Journal of Environmental Psychology 63 (2019) 9–18

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep

Developing and validating the Dragons of Inaction Psychological Barriers (DIPB) scale

Karine Lacroix[a,*], Robert Gifford[b], Angel Chen[c]

[a] University of Victoria, School of Environmental Studies, David Turpin Building B243, PO Box 1700 STN CSC, Victoria, BC, V8W 2Y2, Canada
[b] University of Victoria, Department of Psychology, Canada
[c] Department of Psychology, Langara, Vancouver, Canada

ARTICLE INFO

Handling Editor: Taciano Lemos Milfont

ABSTRACT

The Dragons of Inaction Psychological Barrier (DIPB) scale, a measure of psychological barriers, was developed and validated in three studies across six environmental domains: food choices, transportation, energy use, water use, purchasing, and waste. A preliminary 65-item version was created based on past studies. In Study 1, it was examined using a large sample with exploratory factor analysis; five factors emerged. In Study 2, using a different sample, the factors were supported with confirmatory factor analyses. In Study 3, measurement invariance of the scale was supported across high and low difficulty behaviors. The final 22-item DIPB includes five subscales: Change Unnecessary, Conflicting Goals and Aspirations, Interpersonal Relations, Lacking Knowledge, and Tokenism. No significant DIPB differences across environmental domains were found for Tokenism, but the Change Unnecessary barrier was weakest for buying green, whereas the Interpersonal Relations barrier was strongest for food choices, the Conflicting Goals and Aspirations barrier was strongest for driving less, and the Lacking Knowledge barrier was strongest for buying green.

1. Introduction

Humans are facing several large-scale environmental challenges, including climate change, biodiversity loss, and resource depletion. Most agree that the solutions to these problems will require changes in human behavior (Schultz & Kaiser, 2012; Swim et al., 2009, pp. 1–108). Many are concerned about these environmental issues (Environics Institute, 2013; Leiserowitz, 2006; Thornton, 2009), and this concern is sometimes associated with pro-environmental behavior (PEB), but not always, which results in an attitude-behavior gap (or value-action gap; Kollmuss & Agyeman, 2002; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007).

Psychological barriers to PEB may explain this attitude-behavior gap. For example, public understanding of the relative environmental impacts of different behaviors is limited (e.g., turning off lights vs. home insulation; Attari, DeKay, Davidson, & de Bruin, 2010; Lazzarini, Zimmermann, Visschers, & Siegrist, 2016; Truelove & Parks, 2012). Across nations, individuals tend to believe that environmental problems are less severe locally than they are globally (Gifford et al., 2009; Schultz et al., 2014), hindering their motivation for environmental action. Similarly, social norms may foster or hinder motivation, like the perception that others expect one to participate in collective climate action strongly predicting their intentions to participate (Rees & Bamberg, 2014). A validated measure of psychological barriers to PEB is needed to help reduce the attitude-behavior gap.

Using qualitative data, Blake (1999) identified three barriers that prevent concerned individuals from implementing certain environmental actions: individuality (e.g., conflicting attitudes), responsibility (e.g., lack of perceived efficacy or responsibility), and practicality (e.g., social or situational constraints). In the context of climate change, focus groups revealed four types of barriers or justifications for inaction: comfort (e.g., unwilling to make sacrifices), blaming the collective, the belief in technological solutions, and doubting the government's commitment to action (Stoll-Kleemann, O'Riordan, & Jaeger, 2001). Others classified 15 barriers into two categories: individual (e.g., knowledge, distrust, lifestyle) and social (e.g., lack of political and industry-level action, social norms) barriers (Lorenzoni et al., 2007). Recently, Geiger, Middlewood, and Swim (2017) identified a lack of understanding of the causes and of the scientific agreement on climate change, limited experience with the threat, worldviews (e.g., neoliberalism), and social norms as barriers to action on climate change.

In a widely cited account of psychological barriers to PEB, Gifford (2011) described 30 psychological barriers. Gifford (2011) called these psychological barriers the “dragons of inaction” and tentatively placed

* Corresponding author.
E-mail addresses: lacroixk@uvic.ca (K. Lacroix), rgifford@uvic.ca (R. Gifford), achen@langara.ca (A. Chen).

https://doi.org/10.1016/j.jenvp.2019.03.001
Received 3 April 2018; Received in revised form 27 February 2019; Accepted 5 March 2019
Available online 09 March 2019
0272-4944/

them into seven categories. First, Limited Cognition refers to not knowing what one can do to solve climate change or not knowing how to implement a specific PEB change. Second, Ideologies includes various political ideologies, religion, and a general belief that all will be fine or that technology will save us. Third, Comparison with Others recognizes social pressures to not be environmentally conscientious. Fourth, Sunk Costs refers to investments in the form of time, money, or lifestyle, that make change difficult. Fifth, Discredence includes denial of environmental problems including climate change, mistrust in authorities, refusing to change because others are telling you to change (reactance), or doubting the efficacy of climate programs. Sixth, Perceived Risk includes the perception of a variety of risks associated with behavior change, risks to one's safety, financial risks, and risks that the new technology will not work. Seventh, Limited Behavior refers to the tendency for individuals to believe that they have done their part after switching to easy PEBs, and the possible rebound effects caused by financial saving or moral licensing. More detailed descriptions of these barriers are provided elsewhere (see Gifford, 2011; Gifford & Chen, 2017).

The psychological barriers included in each of the seven categories, gathered based on an extensive literature review, likely do not occur in isolation from each other, and so the proposed structure needs to be tested empirically.

1.1. Existing measurement efforts

Survey items for measuring the Dragons of inaction have been developed and tested in multiple environmental domains (Chen & Gifford, 2015; Lacroix & Gifford, 2018). These studies were reviewed and other researchers were contacted to gather additional relevant but unpublished data (i.e., Amouyal et al., 2013).

Using a sample of 85 students from a Canadian university, Chen and Gifford (2015) measured psychological barriers as justifications for defection (i.e., non-cooperative behavior) in a commons dilemma microworld. Most of the psychological barrier items were significantly negatively correlated with cooperative behavior. They examined the barriers structure using principal component analyses (PCA) and exploratory factor analyses (EFA), which resulted in three barrier dimensions: a resource dimension, a self-interest dimension, and an interpersonal dimension. The resource and self-interest dimensions explained over 40% of the variance in cooperative behavior. The authors speculate that the influence of the interpersonal dimension may have been weakened by the specific social dynamics (e.g., small group size and unclear social norms) modeled in the microworld.

In a subsequent study, Gifford and Chen (2017) measured the perception of psychological barriers to climate-positive food choice intentions (e.g., eating less meat) in a sample of 251 Canadians. They found significant negative correlations between the psychological barriers and climate-positive food choice intentions. PCA resulted in four barrier components: Denial, Conflicting Goals and Aspirations, Tokenism, and Interpersonal Influences. In multiple regression analyses, all components except Interpersonal Influences significantly negatively predicted food choice intentions. The authors cautioned that the Interpersonal Influences barrier had weak internal consistency and called for more research.

Using confirmatory factor analysis (CFA), Gifford and Chen (2017) compared their four-factor structure to Gifford's (2011) seven categories structure, and to a one-factor barrier structure to consider the possible unidimensionality of the construct. They concluded that the four-factor model and the seven-factor model both demonstrated good model fit and offered similar ability to predict food choice intentions, but that the one-factor model was less adequate.

Lacroix and Gifford (2018) measured the perception of psychological barriers in the context of household energy conservation behavior (e.g., line-drying clothes), using a sample of 152 Canadians. They found significant negative correlations between the psychological barriers and reported frequency of energy conservation behaviors. The authors examined the barrier structure using PCA, which resulted in six barrier components: Mission Impossible, Interpersonal Influences, Conflicting Goals and Aspirations, Technosalvation, Ignorance, and Denial. They highlight some initial differences between this barrier structure and the original structure proposed by Gifford (2011), but also called for further research.

Using university student samples, Amouyal et al. (2013) examined the psychological barriers in four contexts: food (N = 115), purchasing (N = 108), transportation (N = 122), and waste (N = 110). PCA in each context revealed three to five barrier components: Conflicting Goals and Aspirations, Change Unnecessary, Denial, Interpersonal Relations, and Others (Not Me) Need to Change.

1.2. The need for a comprehensive study

The foregoing studies report similar yet somewhat different barriers, and thus provide an appropriate starting point for developing a definitive measure of the psychological barriers to PEB. To achieve this, some gaps need to be addressed before a robust measurement model can be established. For example, some context- or domain-specific barrier items (e.g., “It was hard to cooperate because other fishers did not” in a commons dilemma context; Chen & Gifford, 2015) should be avoided if a measurement instrument with face validity across a wide range of environmental domains is to be developed.

Furthermore, not all seven barrier categories theorized by Gifford (2011) were included in the previous studies. For example, his Perceived Risk and Limited Behavior categories were not measured in Lacroix and Gifford (2018). Limited Cognition, specifically a lack of information about how to change, was not measured in Chen and Gifford (2017) or in Amouyal et al. (2013). Item wording also varies significantly between studies, with no more than a dozen identical barrier items between any two studies. Additionally, some Dragons of inaction were measured using single-item measures, which are less reliable than measures with multiple items (DeVellis, 1991; Wegener & Fabrigar, 2008).

Moreover, previous studies did not test for measurement invariance of the psychological barrier scale. Before barriers can be compared across different studies, groups, or behavioral domains, researchers must first confirm that the items and factors being measured have the same meaning to different individuals (Milfont & Fischer, 2010; Vandenberg & Lance, 2000). Otherwise, groups differences might be confounded with measurement differences (Cheung & Rensvold, 2002).

1.3. The present studies

The overall objective of the present studies was to develop a valid, reliable, definitive measure of the psychological barriers to PEB, one that will be applicable across multiple domains of environmental behavior. The scale development process includes generating a large pool of items, with three to four times more items than the anticipated final scale, testing the initial pool of items on a large sample, and evaluating the items using factor analysis, item-total correlations, and reliability analysis (DeVellis, 1991). The resulting scale should then be validated on a separate sample.

Therefore, building on past studies, Study 1 aimed to develop a psychological barrier scale that could be used to measure barriers in multiple environmental domains. This was initially accomplished by using EFA to “uncover empirically distinct latent (i.e., unobservable) constructs” of psychological barriers (Sakaluk & Short, 2017, p. 1). Next, Study 2 examined the construct validity of the model using CFA. It compared the structure of the present barrier model to Gifford's (2011) theorized barrier categories and to a unidimensional model. Finally, Study 3 tested measurement invariance using Multigroup CFA. It compared the structure of the model across two groups: a high-difficulty behavior group and a low-difficulty behavior group.

We hypothesized that the emergent psychological barrier structure

would be valid across environmental domains. Multigroup CFA is used to test for configural and metric invariance. We also hypothesized that the relative importance of each barrier factor would vary across behaviors, even as their factorial structure remains the same. For example, not knowing *how* to change a behavior might be more applicable to more difficult behaviors, and social influences might be more relevant to some more visible behaviors (e.g., eating less meat), as opposed to others (e.g., household water use; Babutsidze & Chai, 2018). Multigroup CFA is used to test for scalar and factor mean invariance.

2. Study 1

2.1. Method

2.1.1. Participants and procedure

A sample of 380 Canadians was obtained using a panel management agency (Qualtrics). The mean age of the sample was 49 years (*SD* = 15 years), and it included 134 males (35%), 245 females (65%), and one other. A few participants (*n* = 2 or 0.5%) had not completed high school, 96 participants had a high school diploma or equivalent (25.3%), 90 had completed some college or university (23.7%), 69 completed college or vocational school (18.2%), 96 had a bachelor's degree (25.3%), and the rest had a post-graduate or professional degree (*n* = 27 or 7.1%).

The participants were presented with six behaviors: eating less meat, taking public transport, cycling, or walking rather than driving, wearing a sweater rather than turning up the heat in the winter, reducing water use (e.g., taking shorter showers, repairing leaks), making more eco-friendly purchases, and recycling all items permitted by their local programs. These behaviors were chosen to cover the major domains of environmental behavior: food, transportation, energy, water, purchasing, and waste (Gifford, 2014). The participants were asked to select one of these behaviors that they or others believed should be done to help the environment, but which they were not doing now, or were not doing often enough.

After selecting a behavior, participants were asked the following open-ended question: "What are some of the most important reasons why you are not doing this?" This question was included to help verify that no psychological barriers were omitted from the list of items. Following this, participants were presented with a preliminary 65-item psychological barrier scale and asked to rate their agreement with each of the items on a 7-point Likert scale, from "strongly disagree" to "strongly agree."

2.1.2. Measures

Upon reviewing psychological barrier factors in past studies (Amouyal et al., 2013; Chen & Gifford, 2015; Gifford & Chen, 2017; Lacroix & Gifford, 2018), three barrier themes seem to consistently emerge. These are social influences, denial of environmental problems, and conflicting goals and aspirations. Other important themes were mentioned in at least two of these studies: questioning the necessity of changes in behavior, not knowing how to change, tokenism, and a belief that the government or industry are not doing enough to facilitate change.

A pool of potential items measuring these barrier themes was generated to form the preliminary 65-item scale. Barrier items from previous studies were supplemented with new items when needed to ensure that each theme was measured with five to six items. Multiple items were used to cover each aspect of the barrier construct. For example, items measuring conflicting goals and aspirations were chosen to cover time limitations, financial investments, and lifestyle preferences (see the supplementary material for full list of items). Using numerous items in the preliminary scale allowed the selection of the most psychometrically sound items for the final scale.

2.2. Results

2.2.1. Exploratory factor analysis

Principal axis factor analysis with oblimin rotation was used to extract factors. To determine the number of factors to retain, a combination of the Kaiser criterion (i.e., eigenvalue > 1), scree test, and parallel analysis was used. Four items had low communalities (i.e., less than 0.40; Costello & Osborne, 2005). After these items were removed, nine factors had eigenvalues greater than 1. The leveling off of eigenvalues on the scree plot suggested retaining five factors. Parallel analysis calculates eigenvalues based on sets of randomly simulated data (Sakaluk & Short, 2017). Factors with actual eigenvalues greater than their parallel analysis eigenvalues should be retained (Franklin, Gibson, Robertson, Polhmann, & Fralish, 1995; Sakaluk & Short, 2017). Parallel analysis indicated that seven factors should be retained.

The five and seven-factors solutions were examined for cross-loadings and factor reliability (Costello & Osborne, 2005). Guidelines suggest that factors with 10 or more loadings greater than 0.40, 4 or more loadings greater than 0.60, or 3 or more loadings greater than 0.80 are reliable (Stevens, 2002). The five-factor solution was the cleanest and most reliable and provided a meaningful interpretation. It explained 53% of the variance.

Next, the items within each of the five factors were examined in order to reduce the number of items in the scale. Four, five, and six items per factor were considered. Items were selected based on factor loadings and content analysis to account for the empirical and theoretical relations between items and their latent construct.

Following guidelines appropriate for the present sample size (Stevens, 2002), items with factor loadings below the critical value of 0.30 were eliminated. Next, items with strong loadings on one factor and weak loadings on another were assigned to the strong factor. Item-total correlations were analyzed for the remaining items to remove discernibly weak items before proceeding to the content analysis.

After removing weaker items, item wording was considered. To fully represent the construct, the goal was to ensure that as many of the latent aspects comprising each factor were retained, and having multiple items measuring similar latent aspects (i.e., redundancy) was avoided to enhance parsimony. For example, after removing items with low factor loadings, 24 items remained for factor 1. Content analysis of the remaining items suggested that the theme for this factor was "no need to change" and that it contained the following five underlying ideas: denial of environmental problems, the belief that technology would solve the problems, the belief that individuals are powerless because of industry or because of a superior entity, and the belief that all would turn out fine, therefore behavior change is unnecessary. One item was retained for each of these five themes.

2.2.2. Revised barrier scales

The above steps were repeated for each factor. The resulting five subscales included 24 items, covered coherent themes, and were reliable, with Cronbach alphas between .77 and .85. The retained items, inter-item correlations, and Cronbach alphas are presented in Table 1. Latent factor correlations are provided in the supplementary material.

Factor 1 encompasses the general belief that a change in behavior is not necessary. It includes denial of environmental problems and denial of the necessity to act. Factor 2 covers the theme of conflicting goals and aspirations, which include limited time, past investments, and difficulty in changing habits. Factor 3 represents interpersonal relations as a barrier; it includes themes of social disapproval or criticism. Factor 4 represents a person's claim of ignorance, that one simply does not know how to change. Finally, Factor 5 is tokenism, the general belief that "I already do my part to help the environment, so no further action is needed" and the belief that industry and government (rather than me) should facilitate this change.

Table 1
Psychological barrier factors and items (study 1, N = 380).

Item number and items	Corrected item-total correlation	Cronbach's alpha if item deleted
Factor 1[a]: Change Unnecessary (α = .84)		
1. There's not much point in me making this change because I feel confident that technological innovators will solve environmental problems.	.73	.79
2. Human are powerless when it comes to saving the earth, so there is no need to change.	.71	.79
3. These problems are so far in the future, so there is no need to act.	.73	.79
25. There's a need for change because I believe that a serious environmental problem exists (reversed item). [b]	.54	.84
26. What happens at the industrial level makes my changing insignificant. [b]	.56	.84
Factor 2: Conflicting Goals and Aspirations (α = .85)		
6. Making this change would interfere too much with my other goals in life.	.75	.80
7. I'm concerned that this change will take up too much of my time.	.68	.82
8. I can't change because I'm invested in my current lifestyle.	.74	.81
9. These issues are important to me but it's too hard to change my habits.	.57	.85
10. I haven't changed because I'm afraid this wouldn't work.	.62	.84
Factor 3: Interpersonal Relations (α = .85)		
11. Making this change would be criticized by those around me.	.63	.83
12. I would be letting certain people down if I made this change.	.67	.81
13. I'm worried that my friends would disapprove if I made this change.	.75	.78
14. If I made the necessary change, I would probably be embarrassed when others noticed what I was doing.	.71	.79
Factor 4: Lacking Knowledge (α = .77)		
15. There's so much information out there that I am confused about how to make this change.	.71	.64
16. I don't understand enough of the details about how to make this change.	.65	.68
17. I'd like to change but I'm not sure where to begin.	.56	.72
24. It's the government's responsibility to regulate this change. [b]	.40	.81
Factor 5: Tokenism (α = .78)		
18. The pro-environmental efforts that I currently engage in make further changes unnecessary.	.65	.72
19. I've already made sacrifices to solve environmental problems, so there is no need for me to do more.	.49	.76
20. I previously have made important effort in this, so there is no need for me to make further changes.	.56	.74
21. My environmental actions already make enough of a difference.	.62	.73
22. It's not fair for me to change when really it's industry that's causing the majority of environmental problems.	.55	.74
23. The government should make it easier for me to change, if it really has the best interest of the environment in mind. [b]	.36	.79

Note.
[a] Two items were added to Factor 1 during Study 3 (i.e., item 4 "Changes likes this are not really necessary for me because environmental conditions are likely to remain ok in my area" and item 5 "There is no pressing need to change because nature has great resiliency and our actions are trivial").
[b] Indicates items that are not part of the final 22-items Dragons of Inaction Psychological Barrier instrument (i.e., items 23 and 24 were removed during Study 2; items 25 and 26 were removed during Study 3). However, items 23 and 24 might be useful in contexts in which governments play an important role.

2.3. Discussion

The Dragons of inaction have been measured before, but not comprehensively. We began with 65 items covering a wide range of psychological barriers. Our sample was considered large enough to perform EFA (i.e., the number of participants was 5 times larger than the number of variables; Sakaluk & Short, 2017), which suggests retaining five factors. We created a preliminary 24-item scale, which has good psychometric properties, but it needed to be confirmed using a separate sample.

3. Study 2

The purpose of the second study was to confirm or disconfirm the five-factor barrier structure and measurement model obtained in Study 1, using a different sample. CFA was used to evaluate the dimensionality of the psychological barriers, and to compare the five-factor model with two alternative models (i.e., a seven-factor model and a one-factor model). Comparison with a seven-factor model based on Gifford's (2011) original list of barriers provided a theoretical basis for model evaluation. Comparison with a one-factor model allowed for testing the multidimensionality of the psychological barriers.

3.1. Method

3.1.1. Participants, procedure, and measures

A sample of Canadians was obtained using a panel recruitment agency (MTurk). The sample consisted of 297 Canadians. Their mean age was 59 years (*SD* = 9 years); the sample included 153 males (52%), 142 females (48%), and two others. One participant (0.3%) had not completed high school, 93 participants had a high school diploma or equivalent (6.7%), 93 had completed some college or university (31.3%), 35 completed college or vocational school (11.8%), 106 had a bachelor's degree (35.7%), and the rest had a post-graduate or professional degree (*n* = 42 or 14.1%). The procedure and questions were the same as for Study 1, except that the 24-item barrier scale resulting from Study 1 (i.e., 5 barrier factors with 4–6 items per factor) was administered instead of the 65-item preliminary barrier scale.

3.2. Results

3.2.1. Scale reliability

The barrier subscales were assessed for reliability using item-total correlation and Cronbach's alpha. Two items (i.e., "The government should make it easier for me to change, if it really has the best interests of the environment in mind" and "It's the government's responsibility to regulate this change") were removed, resulting in a scale with 22 items. Scale reliability is detailed in Table 3.

3.2.2. Model specification

The five-factor model was specified according to the EFA results from Study 1. To test the alternative seven-factor model, the list of 22 barrier items were re-assigned to model Gifford's (2011) seven theorized categories. To re-assign the items, the three present authors independently allotted each of the 22 barrier items to one of Gifford's (2011) seven barrier categories. The authors were in unanimous

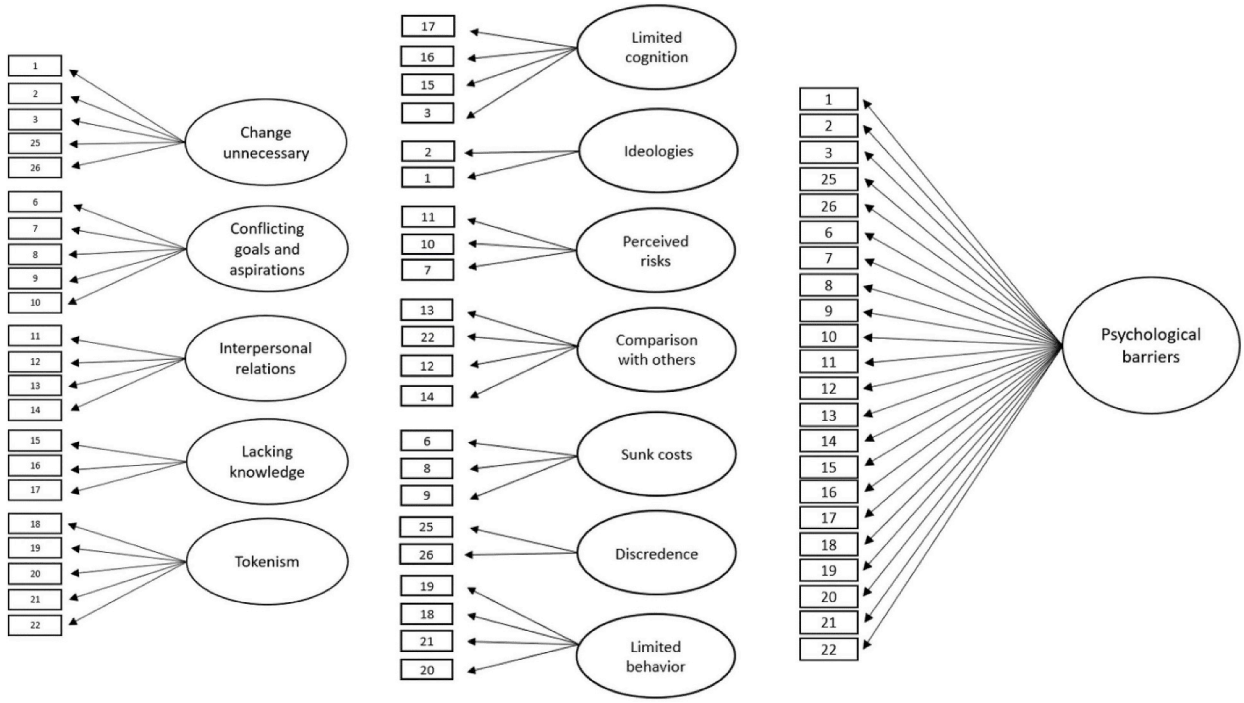

Fig. 1. The five, seven, and one-factor models. Latent factors are co-varied (not shown).

Table 2
Model fit criteria for the five-factor model and two alternative models.

Indices	5-factor model	7-factor model	1-factor model
χ^2	555.71_{199}	788.22_{188}	1471.79_{298}
χ^2/df	2.79	4.19	4.93
CFI	.84	.73	.43
RMSEA [90% CI]	.078 [.07, .09]	.104 [.10, .11]	.143 [.14, .15]
SRMR	.08	.116	.133
BIC	22087.88	22383.03	22947.03

Note. Chi-square statistic is significant for all three models ($p < .001$). Degrees of freedom are listed in subscript.

Table 3
Subscales and Cronbach's alphas.

Subscale	Study 1 (N = 380)	Study 2 (N = 297)	Study 3 (N = 825)
Change Unnecessary	.84	.69	.85
Conflicting Goals and Aspirations	.85	.79	.82
Interpersonal Relations	.85	.79	.80
Lacking Knowledge	.77	.77	.73
Tokenism	.78	.77	.77

Note. Items included in the Change Unnecessary, Lacking knowledge, and Tokenism subscales slightly differ between the three studies. Refer to Table 1 for more details.

agreement, and the seven-factor model was specified accordingly. The one-factor model was specified to include all 22 items under one factor (see Fig. 1).

3.2.3. Confirmatory factor analysis

Multiple criteria were examined to ensure adequate sample size for the CFA: a ratio of sample size to parameters in the model greater than 5, and a ratio of sample size to variables greater than 10 (Myers, Ahn, & Jin, 2011). By these criteria, the sample was sufficiently large to evaluate the five-factor barrier model and the alternative models.

Several indices were examined to evaluate model fit: a χ^2 to degrees of freedom ratio smaller than 3 indicates adequate fit, a root mean square error of approximation (RMSEA) of 0.05 or less indicates good fit and 0.08 or less indicates reasonable fit, a standardized root mean square residual (SRMR) of 0.08 or less indicates adequate fit, and a comparative fit index (CFI) of 0.95 or more indicates good fit and 0.90 or more indicates adequate fit (Hu & Bentler, 1999; Stevens, 2002). For the RMSEA and SRMR, smaller values indicate better model fit, while the opposite is true for the CFI (Sakaluk & Short, 2017).

CFA using the Lavaan package in R (Rosseel, 2012) was performed to verify the five-factor solution obtained in Study 1. The five-factor model had adequate model fit (Table 3). The five-factor model was compared to two alternative models: a seven-factor model based on Gifford's (2011) theorized barrier categories, and a unidimensional model (Fig. 1). The five-factor model was evidently superior to the two alternative models. It met the minimum suggested threshold for three model fit indices, but the seven-factor model and the one-factor model did not meet any of the model fit thresholds. Model fit criteria for all three models are presented in Table 2. Latent factors correlations are provided in the supplementary material.

3.3. Discussion

The preliminary 24-item scale from Study 1 was tested on a different sample using CFA. After two weak items were removed, the resulting five-factor model outperforms the original seven-factor scale and a unidimensional scale. Model fit was adequate although efforts to improve reliability of the Change Unnecessary factor are needed. The five-factor scale needed to be thoroughly tested using Multigroup CFA.

4. Study 3

The aim of the third study was to validate the barrier scale across multiple domains of PEB and to further understand the relative importance of each barrier factor in the different domains. Multigroup CFA was used to test for measurement invariance of the five-factor psychological barrier scale. Prior to doing so, we improved the reliability of the Change Unnecessary barrier.

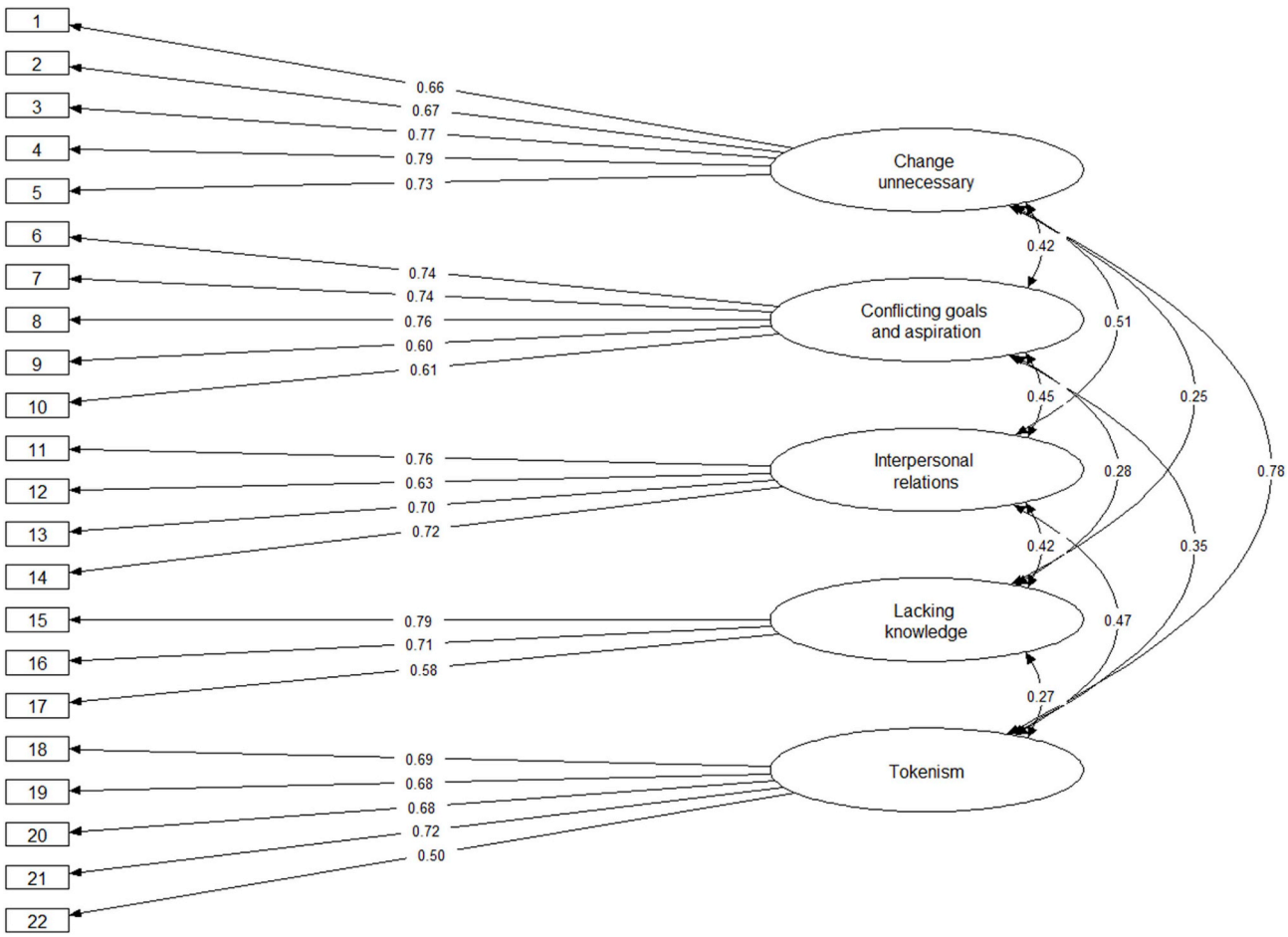

Fig. 2. Five-factor model and standardized parameter estimates.

4.1. Method

4.1.1. Participants, procedure, and measures

A sample of 825 Canadians was obtained using a panel recruitment agency (MTurk). Their mean age was 31 years (*SD* = 9 years); the sample included 466 males (57%), 357 females (43%), and 2 others. The participants' education levels were similar to Study 2, and the procedure was the same as for Study 2. The measures included 24 items; the 22-item scale from Study 2 and two items from the preliminary scale that were re-incorporated to improve on the measure of Change Unnecessary ("Changes likes this are not really necessary for me because environmental conditions are likely to remain ok in my area" and "There is no pressing need to change because nature has great resiliency and our actions are trivial").

4.2. Results

4.2.1. Scale reliability

The Change Unnecessary barrier was assessed for reliability using item-total correlation and Cronbach's alpha. The items with the lowest item-total correlations (i.e., "There's a need for change because I believe that a serious environmental problem exists" (reversed) and "What happens at the industrial level makes my changing insignificant") also resulted in an increase in the Cronbach's alpha if they were removed. These two items were removed, resulting in a scale with 22 items.

The 5-factor model was specified, with modifications to the Change Unnecessary barrier items, as mentioned above. The 5-factor model had good model fit (i.e., CFI = 0.91, RMSEA = 0.062, 90% CI [0.058, 0.066], SRMR = 0.061). Subscale reliability is detailed in Table 3. Standardized parameter estimates for the five-factor model are indicated in Fig. 2.

Table 4
Five-factor model fit indices for high- and low-difficulty behaviors.

Model indices	High-difficulty	Low-difficulty
χ^2	559.71_{199}	523.62_{199}
χ^2/df	2.81	2.63
CFI	.89	.91
RMSEA [90% CI]	.066 [.06, .07]	.063 [.06, .07]
SRMR	.071	.062
BIC	31109.45	29403.03
N	414	411

Note. Chi-square significant ($p < .001$), degrees of freedom indicated in subscript. High-difficulty included eating less meat and driving less. Low-difficulty included wearing a sweater, recycling, reducing water use, and buying green.

4.2.2. Multigroup confirmation factor analyses

Two hundred and ninety-three participants selected driving less (i.e., taking public transit, cycling, or walking rather than driving) as the behavior that they or others believed should be done to help the environment, but which they were not doing often enough, and 191 selected eating less meat. Both behaviors were categorized as high-difficulty behaviors (n = 414). All other behaviors were categorized as low-difficulty behavior (n = 411). The 5-factor model was fitted for both groups to validate the factorial structure. The model had a good fit for high-difficulty and low-difficulty behaviors (Table 4).

After confirming the factorial structure, we used Multigroup CFA to compare measurement invariance between high-difficulty and low-

Table 5
Fit Indices for Multigroup CFA Measurement Invariance Models.

Model indices	Configural invariance	Metric invariance	Scalar invariance	Factor means invariance
χ^2	1083.3	1096.2	1126.5	1303.5
Degrees of freedom (Df)	398	415	432	437
$\Delta\ \chi^2$ (Df)	–	12.867 (17)	30.308 (17)	177.03 (5)
p-value ($\Delta\ \chi^2$)	–	0.75	0.02	0.00
CFI	0.900	0.900	0.899	0.873
Δ CFI	–	0.001	0.002	0.025
RMSEA 90% CI	0.065 [.060, .069]	0.063 [.059, .068]	0.062 [.058, .067]	0.069 [.065, .074]
Δ RMSEA	–	0.002	0.001	0.007
BIC	60883	60782	60698	60841

difficulty behaviors. Measurement invariance was tested by incrementally increasing the parameter constraints of nested models and comparing the model fit indices between the baseline model and the more constrained model. A non-significant change in chi-square between the nested models indicated invariance (Cheung & Rensvold, 2002). However, the chi-square test is sensitive to sample size, and thus changes in CFI and RMSEA were also evaluated. A change in CFI greater or equal to 0.01 and a change in RMSEA greater or equal to 0.015 indicate non-invariance (Chen, 2007; Milfont & Fischer, 2010). Tests of measurement invariance were performed using the SemTools and Lavaan packages in R (Jorgensen, Pornprasertmanit, Shoemann, & Rosseel, 2018; Rosseel, 2012).

Configural invariance refers to the same items being associated with each latent construct in both groups (Cheung & Rensvold, 2002). To test for configural invariance, the 5-factor model Multigroup CFA was fitted without any equality constraints. The configural invariance model had good fit (see Table 5). Metric (or weak) invariance refers to the strength of the relation between the items and the factors being similar across groups (Chen, 2007). To test for metric invariance, factor item loadings were constrained to be equal across groups, and this more constrained model was compared to the configural invariance model. Metric invariance was supported in the Multigroup CFA (Δ CFI < 0.01, Δ RMSEA < 0.015; Table 5). Hypothesis 1 was supported; the psychological barrier structure is valid across high-difficulty and low-difficulty environmental behaviors.

Scalar (or strong) invariance refers to items having the same intercepts across groups (i.e., equal intercepts corresponding to the zero value of the underlying factor; Cheung & Rensvold, 2002) and is a prerequisite to testing factor mean invariance. To test for scalar invariance, the item loadings and item intercepts were constrained to be equal across groups, and the latent factor means were fixed to 0 for the low-difficulty group. This more constrained model was compared to the metric invariance model, which showed support for scalar invariance (Δ CFI < 0.01, Δ RMSEA < 0.015; Table 5). Compared to the low-difficulty group, the high-difficulty group had significantly higher latent factor scores for Conflicting Goals and Aspirations (Δ M = .99, $p < .001$) and Interpersonal Relations (Δ M = 0.53, $p < .001$), and significantly lower latent factor scores for Lacking Knowledge (Δ M = −0.24, $p = .001$). There were no significant differences for Change Unnecessary (Δ M = 0.04, $p = .53$) and Tokenism (Δ M = 0.09, $p = .24$).

To test for factor mean invariance, the mean level of latent factors were constrained to be equal across groups (Cheung & Rensvold, 2002). When compared to the scalar invariance model, the change in CFI is above the cut-off value (Δ CFI = 0.025), whereas the change in RMSEA was below the cut-off value (RMSEA = 0.007), suggesting that latent factor means may not be invariant across low-difficulty and high-difficulty behaviors.

4.2.3. Perception of barriers across different behaviors

One-way ANOVAs were conducted to further examine the differences in mean barrier scores across the six groups of behaviors. Individuals were assigned to one of six behaviors, according to their selection (for procedures, see to section 2.1.1). The homogeneity of variance and Welch's *F* were examined where appropriate (Field, 2013). Significant differences between behaviors were found for the Change Unnecessary ($F_{5,819} = 3.45$, $p < .01$), Interpersonal Relations ($F_{5,819} = 10.60$, Welch's $F_{5,243} = 10.27$, $p < .001$), Conflicting Goals and Aspirations ($F_{5,819} = 24.66$, Welch's $F_{5,245} = 23.34$, $p < .001$), and Lacking Knowledge barriers ($F_{5,819} = 9.85$, $p < .001$). None occurred for Tokenism. The mean barrier scores and 95% confidence interval for each behavior are illustrated in Fig. 3.

For Conflicting Goals and Aspirations (CGA), *post hoc* analyses using the Games-Howell procedure, which is appropriate when sample sizes and population variances differ (Field, 2013), revealed that the barrier was greatest for driving less ($M = 4.38$, $SD = 1.42$). The CGA barrier for driving less was significantly larger than all other behaviors, that is, for eating less meat ($MD = 0.51$, $p < .01$), wearing a sweater ($MD = 1.39$, $p < .001$), reducing water use ($MD = 1.04$, $p < .001$), buying green ($MD = 1.13$, $p < .001$), and recycling ($MD = 1.24$, $p < .001$). The mean CGA barrier perception for eating less meat was significantly larger than all other behaviors except for driving less, that is, for reducing water use ($MD = 0.52$, $p < .01$), wearing a sweater ($MD = 0.87$, $p < .001$), buying green ($MD = 0.62$, $p < .001$), recycling ($MD = 0.72$, $p < .01$). There were no significant differences between easier behaviors for CGA.

Post hoc tests revealed that across behaviors, the mean Interpersonal Relations barrier was the largest for eating less meat ($M = 2.51$, $SD = 1.27$), which was significantly larger than for using less water ($MD = 0.55$, $p = .001$), buying green ($MD = 0.69$, $p < .001$), and recycling ($MD = 0.70$, $p < .001$). The mean Interpersonal Relations barrier for driving less was significantly larger than that for buying green ($MD = 0.44$, $p < .001$) and for recycling ($MD = 0.45$, $p < .01$). No significant differences occurred between easier behaviors or between difficult behaviors.

For Lacking Knowledge, the mean barrier perception was significantly larger for buying green ($M = 4.07$, $SD = 1.28$) than for all other behaviors except for recycling, that is, for eating less meat ($MD = 0.54$, $p < .01$), wearing a sweater ($MD = 0.94$, $p < .001$), reducing water use ($MD = 0.85$, $p < .001$), and driving less ($MD = 0.77$, $p < .001$). The mean barrier perception for Change Unnecessary was significantly larger for reducing water use ($MD = 0.36$, $p < .05$) and for driving less ($MD = 0.34$, $p < .05$) than for buying green ($M = 1.97$, $SD = 0.94$). For both the Lacking Knowledge and Change Unnecessary barriers, there were no significant differences between high-difficulty behaviors.

4.3. Discussion

The attempts to improve reliability of the Change Unnecessary barrier were successful. The final 22-item five-factor model has good reliability and model fit. Tests of measurement invariance suggest that the five-factor barrier structure is adequate for different domains of environmental behavior, regardless of their overall barrier score. The

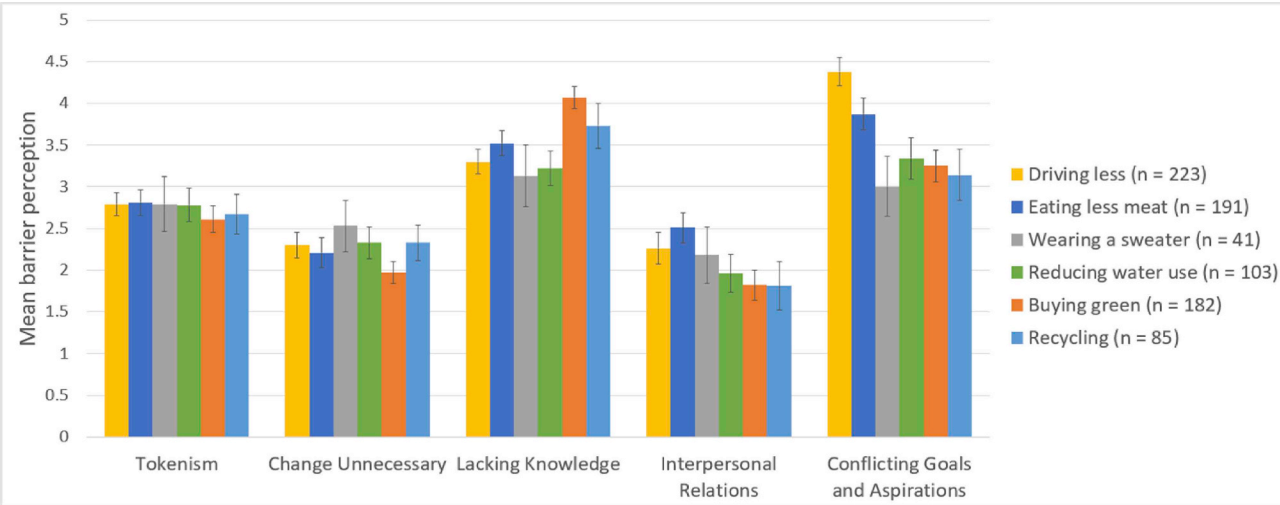

Fig. 3. Mean barrier scores across behaviors.

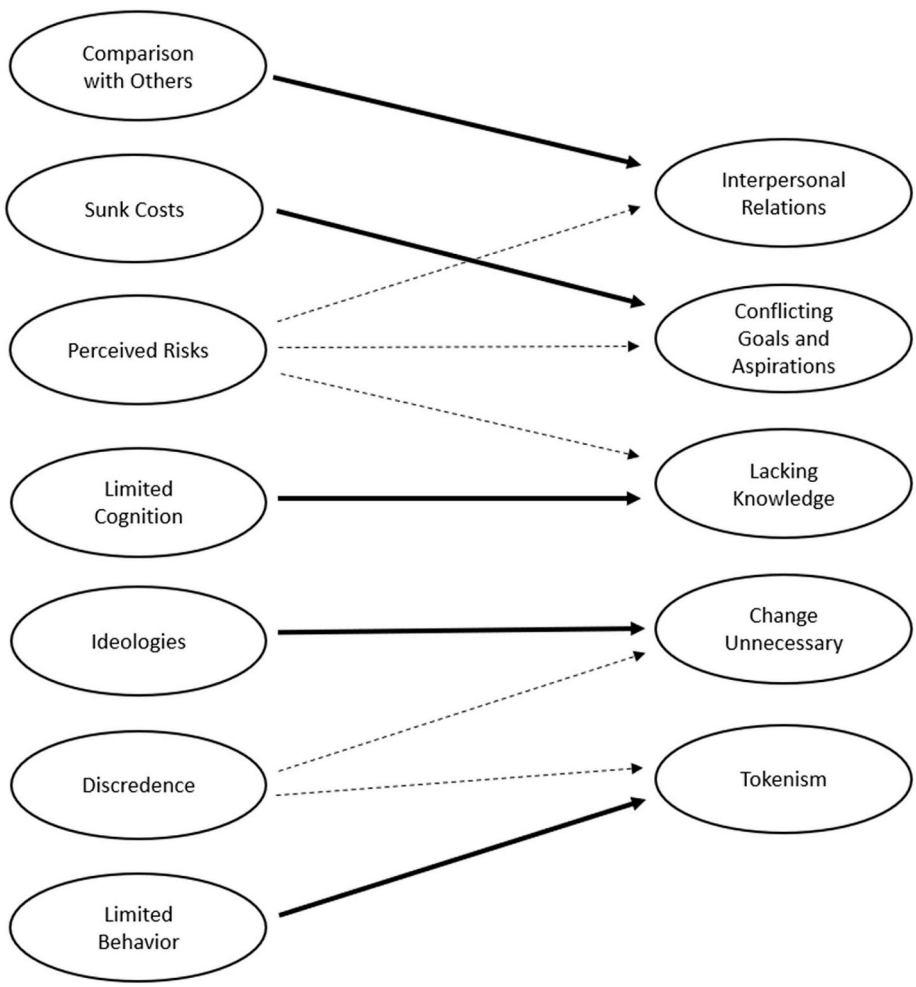

Fig. 4. Comparing Gifford's seven barrier categories (left) with the Dragons of Inaction Psychological Barriers (right).

Multigroup CFA provide evidence that barrier means vary across high-difficulty and low-difficulty behaviors for Conflicting Goals and Aspirations, Interpersonal Relations, and Lacking Knowledge. Moreover, the ANOVAS provide evidence for differences in barrier means across the six domains of environmental behaviors. However, some barriers do not differ across behaviors (i.e., Tokenism), some do not differ when comparing across easier behaviors (i.e., Conflicting Goals and Aspirations), and some only differ when comparing difficult behaviors with easier behaviors (i.e., Interpersonal Relations).

5. The Dragons of Inaction Psychological Barriers (DIPB) scale

As developed in Study 1 and confirmed in Study 2 and Study 3, the Dragons of Inaction Psychological Barriers (DIPB) scale is a 22-item

scale that measures five barrier factors. For its items, see Table 1 or items number 1 to 22 listed in the supplementary material. Based on these results, the seven categories comprising Gifford's (2011) original list were slightly re-arranged. Specifically, items from the former Perceived Risks barrier were re-assigned to three other original barrier categories (e.g., the social risks construct of Perceived Risks is very similar to the Interpersonal Relations barrier). Only one original element of the Limited Cognition barrier held on its own ("not knowing how to change") and now forms the Lacking Knowledge barrier.

The former Ideologies barrier is now part of the Change Unnecessary barrier, which also includes elements of the former Discredence barrier (e.g., denial of the problem or of its cause) Other elements of the former Discredence barrier (e.g., perceived program inadequacy or the perception that "industry is not doing its part, so why should I bother?") are now included under Tokenism. The original Comparison with Others, Sunk Costs, and Limited Behavior barrier categories are quite similar empirically to the original theory, although these are renamed here to better represent the latent themes associated with each factor. Fig. 4 illustrates the changes in the component structure of the DIPB.

6. General discussion

Building on past research on the Dragons of inaction approach to psychological barriers to pro-environmental behavior, these three studies developed and validated a measurement model applicable to a wide range of pro-environmental behaviors. The new DIPB 22-item instrument includes five reliable subscales: Change Unnecessary, Conflicting Goals and Aspirations, Interpersonal Relations, Lacking Knowledge, and Tokenism.

In multigroup CFA, the DIPB structure was validated on high (e.g., driving less) and low (e.g., recycling) difficulty behaviors. Furthermore, the relative importance of the Change Unnecessary, Interpersonal Relations, Conflicting Goals and Aspirations, and the Lacking Knowledge barrier factors vary across behaviors. No significant differences exist between behaviors for the Tokenism barrier. The Interpersonal Relations barrier is strongest for eating less meat, the Conflicting Goals and Aspirations barrier is strongest for driving less, closely followed by eating less meat, and the Lacking Knowledge barrier is strongest for buying green.

An important result of these studies is the creation of a more parsimonious construct for measuring the Dragons of inaction after initially considering 65 potential barrier items and seven dimensions. The compact 22-item final DIPB scale not only covers virtually all the semantic territory of the Dragons of inaction, it also is more likely to be employed, given its relative brevity and comprehensive coverage of the psychological barriers to engaging in pro-environmental behavior.

6.1. Theoretical and practical applications

Building on previous work, these studies advance understanding of psychological barriers to pro-environmental behavior. The original list of barriers (Gifford, 2011) was gathered based on extensive literature reviews and discussions, but their proposed structure was not empirically tested at the time. Multiple studies have since measured the psychological barriers, but each of them was limited to one context or to a subset of barrier categories, whereas the present studies measured all Dragons of inaction across six domains of environmental-behavior.

The DIPB scale demonstrated better model fit than Gifford's (2011) original seven-factor structure. These five barrier factors are similar to the original barrier structure, but some categories have been combined, and others have been teased apart (Fig. 4). The DIPB scale will help to guide future intervention efforts by enabling researchers to identify the strongest barriers for different environmentally-relevant behaviors and different population segments. For example, the Interpersonal Relations barrier appears to be the most relevant for reducing meat consumption, when compared to other barriers. However, as always, the present results should be confirmed in future studies.

Interpersonal Relations appear to be the weakest psychological barrier across environmental domains. However, many underestimate the influence of social norms on their behavior (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Thøgersen, 2014). Also, psychological barriers will likely change over time and interact with other barriers. As one barrier decreases, behavioral intentions may change, and this might make other psychological barriers more salient. For example, as individuals become more familiar with meat replacement products (i.e., lessening of the Lacking Knowledge barrier), they might make more efforts to reduce their consumption of meat, and while doing so might discover that their friends and family are not supportive of these efforts (i.e., strengthening of the Interpersonal Relations barrier; Corrin & Papadopoulos, 2017).

6.2. Limitations

Although online platforms like MTurk can provide diverse high-quality data (Buhrmester, Kwang, & Gosling, 2011; Buhrmester, Talaifar, & Gosling, 2018), our findings might not be representative of the general population. Furthermore, the DIPB scale was developed and validated with Canadian samples. Its applicability to other cultures should be examined in future studies. As with other surveys used in social research, the current study may be limited by the general tendency of respondents to respond in socially desirable ways, although the effects of social desirability on self-reported PEB are likely to be small (Milfont, 2009).

6.3. Future research

A crucial goal is to better understand how and why psychological barriers hinder pro-environmental behavior. The DIPB will be a useful tool for this purpose. The present work helps to identify which psychological barriers are most problematic for which of the six major environmental domains. However, this probably will vary with demographic segments. Therefore, an important future direction will be to discover which populations experience the strongest barriers for which environmental domains.

An intervention study that targets the psychological barrier that a given population experiences as most troublesome would be one interesting avenue for future study. Specifically, community-based social marketing and related techniques (e.g., McKenzie-Mohr, 2011) could be used to weaken barriers and to determine whether their removal is effective for promoting greater levels of cooperation. For example, one might investigate whether establishing more stringent product labelling standards would increase eco-friendly purchases, or whether interventions targeting dietary habit changes would help increase sustainable food choices (Steg & Vlek, 2009).

Acknowledgements

This research was supported by the Social Sciences and Humanities Research Council of Canada (File Number 435-2016-0610).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2019.03.001.

References

Amouyal, M., Bains, P., Brown, E., Hallordson, A. L., Ho, C., Houliston, D., et al. (2013). *Climate change messaging strategies: Effects on perceived barriers and behavioural intentions.* (Unpublished raw data).

Attari, S. Z., DeKay, M. L., Davidson, C. I., & de Bruin, W. B. (2010). Public perceptions of

energy consumption and savings. *Proceedings of the National Academy of Sciences of the United States of America, 107*(37), 16054–16059 https://doi.org/doi: 10.1073/pnas.1001509107.
Babutsidze, Z., & Chai, A. (2018). Look at me saving the planet! the imitation of visible green behavior and its impact on the climate value-action gap. *Ecological Economics, 146*, 290–303.
Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment, 4*, 257–278. https://doi.org/10.1080/13549839908725599.
Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science, 6*, 3–5. https://doi.org/10.1177/1745691610393980.
Buhrmester, M. D., Talaifar, S., & Gosling, S. D. (2018). An evaluation of Amazon's Mechanical Turk, its rapid rise, and its effective use. *Perspectives on Psychological Science, 13*(2), 149–154. https://doi.org/10.1177/1745691617706516.
Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 14*, 464–504. https://doi.org/10.1080/10705510701301834.
Chen, A., & Gifford, R. (2015). "I wanted to cooperate, but...": Justifying suboptimal cooperation in a commons dilemma. *Canadian Journal of Behavioural Science/Revue Canadienne des Sciences du Comportement, 47*(4), 282–291. https://doi.org/10.1037/cbs0000021.
Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5.
Corrin, T., & Papadopoulos, A. (2017). Understanding the attitudes and perceptions of vegetarian and plant-based diets to shape future health promotion programs. *Appetite, 109*, 40–47.
Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation, 10*, 173–178.
DeVellis, R. F. (1991). *Scale development: Theory and applications* (3 edition). Newberry Park, California: Sage Publications.
Environics Institute (2013). *Canadian public opinion about climate change.* Retrieved from http://www.davidsuzuki.org/media/news/downloads/Focus%20Canada%202013%20-%20Canadian%20public%20opinion%20about%20climate%20change.pdf.
Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics* (4th ed.). Los Angeles, USA: SAGE.
Franklin, S. B., Gibson, D. J., Robertson, P. A., Polhmann, J. T., & Fralish, J. S. (1995). Parallel analysis: A method for determining significant principal components. *Journal of Vegetation Science, 6*, 99–106.
Geiger, N., Middlewood, B., & Swim, J. (2017). *Psychological, social, and cultural barriers to communicating about climate change.* Oxford Research Encyclopedia of Climate Sciencehttps://doi.org/10.1093/acrefore/9780190228620.013.377.
Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist, 66*, 290–302. https://doi.org/10.1037/a0023566.
Gifford, R. (2014). Environmental psychology matters. *Annual Review of Psychology, 65*, 541–579. https://doi.org/10.1146/annurev-psych-010213-115048.
Gifford, R., & Chen, A. (2017). Why aren't we taking action? Psychological barriers to climate-positive food choices. *Climatic Change, 140*(2), 165–178. https://doi.org/10.1007/s10584-016-1830-y.
Gifford, R., Scannell, L., Kormos, C., Smolova, L., Biel, A., Boncu, S., ... Uzzell, D. (2009). Temporal pessimism and spatial optimism in environmental assessments: An 18-nation study. *Journal of Environmental Psychology, 29*, 1–12. https://doi.org/10.1016/j.jenvp.2008.06.001.
Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118.
Jorgensen, T. D., Pornprasertmanit, S., Shoemann, A. M., & Rosseel, Y. (2018). semTools: useful tools for structural equation modeling. R Package Version 0.5-1. Retrieved from https://CRAN.R-project.org/package=semTools.
Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*, 239–260. https://doi.org/10.1080/13504620220145401.
Lacroix, K., & Gifford, R. (2018). Psychological barriers to energy conservation behavior: The role of worldviews and climate change risk perception. *Environment and Behavior, 50*, 749–780. https://doi.org/10.1177/0013916517715296.
Lazzarini, G. A., Zimmermann, J., Visschers, V. H. M., & Siegrist, M. (2016). Does environmental friendliness equal healthiness? Swiss consumers' perception of protein products. *Appetite, 105*, 663–673. https://doi.org/10.1016/j.appet.2016.06.038.
Leiserowitz, A. (2006). Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change, 77*, 45–72. https://doi.org/10.1007/s10584-006-9059-9.
Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change, 17*, 445–459. https://doi.org/10.1016/j.gloenvcha.2007.01.004.
Milfont, T. L. (2009). The effects of social desirability on self-reported environmental attitudes and ecological behaviour. *Environmentalist, 29*(3), 263–269. https://doi.org/10.1007/s10669-008-9192-2.
Milfont, T. L., & Fischer, R. (2010). Testing measurement invariance across groups: Applications in cross-cultural research. *International Journal of Psychological Research, 3*(1), 111–130.
Myers, N. D., Ahn, S., & Jin, Y. (2011). Sample size and power estimates for a confirmatory factor analytic model in exercise and sport: A Monte Carlo approach. *Research Quarterly for Exercise & Sport, 82*(3), 412–423.
Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin, 34*, 913–923. https://doi.org/10.1177/0146167208316691.
Rees, J. H., & Bamberg, S. (2014). Climate protection needs societal change: Determinants of intention to participate in collective climate action: Collective climate action intention. *European Journal of Social Psychology, 44*, 466–473. https://doi.org/10.1002/ejsp.2032.
Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), Retrieved from http://www.jstatsoft.org/v48/i02/.
Sakaluk, J. K., & Short, S. D. (2017). A methodological review of exploratory factor analysis in sexuality research: Used practices, best practices, and data analysis resources. *The Journal of Sex Research, 54*(1), 1–9. https://doi.org/10.1080/00224499.2015.1137538.
Schultz, P. W., & Kaiser, F. G. (2012). Promoting pro-environmental behavior. In S. Clayton (Ed.). *The Oxford handbook of environmental and conservation psychology* (pp. 556–580). New York: Oxford University Press.
Schultz, P. W., Milfont, T. L., Chance, R. C., Tronu, G., Luís, S., Ando, K., ... Gouveia, V. V. (2014). Cross-cultural evidence for spatial bias in beliefs about the severity of environmental problems. *Environment and Behavior, 46*, 267–302. https://doi.org/10.1177/0013916512458579.
Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004.
Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). Mahwah, N.J: Lawrence Erlbaum Associates.
Stoll-Kleemann, S., O'Riordan, T., & Jaeger, C. C. (2001). The psychology of denial concerning climate mitigation measures: Evidence from Swiss focus groups. *Global Environmental Change, 11*, 107–117. https://doi.org/10.1016/S0959-3780(00)00061-3.
Swim, J., Howard, G., Clayton, S., Reser, J. P., Doherty, T. J., Stern, P. C., ... Weber, E. U. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges.* American Psychological Association. Retrieved from http://www.apa.org/science/about/publications/climate-change.aspx.
Thøgersen, J. (2014). The mediated influences of perceived norms on pro-environmental behavior. *Revue d'Économie Politique, 124*(2), 179–193.
Thornton, A. (2009). *Public attitudes and behaviours towards the environment - tracker survey: A report to the department for environment.* Food and Rural Affairs.
Truelove, H. B., & Parks, C. (2012). Perceptions of behaviors that cause and mitigate global warming and intentions to perform these behaviors. *Journal of Environmental Psychology, 32*(3), 246–259. https://doi.org/10.1016/j.jenvp.2012.04.002.
Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*(1), 4–70. https://doi.org/10.1177/109442810031002.
Wegener, D. T., & Fabrigar, L. R. (2008). Constructing and evaluating quantitative measures for social psychological research: Conceptual challenges and methodological solutions. *The SAGE handbook of methods in social psychology* (pp. 145–172). Thousand Oaks: SAGE Publications, Inc. https://doi.org/10.4135/9781412976190.