Reducing the Impact of Transportation on Climate Change Through Climate-friendly Transportation Options and Virtual Participation

Jordan R. Dudley, Lindsey Larkin, Artit Sukmekerd, Maya Lopez Foresythe, and Kimberly A. Barchard
University of Nevada, Las Vegas

INTRODUCTION

- The transportation sector contributes a large portion of U.S. and global GHG emissions.
- The Climate Change Action Inventory (CCAI; Barchard et al., 2021) measures the frequency of direct and indirect actions that can reduce climate change, including 11 actions that can reduce the impact of transportation on climate.
- The purpose of this research was to determine the number and nature of factors underlying the transportation domain.

METHOD

Participants

- 500 United States MTurk workers pre-screened using CloudResearch's toolkit.
- 471 participants after removing 15 climate change deniers and 14 multivariate outliers.
  - Ages: 19 to 76 years (M = 39.7, SD = 11.9)
  - Gender: 197 female, 271 male, and 3 non-binary
  - Race: 394 Caucasian/White, 39 African American/Black, 23 Asian, 15 other races

Measures

- Climate Change Action Inventory (CCAI; Barchard et al., 2021) has 77 items measuring frequency of direct and indirect actions that can reduce climate change.
  - Transportation domain includes 11 actions. See Table 1.
  - Each item is rated on a 9-point frequency scale ranging from *less than once a year* (1) to *at least 14 times a week* (9).

Procedure

- Participants completed a 15-minute online study and received $3.

Data Analysis

- To determine if all items relate to a single overall construct, we extracted the first principal component
- To determine the number and nature of factors, we ran an exploratory factor analysis. To determine the number of factors, we used scree test, parallel analysis, and MAP test. We examined several orthogonal and oblique rotations. Promax was the optimal rotation as it came closest to the ideal of a simple structure with 0 complex items, 7 hyperplanar loadings, and a moderate correlation amongst factors.

RESULTS

- One factor: all items had salient loadings. See Table 1.
- Two factors underlie the Transportation domain. We named them Climate-friendly Transportation and Virtual Participation. See Table 2.

DISCUSSION

- Virtual participation reduces GHG emissions by eliminating the need to transport.
- Climate-friendly transportation includes human-powered and public transit and supporting organizations working to improve climate-friendly transportation.
- Sample exclusively from the United States which prevents generalizability.
- Future research could examine the factor structure within a sample of climate change deniers. Deniers may engage in climate-friendly behaviors for different reasons (e.g., saving money, better air quality, convenience), which might change the factos.
- Future revisions of the CCAI could include additional climate-friendly transportation actions, such as car maintenance to increase efficiency, turning off your car while idle, and living close to work and school.

Climate-friendly transportation and virtual participation reduce climate change

UNLV

Table 1

First Principal Component

Item		Pattern Matrix Coefficient
1	Attend meetings / classes using computers or phones (instead of in person)	**.60**
2	Visit friends / family using computers or phones (instead of in person)	**.54**
3	Work (or attend school) from home	**.41**
4	Use human-powered transport (walk, bicycle, scooter, etc.)	**.56**
5	Use public transit (trains, buses, subways, etc.)	**.67**
6	Carpool	**.63**
7	Use an electric / fuel efficient car	**.56**
8	Combine trips to reduce mileage (e.g., shop on the way home)	**.44**
9	Encourage others to use climate-friendly transportation options	**.85**
10	Problem solve how to reduce the impact of transportation on climate change	**.84**
11	Give time or money to organizations working to reduce the impact of transportation on climate change	**.79**

Table 2

Factor Analysis of Transportation Domain Items

		Factor		
Item		1	2	h^2
3	Work (or attend school) from home	**.85**	-.16	.62
1	Attend meetings / classes using computers or phones (instead of in person)	**.78**	.08	.67
2	Visit friends / family using computers or phones (instead of in person)	**.71**	.07	.55
11	Give time or money to organizations working to reduce the impact of transportation on climate change	-.05	**.84**	.68
10	Problem solve how to reduce the impact of transportation on climate change	.05	**.83**	.73
9	Encourage others to use climate-friendly transportation options	.08	**.82**	.74
6	Carpool	-.16	**.76**	.50
5	Use public transit (trains, buses, subways, etc.)	-.02	**.71**	.49
7	Use an electric / fuel efficient car	-.09	**.64**	.36
4	Use human-powered transport (walk, bicycle, scooter, etc.)	.20	**.44**	.31
8	Combine trips to reduce mileage (e.g., shop on the way home)	.19	**.33**	.20
	Factor Intercorrelations	1	2	
	Factor 1	1		
	Factor 2	.45	1	

Note. h^2 = commonality. Salient factor pattern matrix coefficients are in boldface. Factor 1 = Virtual Participation. Factor 2 = Climate-friendly Transportation.