.02	.78	.02
23. I'm satisfied with my current way of doing things.	.30	.21	.67	.03
17. My environmental actions already make enough of a difference.	.13	.34	.55	.03
28. I'm unsure that these changes would be an improvement over my current choices.*	.50	.38	.47	.20
2. The pro-environmental behaviours that I currently engage in make further changes unnecessary.*	.28	.03	.45	.07
M (*SD*)	2.01 (0.-97)	2.20 (0.-83)	2.89 (0.-75)	2.92 (1.-94)

Note. Factor labels: F^1 = Denial F^2 = Conflicting Goals F^3 = Tokenism F^4 = Interpersonal * added to increase construct validity

environmental crisis has been exaggerated (item 27), the belief that it is promoted by fake experts (item 36), and that humankind cannot make a difference (item 35). The items were used to create an index ($\alpha = .89$).

Five items loaded .50 or more on Factor II. They pertain to difficulty of changing one's behavior (item 14), potential risks inherent in change (item 16), lack of time (item 25), financial stake (item 22), and other obstacles (item 29). Factor III was named Conflicting Goals and Aspirations because climate-positive behavior change was deemed incompatible with other valued goals. Cronbach's α for this 5-item scale was .82.

Three items (5, 17, and 23) loaded .50 or more on Factor III, Tokenism. They represent actions that the person has already adopted and contentment with current behaviors. To increase construct validity, we included 2 more items with slightly smaller loadings (items 28 and 2). These items were used by the person to conclude that their current choices make further behavioral changes are unnecessary. Cronbach's α for this 5-item scale was .74.

Two items identifying interpersonal barriers loaded .50 or more on Factor IV. The items involve embarrassment (item 11) and criticism (item 8) associated with behavioral changes. Because this factor was associated with the participants' perceived views of others, it was named Interpersonal Influences. Cronbach's α for this scale was .66.

Competing models: confirmatory factor analysis We addressed the multidimensionality of psychological barriers by performing Confirmatory Factor Analysis (CFA) within Analysis of Moment Structures (AMOS 4.01) to evaluate how well our proposed measurement model fit the 17 items. We tested the original hypothesis that the psychological barriers form a four-factor structure (comprised of Denial, Interpersonal, Conflicting Goals and Aspirations, and Tokenism), against two alternative models: (a) that they form a seven-factor structure, and (b) that they form a one-factor structure. The three competing models are represented schematically in Fig. 1.

In the first step, each item was permitted to load only on the component it was expected to indicate, with zero loading on all other components. The four components are intercorrelated. The standardized

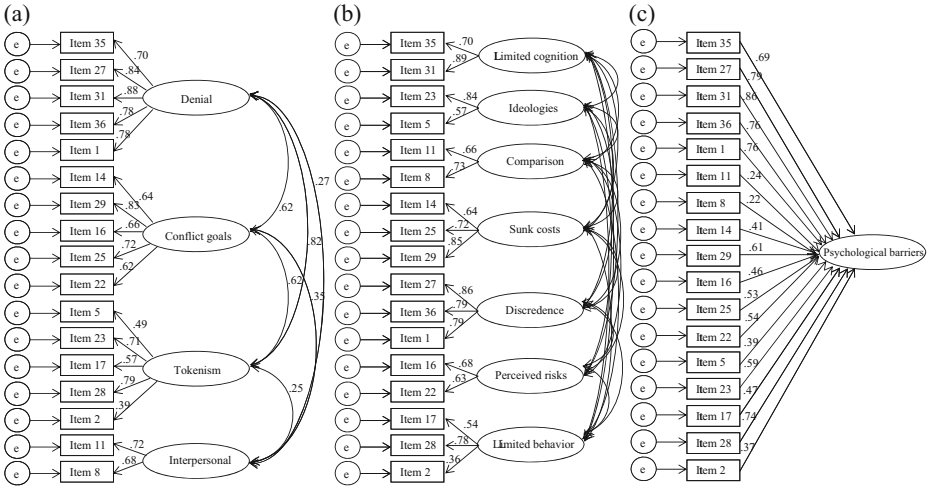

Fig. 1 Competing measurement models of psychological barrier. The path diagrams of three competing models of psychological barrier to mitigative food choice intentions (MFCI). (**a**) four component. (**b**) seven component. (**c**) one component

item loadings confirmed that each of the four components was well defined by its items and all item loadings differed reliably from zero ($p < .001$). Because of the large sample size and number of degrees of freedom, the significant chi-square value was dismissed, and additional indices of model fit were examined. With the exception of the NFI value of .88, the CFI exceeded the benchmark of .93 and the GFI exceeded the benchmark of .90 (Byrne 1994). Both main residual indices (SRMR and RMSEA) were below.80 (Hu and Bentler 1999). Because the fit between the measurement model and the observed data was satisfactory, we did not conduct post-hoc modifications.

In a second step, we followed recommendations by Byrne (2009) to estimate whether the fit of alternative models also adequately accounted for the data. Table 3 summarizes the fits of the three competing models. The Akaike information criterion (AIC) was used to compare models on the basis of the same data matrix; lowest value is considered optimal (Kline 1998). The first alternative model, suggested on rational grounds by Gifford (2011), postulates a seven-factor structure of psychological barriers: Limited Cognition, Ideologies, Comparisons with Others, Sunk Costs, Discredence, Perceived Risks, and Limited Behavior. Analysis of the hypothesized seven-factor model indicated superior goodness of fit—the AIC value (288.85) is lower, albeit slightly, than our proposed model (310.64). To examine whether the psychological barriers form a unidimensional construct, the second alternative model specified all of the items as indicating one general factor. However, its fit indices were strongly inferior; its AIC value was about double that of the two other models.

5.3 Hypothesis 3: psychological barrier dimensions predict food choice intentions

Because the psychological barriers to MFCI are best represented as a multidimensional construct and both four-factor and seven-factor models demonstrated similar good fits, both were examined as predictors of MFCI. For the four-factor structure, significant negative relations were found between MFCI and three of its latent variables (Denial, Conflicting Goals and Aspirations, and Tokenism); Interpersonal Influence was not significantly correlated with MFCI. For the seven-factor model, all the barrier components except Comparison with Others were negatively correlated with MFCI, all ps $< .001$.

To test hypothesis 3, that is, to determine whether the barrier factors collectively predicted MFCI, two multiple linear regression analyses were conducted, one for the four-factor model (Model 1) and one for the seven-factor model (Model 2), with MFCI as the dependent variable, and the barrier dimensions (excluding those with nonsignificant relations with MFCI) as the independent variables. Table 4 summarizes the results of these analyses. Model 1 explained 25 % of the variance in MFCI, $F(3, 214) = 25.43$, $p < .001$, adj. $R^2 = .25$. Denial had the largest regression weight ($\beta = -.34$, $p < .001$), followed by Conflicting Goals and Aspirations, ($\beta = -.17$, $p < .05$). Model 2 also accounted for a significant amount of variance in MFCI, $F(6, 211) = 13.57$, $p < .001$, adj. $R^2 = .26$. Discredence had the strongest partial effect in the full

Table 3 Fit indicators of competing models ($N = 251$)

Model	χ^2	*df*	CFI	GFI	NFI	SRMR	RMSEA	AIC
Four Factor	230.635*	113	.935	.904	.881	.056	.065	310.635
Seven Factor	178.852*	98	.955	.925	.908	.048	.057	288.852
Single Factor	541.339*	119	.765	.759	.720	.092	.119	609.339

Note. CFI = comparative fit index; GFI = goodness-of-fit index; NFI = normed fit index; SRMR = standardized root-mean square residual; RMSEA = root-mean-square error of approximation. * $p < .05$

Table 4 Standard multiple regression of barrier factors for the two models predicting Mitigative Food Choice Intentions (MFCI) ($N = 251$)

	Predictors	Items	α	Pearson *r*	β	*b*	*SE b*
Model 1	Denial	5	.89	–.48***	–.34***	–.42	.10
	Conflicting goals	5	.82	–.36***	–.17*	–.24	.10
	Tokenism	5	.74	–.39***	–.11	–.16	.12
	Interpersonal	2	.66	–.07			
Model 2	Limited cognition	2	.75	–.42***	–.04	–.05	.12
	Ideologies	2	.65	–.36***	–.16*	–.20	.09
	Sunk costs	3	.78	–.35***	–.15*	–.19	.10
	Discredence	3	.85	–.48***	–.31**	–.36	.12
	Perceived risks	2	.60	–.30***	–.05	–.08	.11
	Limited behavior	3	.59	–.33***	.04	.06	.12
	Comparison	2	.66	–.16			

Note. For Model 1, $R^2 = .26$, Adj. $R^2 = .25$; For Model 2, $R^2 = .28$, Adj. $R^2 = .26$; Interpersonal and Comparison were removed from the analyses; $^{**}p < .001$,$^{**}p < .01$ $^{*}p < .05$

model, (β = -.31, $p < .01$), followed by Ideologies (β = -.16, $p < .05$). Based on these results, which include negligible differences in the common latent construct themes, predictive patterns, and the amount of variance explained, the two models appear to have equal validity.

Demographic differences Although demographics were not the focus of the study, they are of some interest. Women generally expressed stronger food choice intentions, $M = 4.52$, $SD = 1.05$, than men ($M = 4.14$, $SD = 1.19$), $t(216) = -2.49$, $p < .05$. In particular, women reported stronger intentions to eat less meat ($M = 3.94$; $SD = 1.98$) than men ($M = 3.33$, $SD = 1.93$) and stronger intentions to consider the environmental impact of the foods they eat ($M = 4.81$, $SD = 1.43$) than to men ($M = 4.36$, $SD = 1.75$).

We also investigated whether different segments of the sample experienced different barriers. On average, men reported stronger barriers (averaged across all 36) to change their behavior ($M = 2.58$, $SD = .71$) than women ($M = 2.33$, $SD = .69$). Specifically, they were more likely to deny that climate change is a problem ($M = 2.16$; $SD = 1.02$) than women [$M = 1.78$; $SD = .77$, $t(215.82) = 3.31$, $p = .001$], and reported more tokenism-related barriers ($M = 2.98$, $SD = .75$) than women [$M = 2.70$; $SD = .72$, $t(249) = 3.08$, $p < .01$]. Older respondents were more likely to report that behavioral change conflicted with their current goals, $r(250) = -.24$, $p < .001$. Overall, women reported more mitigative food choice intentions and fewer barriers, but the barrier dimensions did not significantly vary for educational level, income level, or neighborhood type (all $ps > .05$).

6 Discussion

Although extensive efforts in climate change communication have raised public concern, most people continue to engage in greenhouse-gas-heavy lifestyle. The large literature on the environmental attitude-behavior gap provokes important theoretical and empirical questions about the existence and variety of psychological barriers that hinder climate-positive behavioral change. To the best of our knowledge, this is the first study to demonstrate how a wide range of psychological

barriers hinders climate-ameliorative food choice intentions. We established equally credible four- and seven-factor structures of the barriers and constructed scales for measuring them.

6.1 Psychological barriers

Inspired by Gifford's (2011) psychological barriers to climate change mitigation, we investigated the possibility of meaningful, parsimonious structures for 36 psychological barriers, and their ability to predict mitigative food choice intentions. Half of their variance was accounted for by four barrier factors. The first, Denial, represents dismissal or distortion of the evidence that climate change exists or that it is caused by human activities. The second, Interpersonal Influences, represents social forces, such as anti-environmental norms. The third, Conflicting Goals and Aspirations, represents financial, time, and other investments that are incompatible with mitigation. The fourth, Tokenism, refers to sub-consequential efforts for the environment that preclude more impactful actions. Three of these psychological barrier factors, except Interpersonal Influences, were significantly associated with fewer mitigative food choice intentions.

Why was Denial the strongest perceived barrier to mitigation? Clearly, denial is a major obstacle to the positive reception of environmental communications if the problem is dismissed in the first place. Denial is not merely negation of information as true. Climate change denial may be particularly resistant because the proclivity to remain apathetic, indifferent, or even block out the problem implies that denial serves as a defense mechanism for negative emotions associated with problem awareness (Cohen 2001).

Interestingly, Interpersonal Influences was not associated with mitigative food choice intentions. Although the factor's relatively weak internal consistency ($\alpha = .66$) may have dampened this relation, one might reasonably argue that food is a very social activity. One possible explanation is that individuals are often unaware that the presence and behaviors of others can have a strong impact on their food consumption choices, and many of them attribute to other factors, such as taste, costs, and health impacts (Croker et al. 2009; Vartanian et al. 2008).

6.2 The barrier structure

Because PCA is an exploratory approach to examine parsimonious latent structure items, we utilized complementary CFA for a more direct assessment of the proposed four-factor model in comparison with two reasonable alternatives: a seven-factor model, based on the theoretical groundwork of Gifford's (2011) seven categories of psychological barriers to climate change mitigation, and a one-factor structure, to address the possibility of unidimensionality. Given that a broader range of narrowly specified components usually enable a more precise assessment of latent structure (Kline 1998), the seven-factor model had a better fit than the four-factor model. However, because the two models capture similar themes, both have potential value: one offers more parsimony and the other offers useful variety.

For example, if one is interested in perceived risks and ideologies, the seven-factor model may be more informative for investigating those two constructs independently from the other five constructs (they are merged into other factors in the four-factor model). On the other hand, if one is more interested in a simple-structure approach to an outcome, the four-component model may be more useful. We acknowledge that the seven-factor model may require further item development to increase the reliability of some of its scales.

6.3 Future directions and implications

The present study offers some new avenues for future scientific endeavor in this area. First, 17 of the 36 individual barriers were organized into clear constructs relating to food choices, but the other 19 psychological barriers may well partially represent factors that need additional items in order to comprise additional factors. Proenvironmental behaviors are often context-dependent (Kaiser and Keller 2001); therefore, predictors of any given sustainable behavior may not be applicable to others (McKenzie-Mohr et al. 1995; Pickett et al. 1993). Because Gifford's (2011) taxonomy was developed for general climate change mitigation, other greenhouse-gas-heavy behavioral domains, such as transportation or household energy use, may be best predicted by other groupings of the full list of barriers. This deserves further investigation.

Second, barriers are important hindrances to converting environmental concern into actions. Therefore, the present study offers a valuable starting point for investigating the very problematic attitude-behavior gap or extending knowledge from previous conceptual models of pro-environmental behavior. For example, future research might examine whether psychological barriers predict outcomes such as climate change engagement and perceived competence to act, or whether they moderate or mediate environmental concern and behaviors.

Third, the study indicates where the most effort might be needed for "slaying the dragons." The demographic differences highlight areas of dragon strength (mainly for men and, to a lesser extent for older people). This suggests where messaging and policy might be more efficiently directed. The strength rank-ordering of the individual barriers also suggests which of them appears to need the most effort in terms of targeting resources toward overcoming barriers (and, conversely, where scarce resources are least needed).

Finally, the obvious question remains as to the extent to which the same sets of psychological barriers are experienced by other populations or cultural segments. Strategically delivering interventions and policies that target specific segments of the public, while focusing on overcoming a particularly troubling barrier, are most likely to increase mitigative efforts (e.g., McKenzie-Mohr and Smith 1999). Recent analyses indicate that restricted consumption of meat is associated with multiple benefits: reduction of chronic-disease morality, healthcare costs, and GHG emissions (e.g., Springmann et al. 2016). Thus, one promising route for combating denial might be to highlight personal benefits (e.g., safety and health) or complementary values (e.g., animal anti-cruelty) that alight with, or indirectly support, climate change mitigation. When facing global environmental challenges, reluctance to change appears to be a status quo bias (Samelson and Zeckhauser 1988). Understanding psychological barriers may be one significant path toward fostering behavior change that would decelerate climate change.

Acknowledgments We acknowledge the Social Sciences and Humanities Research Council of Canada for funding.

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