

Article

Demographic Considerations in Incenting Reuse of Corrugated Cardboard Boxes

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Abstract: Climate change is heavily impacted by greenhouse gases. Many sustainability efforts directly or indirectly affect greenhouse gas (GHG) emissions into the environment. In order to address climate change, sustainability efforts are promoted all around the world. The need to motivate the general population was identified by authors in their previous research. This paper proposes to use a positive reinforcement ethos as a psychological incentive to motivate the general population. This paper further examines the findings of the previous paper to better construct the structure of motivating the general population with the use of this positive reinforcement ethos. This paper attempts to segment the general population based on demographic information including age, gender, awareness of climate change, and current recycling efforts to examine its relevance with persuasion and operant conditions. Further, this paper also tests the hypothesis of using entropy as a tool to identify confusing/leading questions on the survey. Two different sustainability effort options are explored: returning and reusing Corrugated Cardboard Boxes (CCBs). An online survey is conducted, and its data are analyzed to test these hypotheses. The results indicate that reusing CCBs is statistically significantly preferred over returning them. Also, ethos and aesthetics are statistically significantly preferred over logos and pathos. Segmenting the general population based on demographic does not yield any significant effect on motivating the general population. The results of this study can be applied to motivate the general population for different sustainability efforts such as promoting green energy, waste management, and other initiatives.



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1. Introduction

The United States Environmental Protection Agency (EPA) defines sustainability as “everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations” [1]. Thus, promoting sustainability efforts is important, at a minimum, since humans are directly or indirectly dependent on the environment. According to the United Nations Climate Action (UNCA) [2], the largest contributor to global climate change is the use of fossil fuels and the carbon emissions from it. The seven causes identified by the United Nations Climate Action are generating power, manufacturing goods, cutting down forests, using transportation, producing food, powering buildings, and overconsuming. The recycling process, as seen in the recent literature reviews, is one of the options to reduce greenhouse gas emissions [3–9]. The Intergovernmental Panel on Climate Change (IPCC) states that “Recycling reduces GHG emissions through lower energy demand for production (avoided fossil fuel) and by substitution of recycled feedstocks for virgin materials” [10] (p. 602). Although recycling would help in reducing GHG emissions, the motivation for recycling is lacking in the general population, as observed by Abila [11], Gilli et al. [12], Kattoua et al. [13], Seacat and Boileau [14], and Li et al. [15]. The

authors, in a previous work [16], proposed ways to encourage the general population to reuse Corrugated Cardboard Boxes (CCBs) instead of landfilling them with the use of incentive methods combining operant conditioning and persuasion preferences. The authors, moreover, showed that a lifecycle assessment and economic cost analysis of reusing CCBs is possible [17]. The current research tries to reduce carbon emissions from five of the seven causes (apart from producing food and overconsumption) identified by UNCA in the case of CCBs. Promoting sustainable efforts is important, which is the reason behind focusing on studying the incentive techniques and recommendations from the authors' previous papers in depth [16,17]. The authors [16] concluded that in terms of motivating the general population for sustainable efforts, segmenting the general population into groups and incenting each group according to their preference is ineffective. A more general incentivization approach for the general population was recommended. In order to effectively motivate the general population for sustainable efforts, it is important to evaluate this claim of segmentation using additional segmenting options. While conducting surveys, it is a common practice among researchers to collect demographic data and analyze the overall data based on subcategories. This paper explores additional segmenting options based on demographic data including age, gender, awareness of environment/climate change, and current recycling efforts.

One of the causes mentioned by the UN for climate change is transportation. It is important in terms of the lifecycle of CCBs to evaluate the transportation option for the proposed reuse phase. Thus, it is worth exploring the options in the collection of CCBs for the reuse phase. One approach is to have the general population assign the used CCBs to a specific bin called the "reuse" bin. These CCBs are then collected by a truck and transported to a specific location for further processing. The other option is that individuals gather their used CCBs and personally drive to the nearest specific location (collection site) for drop-off. These two explored options are very different and require different levels of motivation and carbon emissions. The hypothesis here is that more effort is required for individuals to drive to the collection site. Thus, they would need to be more motivated compared to the other option of assigning CCBs to the reuse bins. The carbon emissions vary for both options, as the option where individuals would need to drive to the collection site would have more carbon emissions as more vehicles are used. Thus, the survey attempts to elicit which method of collecting CCBs for recycling (a reuse bin or dumping at a reuse site) is more appealing to the general population, with respect to operant conditions and persuasion techniques.

Many research papers discuss the methodology for developing a questionnaire that avoids the use of leading/confusing questions [18–23]. The authors in [16] also proposed a new tool for using entropy calculations to evaluate the questions asked on the survey to identify if any particular question is biased/confusing/double-barreled. This research further investigates if entropy can be used to identify problems with the questions asked on surveys.

Similar studies where the general population was incentivized to reuse instead of the recycling process were not found in the literature review. Research papers [11,12,15,24] tried to promote sustainable efforts in the general population by using incentives. Based on waste management service charges, the authors of [25–27] tried to incentivize the general population to reduce waste generation. The indirect incentive used by [25–27] was to charge the individual household based on the weight of the waste they wanted to dispose. Gibovic and Bikfalvi [28] studied the use of virtual currency as a means of financial incentive to increase the plastic recycling rate in the general population. Thus, the literature review indicated a need to motivate the general population toward sustainable efforts. Also, a unique method of incentivization like using operant conditioning and persuasion techniques was not found.

Overall, this paper tests the hypothesis that segmenting the general population based on age, gender, recycling efforts, and awareness about environment/climate change has a significant impact on people's preference over incentives. By testing this hypothesis,

the findings may add a new way of motivating the general population to the body of knowledge. This research may also prove the use of entropy to analyze the survey data and examine the survey questions.

2. Materials and Methods

Reference [16] concludes that motivating the general population by segmenting them into different groups did not add significant value (measured in terms of overall cost of incentivizing). In order to further examine this methodology for incentivizing sustainable efforts from the general population, an additional survey was carried out. Survey questions and methodology were reviewed and approved by Colorado State University's Institutional Review Board (IRB). The methodology used in this paper is to conduct the survey and analyze data to test the hypothesis. The research methodology used in this paper is consistent with the previous research [16,17] on which this research paper is based. This research method includes carefully wording the questionnaire to test the required hypothesis as well as making sure that the questions or options are not leading/confusing. In order to avoid these errors, entropy is calculated for all the questions. The survey in [16] also uses entropy calculations to determine the quality/clarity of questions with respect to participants' responses. Entropy is a measure of randomness [16], with random data having higher entropy, and vice versa. It is important to test the hypothesis behind the use of entropy as a unit of measure to evaluate the clarity of questions. The authors identified a few questions from [16] under survey #1, which can be categorized as confusing or double-barreled questions. These questions could be confusing to the participants (indicated by exaggerated entropy, a measure of randomness). Thus, rephrasing the questions for clarity and evaluating entropy change would test the hypothesis.

Survey

There were 58 questions in total on this survey. The objective of this survey was to further evaluate and test the results and conclusions from [16] about incentivizing the general population without the necessity of performing market segmentation. This survey evaluates the preferences of the general population with respect to two different ways of collecting processes for the reuse phase (assigning and returning). This survey also evaluates the "entropy" tool by rephrasing the question with high entropy from survey #1 in [16]. Below are the types of questions that were included in this survey.

1. Six questions to note the demographics of the participants participating in this survey.
2. Questions to evaluate the collection process by assigning CCBs to reuse bins.
 - a. Multiple-choice questions (12 questions)
3. Questions to evaluate the collection process by returning CCBs to a specific location.
 - a. Multiple-choice questions (12 questions)
4. Questions to assess persuasion preferences.
 - a. Likert-type questions (20 questions)
5. Questions to evaluate entropy change by rephrasing.
 - a. Likert-type questions (5 questions)

This survey evaluates the possibility of adding value in motivation by segmenting the general population with respect to demographics. Additionally, it identifies the general population's preferences over the collection process of CCBs for reusing.

3. Results

This survey was published online on the social media platform LinkedIn. The survey was also sent to participants from the survey conducted in [16,17]. Additionally, this survey was distributed to the students, faculty, and staff of Colorado State University. The survey was created, and the responses were collected online using the Qualtrics tool. The survey was active for 50 days and received 151 responses. Responses for the survey were provided

by participants from seven countries on four continents. Qualtrics metadata show that the survey received responses from seven countries. The median time to complete this survey was 9.18 min. Once the responses were collected by the Qualtrics tool, the data were then exported and analyzed in Excel and by the IBM SPSS tool.

3.1. Results and Analysis for Assigning Method

3.1.1. Results for Multiple-Choice Questions

Multiple-choice questions were asked with two options representing two persuasion techniques or two operant conditions each for the assigning approach. Thus, the four persuasion techniques (Ethos, Pathos, Logos, and Aesthetics) and four operant conditions (Positive reinforcement, Negative reinforcement, Positive punishment, and Negative punishment) were compared to each other within their respective category. Table 1 gives the results for the multiple-choice questions for assigning CCBs.

Table 1. Results for multiple-choice questions for assigning method.

Q7	Ethos Pathos	130 21	Q19	Positive Reinforcement Positive Punishment	85 66
Q8	Ethos Logos	93 58	Q20	Positive Reinforcement Negative Punishment	92 59
Q9	Aesthetics Ethos	85 66	Q21	Negative Reinforcement Positive Reinforcement	85 66
Q10	Pathos Logos	76 75	Q22	Positive Punishment Negative Punishment	87 64
Q11	Aesthetics Pathos	121 30	Q23	Negative Reinforcement Positive Punishment	87 64
Q12	Aesthetics Logos	108 43	Q24	Negative Reinforcement Negative Punishment	109 42

3.1.2. Analysis of Multiple-Choice Questions

To analyze the answers for the general population's preferences, a chi-square test was conducted to evaluate if one of the two options was significantly preferred by the participants. A chi-square test is used to statistically evaluate the goodness of fit between the expected values and measured values. The total number of participants was 151; thus, the expected value here is the midpoint between 0 and 151, or 75.5. Tables 2 and 3 give the analysis results for assigning CCBs.

Table 2. Chi-square analysis results for persuasion techniques for assigning method.

Question Number	Persuasion Technique	Observed Score	Expected Score	Chi-Square Score	p-Value
Q7	Ethos Pathos	130 21	75.5	78.68	<0.001 *
Q8	Ethos Logos	93 58	75.5	8.11	0.004 *
Q9	Aesthetics Ethos	85 66	75.5	2.39	0.122
Q10	Pathos Logos	76 75	75.5	0.01	0.935
Q11	Aesthetics Pathos	121 30	75.5	54.84	<0.001 *
Q12	Aesthetics Logos	108 43	75.5	27.98	<0.001 *

An asterisk (*) indicates that the results are statistically significant at $p \leq 0.01$.

Table 3. Chi-square analysis results for operant conditioning for assigning method.

Question Number	Operant Condition	Observed Score	Expected Score	Chi-Square Score	p-Value
Q19	Positive Reinforcement	85	75.5	2.39	0.122
	Positive Punishment	66			
Q20	Positive Reinforcement	92	75.5	7.21	0.007 *
	Negative Punishment	59			
Q21	Negative Reinforcement	85	75.5	2.39	0.122
	Positive Reinforcement	66			
Q22	Positive Punishment	87	75.5	3.50	0.061
	Negative Punishment	64			
Q23	Negative Reinforcement	87	75.5	3.50	0.061
	Positive Punishment	64			
Q24	Negative Reinforcement	109	75.5	29.72	<0.001 *
	Negative Punishment	42			

An asterisk (*) indicates that the results are statistically significant at $p \leq 0.01$.

3.2. Results and Analysis for Returning Method

3.2.1. Results for Multiple-Choice Questions

Multiple-choice questions were asked with two options representing two persuasion techniques or two operant conditions each for the returning approach. Thus, the four persuasion techniques and four operant conditions were compared to each other within their respective categories. Table 4 gives the results for the multiple-choice questions for returning CCBs.

Table 4. Results for multiple-choice questions for returning method.

Q13	Ethos	129	Q25	Positive Reinforcement	93
	Pathos	22		Positive Punishment	58
Q14	Ethos	81	Q26	Positive Reinforcement	105
	Logos	70		Negative Punishment	46
Q15	Aesthetics	82	Q27	Positive Reinforcement	79
	Ethos	69		Negative Reinforcement	72
Q16	Logos	86	Q28	Positive Punishment	86
	Pathos	65		Negative Punishment	65
Q17	Aesthetics	123	Q29	Negative Reinforcement	82
	Pathos	28		Positive Punishment	69
Q18	Aesthetics	90	Q30	Negative Reinforcement	105
	Logos	61		Negative Punishment	46

3.2.2. Analysis for Multiple-Choice Questions

A chi-square test was again conducted to evaluate if one of the two options is significantly preferred by the participants. The expected value here is considered to be 75.5, as mentioned earlier. Tables 5 and 6 give the analysis results for returning CCBs.

3.3. Results and Analysis for Likert Scale Questions

3.3.1. Results for Likert Scale Questions

Likert scale questions were asked to evaluate the general population's preferences for persuasion techniques. Likert scale questions include five options as follows: strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree. To evaluate the results based on the responses, a linear scoring scale was considered with strongly disagree as 1 and strongly agree as 5. Table 7 gives the results for the Likert scale questions.

Table 5. Chi-square analysis results for persuasion techniques for returning method.

Question Number	Persuasion Technique	Observed Score	Expected Score	Chi-Square Score	<i>p</i> -Value
Q13	Ethos	129	75.5	75.82	<0.001 *
	Pathos	22			
Q14	Ethos	81	75.5	0.80	0.370
	Logos	70			
Q15	Aesthetics	82	75.5	1.11	0.290
	Ethos	69			
Q16	Logos	86	75.5	2.92	0.087
	Pathos	65			
Q17	Aesthetics	123	75.5	59.76	<0.001 *
	Pathos	28			
Q18	Aesthetics	90	75.5	5.57	0.018
	Logos	61			

An asterisk (*) indicates that the results are statistically significant at $p \leq 0.01$.

Table 6. Chi-square analysis results for operant conditioning for assigning approach.

Question Number	Operant Condition	Observed Score	Expected Score	Chi-Square Score	<i>p</i> -Value
Q25	Positive Reinforcement	93	75.5	8.113	0.004 *
	Positive Punishment	58			
Q26	Positive Reinforcement	105	75.5	23.053	<0.001 *
	Negative Punishment	46			
Q27	Positive Reinforcement	79	75.5	0.325	0.568
	Negative Reinforcement	72			
Q28	Positive Punishment	86	75.5	2.921	0.087
	Negative Punishment	65			
Q29	Negative Reinforcement	82	75.5	1.119	0.290
	Positive Punishment	69			
Q30	Negative Reinforcement	105	75.5	23.053	<0.001 *
	Negative Punishment	46			

An asterisk (*) indicates that the results are statistically significant at $p \leq 0.01$.

3.3.2. Analysis of Likert Scale Questions

To analyze the data from Likert scale questions, an independent *t*-test was calculated to compare each pair of persuasion technique scores. Table 8 gives the results of the independent *t*-tests on the Likert scale questions.

Table 7. Results for Likert scale questions.

Persuasion Technique	Question Number	Score	Mean Score
Aesthetics	Q35	4.37	4.28
	Q40	4.31	
	Q45	4.32	
	Q50	4.28	
	Q54	4.13	
Ethos	Q32	4.19	4.21
	Q36	4.25	
	Q41	4.28	
	Q46	4.07	
	Q51	4.26	
Logos	Q34	4.06	3.46
	Q39	4.06	
	Q44	3.80	
	Q48	2.21	
	Q53	3.15	

Table 7. Cont.

Persuasion Technique	Question Number	Score	Mean Score
Pathos	Q33	3.56	3.98
	Q38	4.04	
	Q42	3.99	
	Q47	4.05	
	Q52	4.28	

Table 8. Independent *t*-test results of Likert scale questions.

Comparison of Persuasion Techniques	<i>t</i> -Value	<i>p</i> -Value
Ethos (4.21) with Pathos (3.98)	2.25	0.024 *
Ethos (4.21) with Logos (3.46)	2.59	0.013 *
Aesthetics (4.28) with Ethos (4.21)	1.57	0.073
Aesthetics (4.28) with Pathos (3.98)	2.94	0.007 *
Aesthetics (4.28) with Logos (3.46)	2.84	0.008 *
Logos (3.46) with Pathos (3.98)	1.61	0.069

An asterisk (*) indicates that the results are statistically significant at $p \leq 0.05$.

3.4. Results and Analysis of Data Based on Demographics

3.4.1. Results Based on Demographics

In total, six demographic questions were asked. These questions help to identify a participant's age, gender, awareness of climate change, and current recycling efforts. Figure 1 shows the results of the distribution of participants based on the respective demographic information.

3.4.2. Analysis of Data Based on Demographics

The data are partitioned by demographics and analyzed based on the question types. The detailed results of the analyzed data are given in Appendix A. The sections below give a brief summary of those results.

Summary of Analyzed Data from Multiple-Choice Questions

Table 9 gives a summary of the results for the multiple-choice questions. Additionally, a chi-square test was conducted to analyze the data.

Table 9. Summary of results for chi-square test on multiple-choice questions.

			Ethos	Pathos	Logos	Aesthetics	Positive Reinforcement	Positive Punishment	Negative Punishment	Negative Reinforcement
Based on Age	18–30	Mean	30.3	10.7	29.8	36.0	30.2	32.8	17.0	26.0
		Std. Dev.	12.5	4.9	5.7	9.0	6.5	6.8	4.6	6.7
	31–45	Mean	35.3	16.3	21.7	35.8	30.2	28.3	18.8	32.7
		Std. Dev.	8.9	10.2	5.2	8.2	5.3	4.6	2.4	4.9
	46+	Mean	25.7	12.0	12.3	24.8	23.2	9.8	15.8	27.2
		Std. Dev.	6.2	7.7	4.6	5.8	5.0	2.3	8.8	5.4
Based on Gender	Prefer Not to Answer	Mean	3.3	1.3	1.7	3.6	3.2	0.7	2.0	4.2
		Std. Dev.	1.4	1.4	0.5	0.5	1.0	0.5	1.7	1.0
	Male	Mean	44.7	19.8	26.5	45.8	38.7	28.7	28.0	42.7
		Std. Dev.	12.1	13.8	5.8	10.3	5.4	4.0	7.1	6.0
	Female	Mean	46.5	19.5	37.3	50.6	44.8	41.3	23.3	44.5
		Std. Dev.	15.3	8.8	9.2	9.1	9.3	8.4	3.2	8.5
Based on Gender	Prefer Not to Mention	Mean	2.0	0.7	1.0	2.4	2.5	0.0	1.3	2.2
		Std. Dev.	0.9	1.0	0.0	0.5	0.5	0.0	1.4	1.0
	Non-Binary	Mean	1.5	0.3	0.7	1.4	0.7	1.7	1.0	0.7
		Std. Dev.	0.5	0.5	0.5	0.5	0.8	0.5	0.6	0.5

Table 9. Cont.

			Ethos	Pathos	Logos	Aesthetics	Positive Reinforcement	Positive Punishment	Negative Punishment	Negative Reinforcement
Based on Awareness	Tremendous	Mean	14.7	6.0	11.5	15.6	12.2	10.5	7.8	17.5
		Std. Dev.	4.1	2.4	3.4	3.5	3.7	2.1	3.9	3.0
	High	Mean	48.7	19.3	30.3	48.8	44.0	33.3	28.2	42.5
		Std. Dev.	14.7	13.7	7.3	11.0	5.3	5.6	5.8	7.1
	Moderate	Mean	28.7	13.0	22.3	34.0	29.0	25.5	16.0	27.5
		Std. Dev.	10.3	7.6	5.0	6.1	4.9	5.3	1.9	4.7
	Little	Mean	2.7	2.0	1.3	1.8	1.5	2.3	1.7	2.5
		Std. Dev.	0.5	0.6	0.5	0.4	0.8	0.5	0.8	0.5
Based on Recycling Efforts	Tremendous	Mean	4.2	2.3	3.7	3.8	4.7	1.8	2.5	5.0
		Std. Dev.	0.8	0.5	0.5	1.1	1.0	1.0	1.6	1.7
	High	Mean	44.2	17.0	31.3	48.8	41.0	32.5	24.3	44.2
		Std. Dev.	15.3	10.7	9.9	9.1	6.0	5.2	7.6	9.0
	Moderate	Mean	37.7	15.8	22.3	35.6	30.2	29.8	19.7	32.3
		Std. Dev.	9.5	11.5	3.2	9.4	6.0	5.6	1.8	4.6
	Little	Mean	7.0	3.2	7.2	10.8	8.5	6.8	6.5	6.2
		Std. Dev.	4.0	1.5	1.8	2.2	1.8	0.8	2.4	1.2
	Very Little	Mean	1.7	2.0	1.0	1.2	2.3	0.7	0.7	2.3
		Std. Dev.	0.5	0.0	0.0	0.4	0.5	0.8	0.8	1.0

Summary of Analyzed Data from Likert Scale Questions

Table 10 below shows the results of the Likert scale questions for persuasion techniques based on the demographics. To analyze the following data, *t*-tests were conducted by comparing the persuasion techniques to each other.

Table 10. Independent *t*-test results.

		Aesthetics	Ethos	Logos	Pathos
Based on Age	18–30	4.40	4.40	3.63	4.06
	31–45	4.31	4.25	3.43	4.05
	46+	4.15	3.97	3.27	3.87
	Prefer Not to Answer	3.84	3.56	3.32	3.32
Based on Gender	Male	4.27	4.14	3.47	3.94
	Female	4.32	4.30	3.48	4.05
	Non-Binary	4.30	4.30	2.90	3.90
	Prefer Not to Mention	3.80	3.67	3.13	3.47
Based on Awareness	Tremendous	4.44	4.52	3.28	4.08
	High	4.29	4.22	3.50	4.05
	Moderate	4.16	4.02	3.47	3.83
	Little	4.75	4.50	3.55	4.00
Based on Recycling Efforts	Tremendous	4.00	3.69	2.91	3.74
	High	4.44	4.42	3.47	4.21
	Moderate	4.17	4.03	3.54	3.83
	Little	3.97	3.97	3.43	3.43
	Very Little	4.73	5.00	3.00	4.87

3.5. Results and Analysis for Entropy Calculations

3.5.1. Results for Entropy Calculation Questions

In total, five questions were asked on the survey to examine the entropy change. These questions (originally from [16]) were reworded for clarity. Table 11 shows the answers to five Likert scale questions from the survey (originally reworded from [16]).

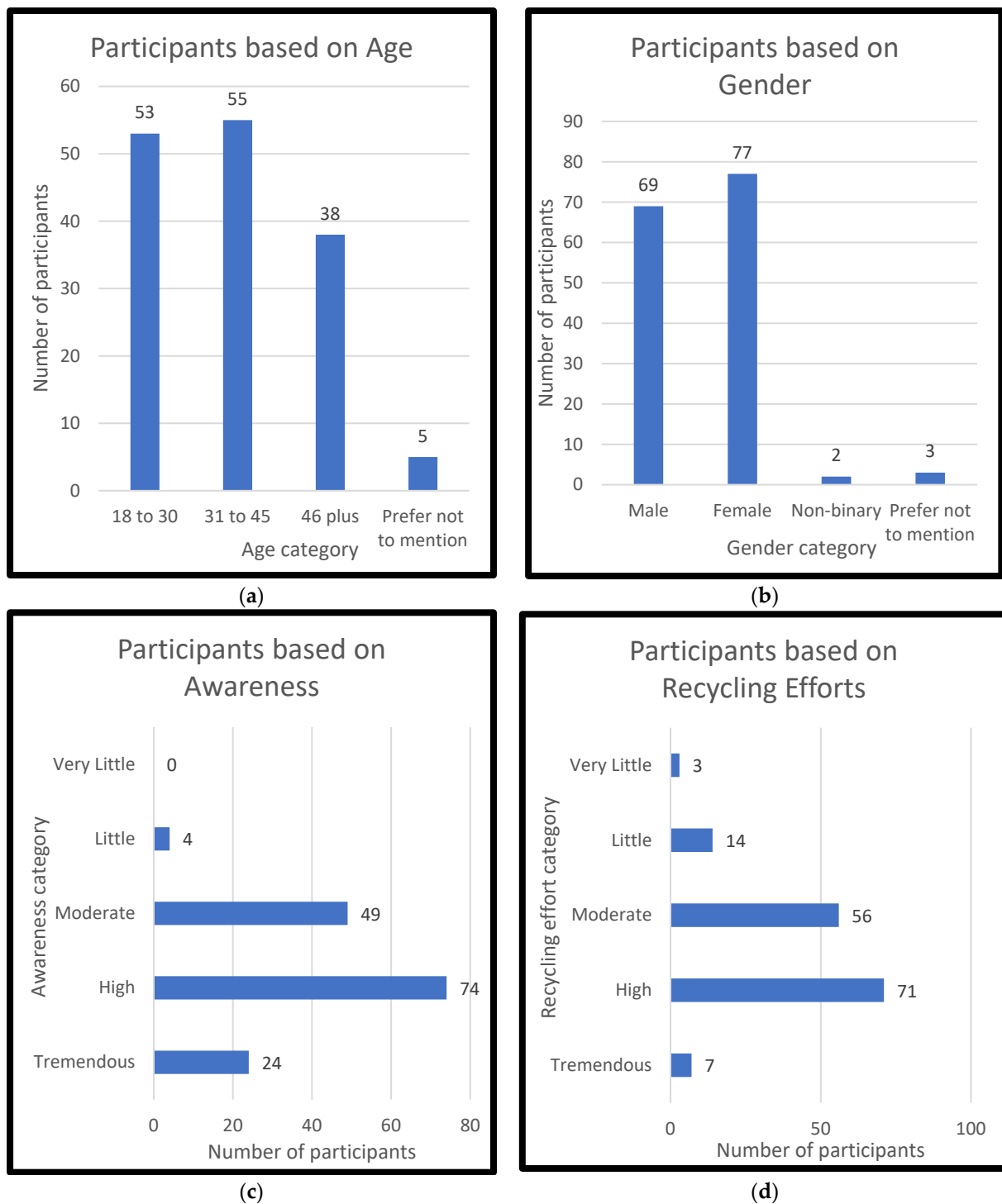


Figure 1. Results for participant's demographics based on (a) age, (b) gender, (c) awareness, and (d) recycling efforts.

3.5.2. Analysis for Entropy Calculations

As explained in [16], entropy is a measure of randomness. Entropy increases as randomness in data increases, and vice versa. In the case of Likert scale questions, high entropy may indicate confusion in questions, as it is primarily expected that the population

of response would be around two main options (strongly disagree or strongly agree). Entropy is calculated by using Equation (1).

$$e = -\sum_{i=1}^N p_i \ln(p_i) \quad (1)$$

The entropy values from [16] and this survey are compared, and the differences between the two values are calculated as shown in Table 12.

Table 11. Results for Likert scale question for entropy calculation.

[16] Reference Question Number	Question Number (Current Survey)	Score
Q13	Q55	3.66
Q14	Q56	4.54
Q17	Q57	3.60
Q27	Q58	3.46
Q32	Q59	4.14

Table 12. Entropy calculations for reworded questions.

[16] Reference Question Number	Entropy Values from [16]	Question Number (Current Survey)	Entropy Values from this Survey	Entropy Difference	Entropy Difference (%)
Q13	2.11	Q55	2.10	0.01	0.47%
Q14	1.92	Q56	1.30	0.62	32.29%
Q17	2.03	Q57	2.11	−0.08	−3.94%
Q27	2.21	Q58	2.11	0.10	4.52%
Q32	2.16	Q59	1.74	0.42	19.44%

4. Discussion

In total, 24 multiple-choice questions were asked on the survey, each of which compared two options among the four choices (for motivation or the operant condition). A chi-square test was carried out to evaluate the participant's preference among the six total comparisons (1 vs. 2, 1 vs. 3, 1 vs. 4, 2 vs. 3, 2 vs. 4, and 3 vs. 4). Tables 1 and 4 give the preference results for assigning CCBs to the reuse bin and returning CCBs to specific locations, respectively. For assigning CCBs with respect to persuasion techniques, it can be observed from Table 2 that the general population statistically significantly more willingly responds toward ethos and aesthetics over logos and pathos. It can be observed that the difference between ethos and aesthetics, as well as the difference between pathos and logos, is not statistically significant. For assigning CCBs with respect to operant conditions, it can be observed from Table 3 that positive reinforcement is statistically significantly preferred over negative punishment, and negative reinforcement is statistically significantly preferred over negative punishment. The other four comparisons of operant conditions to each other are not statistically significantly different. For returning CCBs with respect to persuasion techniques, it can be observed from Table 5 that the general population statistically significantly prefers ethos over pathos and aesthetics over pathos. The difference between logos and both aesthetics and pathos is not statistically significant, whereas the difference between ethos and both logos and aesthetics is not statistically significant. For returning CCBs with respect to operant conditions, it can be observed from Table 6 that positive reinforcement is statistically significantly preferred over both negative punishment and positive punishment. Also, negative reinforcement is statistically significantly preferred over negative punishment. The difference between positive punishment and both negative punishment and negative reinforcement is not statistically significant. Additionally, the difference between positive punishment and negative reinforcement is not statistically significant. Table 7 shows the results for Likert scale questions that evaluate the persuasion preferences of participants. The questions are scored on a scale of 1 to 5, where 1 is strongly

disagree (not preferred) and 5 is strongly agree (preferred). Aesthetics scored highest, followed by ethos with a small, statistically insignificant, margin (0.07), pathos, and logos. The *t*-test shows that at $p \leq 0.05$, ethos and aesthetics are statistically significantly different from pathos and logos. It also shows that the difference between ethos and aesthetics as well as logos and pathos is not statistically significant.

This paper mainly evaluates if segmenting the general population based on their demographic information is an effective approach for motivating the general population to adopt desired sustainable efforts. Table 9 gives the mean and standard deviation of the scores that a multiple-choice question scored with respect to segmenting the general population based on demographics. Tables A1–A4 from Appendix A show the chi-square scores as well as the *p*-values for these multiple-choice questions based on age, gender, awareness, and recycling efforts, respectively. In total, 12 questions (from Q7 to Q18) compare four persuasion techniques to each other. Another 12 questions (from Q19 to Q30) compare four operant conditions to each other. Thus, every pair of persuasion techniques and operant conditions are evaluated twice. Table 10 gives the Likert scale for each persuasion technique with respect to demographics. These scores are calculated by taking the mean of the five questions asked for each persuasion technique. In order to analyze these scores, a *t*-test is conducted by comparing each persuasion technique to the others. Tables A5–A12 from Appendix A show the *t*-value as well as the *p*-value for these Likert scale questions based on age, gender, awareness, and recycling efforts, respectively. In order to better interpret the tabulated results in Appendix A, *p*-values below 0.01 are highlighted in green. Table 11 shows the results for entropy calculations as well as the reference questions from [16] that were reworded. It can be observed from Table 12 that entropy decreased for Q55, Q56, Q58, and Q59. Only Q57 had an increase in entropy by 3.94%. Overall, for five questions, the entropy decreased by 10.56%. The proposed incentivization tool can be used globally, as the overall recycling rate is low compared to other end-of-lifecycle processes. An example of this trend can be observed with the global end-of-lifecycle process of plastic waste. The Organization for Economic Cooperation and Development (OECD) [29,30] shows that as of 2015, 14–18% of global plastic waste is collected for recycling, and 24% of the global plastic waste is thermally treated. The remaining 58–62% of plastic waste ends up in a controlled or uncontrolled landfill. Plastic recycling percentages based on countries [29] include the USA (9%), Australia (12%), Japan (23%), and the EU (30%). As observed in the above data, different countries have different recycling rates for plastics. The plastic recycling example gives a rough idea about the infrastructure in place as well as the difference in the level of motivation for recycling.

From the results and analysis of the multiple-choice questions, it can be observed that for assigning CCBs to the reuse bin, the general population statistically significantly preferred aesthetics and ethos over pathos and logos. This indicates that both ethos and aesthetics persuasion techniques are preferred by the general population for assigning CCBs. In the case of assigning CCBs with respect to operant conditions, no statistically significant preference was found. In the case of returning CCBs with the help of persuasion techniques and operant conditions, no statistically significant preference for a single persuasion technique over another or a single operant condition over another was found. In the case of the Likert scale questions, the results are similar to those of assigning CCBs to reuse bins, with the general population statistically significantly preferring both ethos and aesthetics over logos and pathos. This implies that both aesthetics and ethos are recommended to use to motivate the general population for sustainable efforts. This survey segments the general population based on gender, age, awareness of environment/climate change, and current recycling efforts. The authors conducted *t*-test and chi-square tests on the results and evaluated each sub-category for assigning/returning CCBs with respect to persuasion techniques and operant conditions. It can be concluded that no statistically significant trend in the preferences was observed, implying that the same motivation techniques are broadly applicable across demographics. This paper also examines the use of entropy to evaluate questions for confusion and/or for being double-barreled. The results for the five

reworded questions from [16] show that the entropy decreased by 10.6% overall. As these five questions were identified by the authors to be confusing and double-barreled in [16], they were reworded to make them clearer and more direct.

5. Conclusions

The purpose of this paper was to further examine the results from [16] regarding segmenting the general population to effectively motivate it for sustainable efforts. It can be concluded that the segmentation of the general population based on demographics does not yield an effective way of incentivizing the general population for sustainable efforts. Also, to motivate the general population to conduct sustainable efforts, ethos and aesthetics are preferred among the four types of motivation that were evaluated. This supports the claim from [16] about not segmenting the general population for motivation as well as using ethos to motivate the general population. In terms of assigning CCBs to the reuse bin and returning CCBs to a specific location, it can be concluded that assigning CCBs to the reuse bin is preferred by the general population over returning them, which is considered in the life cycle analysis (LCA) for reusing CCBs in [17]. It can be also concluded that entropy may be used in some cases to evaluate the clarity/quality of the survey questions.

Overall, the proposed model from [16,17] and this paper can be tailored to different products and their unique lifecycles. The life cycle analysis (LCA) conducted in [17] would have a different set of data and different processes with respect to the different countries but can still follow the same process. Thus, the overall research provides a repurposable model that can be adjusted for any other products or processes to promote sustainable efforts among the general population and estimate the carbon emissions savings from the LCA. One of the outlooks of this research is the potential application of this new incentive tool of operant condition and persuasion techniques being used to promote sustainable cars, renewable energy, healthcare applications like vaccinations, etc.

The future scope and prospects of this study include identifying a way to convey the incentive message as well as exploring different incentive delivery methods. Research in the area of the implementation of these incentives may play a vital role in further validating this new approach. As seen from the entropy calculations, it is important to frame a clear incentive message. The use of the entropy concept as a tool to evaluate questionnaires may help future researchers to evaluate their questions and improve them accordingly.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Appendix A

Table A1. Analysis of multiple-choice questions based on age. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

		18–30			31–45			46+			Prefer Not to Mention		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q7	Ethos	46	28.69	<0.001	46	24.89	<0.001	33	20.63	<0.001	5	5.00	0.025
	Pathos	7			9			5			0		
Q8	Ethos	28	0.17	0.68	36	5.26	0.021	26	5.16	0.023	3	0.20	0.654
	Logos	25			19			12			2		
Q9	Ethos	20	3.19	0.074	24	0.89	0.345	20	0.11	0.745	2	0.20	0.654
	Aesthetics	33			31			18			3		
Q10	Pathos	17	6.81	0.009	33	2.20	0.138	23	1.68	0.194	3	0.20	0.654
	Logos	36			22			15			2		
Q11	Pathos	8	25.83	<0.001	12	17.47	0.001	9	10.53	0.001	1	1.80	0.179
	Aesthetics	45			43			29			4		
Q12	Logos	22	1.53	0.216	14	13.26	0.001	6	17.79	0.001	1	1.80	0.179
	Aesthetics	31			41			32			4		
Q13	Ethos	46	28.69	<0.001	45	22.27	<0.001	33	20.63	<0.001	5	5.00	0.025
	Pathos	7			10			5			0		
Q14	Ethos	22	1.53	0.216	33	2.20	0.138	23	1.68	0.194	3	0.20	0.654
	Logos	31			22			15			2		
Q15	Ethos	20	3.19	0.007	28	0.02	0.892	19	0.00	1	2	0.20	0.654
	Aesthetics	33			27			19			3		
Q16	Pathos	17	6.81	0.009	25	0.46	0.500	20	0.11	0.745	3	0.20	0.654
	Logos	36			30			18			2		
Q17	Pathos	8	25.83	<0.001	9	24.89	<0.001	10	8.53	0.003	1	1.80	0.179
	Aesthetics	45			46			28			4		
Q18	Logos	29	0.47	0.492	23	1.47	0.224	8	12.74	0.001	1	1.80	0.179
	Aesthetics	24			32			30			4		
Q19	Positive Reinforcement	23	0.93	0.336	30	0.46	0.500	28	8.53	0.003	4	1.80	0.179
	Positive Punishment	30			25			10			1		
Q20	Positive Reinforcement	30	0.93	0.336	36	5.26	0.021	23	1.68	0.194	3	0.20	0.654
	Negative Punishment	23			19			15			2		
Q21	Positive Reinforcement	24	0.47	0.492	22	2.20	0.138	18	0.11	0.745	2	0.20	0.654
	Negative Reinforcement	29			33			20			3		
Q22	Positive Punishment	40	13.76	0.001	36	5.26	0.021	10	8.53	0.003	1	1.80	0.179
	Negative Punishment	13			19			28			4		
Q23	Positive Punishment	30	0.93	0.336	25	0.46	0.500	9	10.53	0.001	0	5.00	0.025
	Negative Reinforcement	23			30			29			5		
Q24	Negative Punishment	19	4.25	0.039	17	8.02	0.004	5	20.63	<0.001	1	1.80	0.179
	Negative Reinforcement	34			38			33			4		
Q25	Positive Reinforcement	31	1.53	0.216	29	0.16	0.685	29	10.53	0.001	4	1.80	0.179
	Positive Punishment	22			26			9			1		
Q26	Positive Reinforcement	41	15.87	0.001	36	5.26	0.021	24	2.63	0.104	4	1.80	0.179
	Negative Punishment	12			19			14			1		
Q27	Positive Reinforcement	32	2.28	0.130	28	0.02	0.892	17	0.42	0.516	2	0.20	0.654
	Negative Reinforcement	21			27			21			3		
Q28	Positive Punishment	39	11.79	0.001	32	1.47	0.224	14	2.63	0.104	1	1.80	0.179
	Negative Punishment	14			23			24			4		
Q29	Positive Punishment	36	6.81	0.009	26	0.16	0.685	7	15.16	0.001	0	5.00	0.025
	Negative Reinforcement	17			29			31			5		
Q30	Negative Punishment	21	2.28	0.130	16	9.62	0.001	9	10.53	0.001	0	5.00	0.025
	Negative Reinforcement	32			39			29			5		

Table A2. Analysis of multiple-choice questions based on gender. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

		Male			Female			Prefer Not to Mention			Non-Binary		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q7	Ethos	60	37.70	<0.001	65	369.48	<0.001	3	3.00	0.083	2	2.00	0.157
	Pathos	9			12			0			0		
Q8	Ethos	42	3.26	0.070	47	3.75	0.052	2	0.33	0.563	2	2.00	0.157
	Logos	27			30			1			0		
Q9	Ethos	32	0.36	0.547	32	2.20	0.138	1	0.33	0.563	1	0.00	1
	Aesthetics	37			45			2			1		
Q10	Pathos	39	1.17	0.278	34	1.05	0.305	2	0.33	0.563	1	0.00	1
	Logos	30			43			1			1		

Table A2. Cont.

		Male			Female			Prefer Not to Mention			Non-Binary		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q11	Pathos	12	29.35	<0.001	18	21.83	<0.001	0	3.00	0.083	0	2.00	0.157
	Aesthetics	57			59			3			2		
Q12	Logos	16	19.84	<0.001	26	8.12	0.004	1	0.33	0.563	0	2.00	0.157
	Aesthetics	53			51			2			2		
Q13	Ethos	59	34.80	<0.001	65	369.48	<0.001	3	3.00	0.083	2	2.00	0.157
	Pathos	10			12			0			0		
Q14	Ethos	41	2.45	0.117	37	0.12	0.732	2	0.33	0.563	1	0.00	1
	Logos	28			40			1			1		
Q15	Ethos	34	0.01	0.904	33	1.57	0.21	1	0.33	0.563	1	0.00	1
	Aesthetics	35			44			2			1		
Q16	Pathos	36	0.13	0.717	26	8.12	0.004	2	0.33	0.563	1	0.00	1
	Logos	33			51			1			1		
Q17	Pathos	13	26.80	<0.001	15	28.69	<0.001	0	3.00	0.083	0	2.00	0.157
	Aesthetics	56			62			3			2		
Q18	Logos	25	5.23	0.022	34	1.05	0.305	1	0.33	0.563	1	0.00	1
	Aesthetics	44			43			2			1		
Q19	Positive Reinforcement	41	2.45	0.117	41	0.33	0.568	3	3.00	0.083	0	2.00	0.157
	Positive Punishment	28			36			0			2		
Q20	Positive Reinforcement	39	1.17	0.278	51	8.12	0.004	2	0.33	0.563	0	2.00	0.157
	Negative Punishment	30			26			1			2		
Q21	Positive Reinforcement	30	1.17	0.278	32	2.20	0.138	2	0.33	0.563	2	2.00	0.157
	Negative Reinforcement	39			45			1			0		
Q22	Positive Punishment	33	0.13	0.717	53	10.92	0.001	0	3.00	0.083	1	0.00	1
	Negative Punishment	36			24			3			1		
Q23	Positive Punishment	27	3.26	0.070	36	0.33	0.568	0	3.00	0.083	1	0.00	1
	Negative Reinforcement	42			41			3			1		
Q24	Negative Punishment	18	15.78	0.001	22	14.14	0.001	1	0.33	0.563	1	0.00	1
	Negative Reinforcement	51			55			2			1		
Q25	Positive Reinforcement	45	6.39	0.011	45	2.20	0.138	3	3.00	0.083	0	2.00	0.157
	Positive Punishment	24			32			0			2		
Q26	Positive Reinforcement	42	3.26	0.070	59	21.83	<0.001	3	3.00	0.083	1	0.00	1
	Negative Punishment	27			18			0			1		
Q27	Positive Reinforcement	35	0.01	0.904	41	0.33	0.568	2	0.33	0.563	1	0.00	1
	Negative Reinforcement	34			36			1			1		
Q28	Positive Punishment	34	0.01	0.904	50	6.87	0.008	0	3.00	0.083	2	2.00	0.157
	Negative Punishment	35			27			3			0		
Q29	Positive Punishment	26	4.19	0.040	41	0.33	0.568	0	3.00	0.083	2	2.00	0.157
	Negative Reinforcement	43			36			3			0		
Q30	Negative Punishment	22	9.06	0.002	23	12.48	0.001	0	3.00	0.083	1	0.00	1
	Negative Reinforcement	47			54			3			1		

Table A3. Analysis of multiple-choice questions based on awareness. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

		Tremendous			High			Moderate			Little			Very Little		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q7	Ethos	20	10.67	0.001	66	45.46	<0.001	41	22.22	<0.001	3	1.00	0.317	0	-	-
	Pathos	4			8			8			1			0		
Q8	Ethos	12	0.00	1	49	7.78	0.005	29	1.65	0.198	3	1.00	0.317	0	-	-
	Logos	12			25			20			1			0		
Q9	Ethos	12	0.00	1	31	1.95	0.163	20	1.65	0.198	3	1.00	0.317	0	-	-
	Aesthetics	12			43			29			1			0		
Q10	Pathos	9	1.50	0.220	40	0.49	0.485	25	0.02	0.886	2	0.00	1	0	-	-
	Logos	15			34			24			2			0		
Q11	Pathos	5	8.17	0.004	13	31.14	<0.001	10	17.16	0.001	2	0.00	1	0	-	-
	Aesthetics	19			61			39			2			0		
Q12	Logos	7	4.17	0.041	20	15.62	0.001	15	7.37	0.006	1	1.00	0.317	0	-	-
	Aesthetics	17			54			34			3			0		
Q13	Ethos	20	10.67	0.001	66	45.46	<0.001	41	22.22	<0.001	2	0.00	1	0	-	-
	Pathos	4			8			8			2			0		
Q14	Ethos	12	0.00	1	43	1.95	0.163	23	0.18	0.668	3	1.00	0.317	0	-	-
	Logos	12			31			26			1			0		
Q15	Ethos	12	0.00	1	37	0.00	1	18	3.45	0.063	2	0.00	1	0	-	-
	Aesthetics	12			37			31			2			0		
Q16	Pathos	9	1.50	0.220	33	0.87	0.352	20	1.65	0.198	3	1.00	0.317	0	-	-
	Logos	15			41			29			1			0		
Q17	Pathos	5	8.17	0.004	14	28.60	<0.001	7	25.00	<0.001	2	0.00	1	0	-	-
	Aesthetics	19			60			42			2			0		
Q18	Logos	8	2.67	0.102	31	1.95	0.163	20	1.65	0.198	2	0.00	1	0	-	-
	Aesthetics	16			43			29			2			0		
Q19	Positive Reinforcement	12	0.00	1	44	2.65	0.103	28	1.00	0.317	1	1.00	0.317	0	-	-
	Positive Punishment	12			30			21			3			0		

Table A3. Cont.

		Tremendous			High			Moderate			Little			Very Little		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q20	Positive Reinforcement	15	1.50	0.220	43	1.95	0.163	33	5.90	0.015	1	1.00	0.317	0	-	-
	Negative Punishment	9			31			16			3			0		
Q21	Positive Reinforcement	6	6.00	0.014	37	0.00	1	22	0.51	0.475	1	1.00	0.317	0	-	-
	Negative Reinforcement	18			37			27			3			0		
Q22	Positive Punishment	12	0.00	1	40	0.49	0.485	33	5.90	0.015	2	0.00	1	0	-	-
	Negative Punishment	12			34			16			2			0		
Q23	Positive Punishment	8	2.67	0.102	33	0.87	0.352	21	1.00	0.317	2	0.00	1	0	-	-
	Negative Reinforcement	16			41			28			2			0		
Q24	Negative Punishment	3	13.50	0.001	23	10.60	0.001	15	7.37	0.006	1	1.00	0.317	0	-	-
	Negative Reinforcement	21			51			34			3			0		
Q25	Positive Reinforcement	15	1.50	0.220	49	7.78	0.005	27	0.51	0.475	2	0.00	1	0	-	-
	Positive Punishment	9			25			22			2			0		
Q26	Positive Reinforcement	15	1.50	0.220	51	10.60	0.001	36	10.80	0.001	3	1.00	0.317	0	-	-
	Negative Punishment	9			23			13			1			0		
Q27	Positive Reinforcement	10	0.67	0.414	40	0.49	0.485	28	1.00	0.317	1	1.00	0.317	0	-	-
	Negative Reinforcement	14			34			21			3			0		
Q28	Positive Punishment	13	0.17	0.683	39	0.22	0.641	31	3.45	0.063	3	1.00	0.317	0	-	-
	Negative Punishment	11			35			18			1			0		
Q29	Positive Punishment	9	1.50	0.220	33	0.87	0.352	25	0.02	0.886	2	0.00	1	0	-	-
	Negative Reinforcement	15			41			24			2			0		
Q30	Negative Punishment	3	13.50	0.001	23	10.60	0.001	18	3.45	0.063	2	0.00	1	0	-	-
	Negative Reinforcement	21			51			31			2			0		

Table A4. Analysis of multiple-choice questions based on recycling efforts. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

		Tremendous			High			Moderate			Little			Very Little		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q7	Ethos	5	1.29	0.256	62	39.56	<0.001	50	34.57	<0.001	12	7.14	0.007	1	0.33	0.563
	Pathos	2			9			6			2			2		
Q8	Ethos	4	0.14	0.705	45	5.09	0.024	35	3.50	0.061	7	0.00	1	2	0.33	0.563
	Logos	3			26			21			7			1		
Q9	Ethos	4	0.14	0.705	28	3.17	0.075	29	0.07	0.789	3	4.57	0.032	2	0.33	0.563
	Aesthetics	3			43			27			11			1		
Q10	Pathos	3	0.14	0.705	35	0.01	0.905	31	0.64	0.422	5	1.14	0.285	2	0.33	0.563
	Logos	4			36			25			9			1		
Q11	Pathos	2	1.29	0.256	13	28.52	<0.001	11	20.64	<0.001	2	7.14	0.007	2	0.33	0.563
	Aesthetics	5			58			45			12			1		
Q12	Logos	3	0.14	0.705	18	7.25	0.001	17	8.64	0.003	4	2.57	0.108	1	0.33	0.563
	Aesthetics	4			53			39			10			2		
Q13	Ethos	5	1.29	0.256	63	42.61	<0.001	49	31.50	<0.001	11	4.57	0.032	1	0.33	0.563
	Pathos	2			8			7			3			2		
Q14	Ethos	3	0.14	0.705	35	0.01	0.905	34	2.57	0.108	7	0.00	1	2	0.33	0.563
	Logos	4			36			22			7			1		
Q15	Ethos	4	0.14	0.705	32	0.69	0.406	29	0.07	0.789	2	7.14	0.007	2	0.33	0.563
	Aesthetics	3			39			27			12			1		
Q16	Pathos	3	0.14	0.705	25	6.21	0.012	30	0.29	0.592	5	1.14	0.285	2	0.33	0.563
	Logos	4			46			26			9			1		
Q17	Pathos	2	1.29	0.256	12	31.11	<0.001	10	23.14	<0.001	2	7.14	0.007	2	0.33	0.563
	Aesthetics	5			59			46			12			1		
Q18	Logos	4	0.14	0.705	26	5.09	0.024	23	1.79	0.181	7	0.00	1	1	0.33	0.563
	Aesthetics	3			45			33			7			2		

Table A4. Cont.

		Tremendous			High			Moderate			Little			Very Little		
		Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value	Score	Chi ² Value	p-Value
Q19	Positive Reinforcement	6			40	1.14	0.285	30	0.29	0.592	7	0.00	1	2	0.33	0.563
	Positive Punishment	1	3.57	0.587	31			26			7			1		
Q20	Positive Reinforcement	4			42	2.38	0.122	33	1.79	0.181	11	4.57	0.032	2	0.33	0.563
	Negative Punishment	3	0.14	0.705	29			23			3			1		
Q21	Positive Reinforcement	4			32	0.69	0.406	21	3.50	0.061	7	0.00	1	2	0.33	0.563
	Negative Reinforcement	3	0.14	0.705	39			35			7			1		
Q22	Positive Punishment	3			39	0.69	0.406	37	5.79	0.016	7	0.00	1	1	0.33	0.563
	Negative Punishment	4	0.14	0.705	32			19			7			2		
Q23	Positive Punishment	2			29	2.38	0.122	27	0.07	0.789	6	0.29	0.592	0	3.00	0.083
	Negative Reinforcement	5	1.29	0.256	42			29			8			3		
Q24	Negative Punishment	0	7.00	0.008	15	23.68	<0.001	19	5.79	0.016	8	0.29	0.592	0	3.00	0.083
	Negative Reinforcement	7			56			37			6			3		
Q25	Positive Reinforcement	6			44	4.07	0.043	33	1.79	0.181	7	0.00	1	3	3.00	0.083
	Positive Punishment	1	3.57	0.587	27			23			7			0		
Q26	Positive Reinforcement	4			50	11.85	0.001	38	7.14	0.007	10	2.57	0.108	3	3.00	0.083
	Negative Punishment	3	0.14	0.705	21			18			4			0		
Q27	Positive Reinforcement	4			38	0.35	0.552	26	0.29	0.592	9	1.14	0.285	2	0.33	0.563
	Negative Reinforcement	3	0.14	0.705	33			30			5			1		
Q28	Positive Punishment	3			39	0.69	0.406	36	4.57	0.032	6	0.29	0.592	2	0.33	0.563
	Negative Punishment	4	0.14	0.705	32			20			8			1		
Q29	Positive Punishment	1			30	1.70	0.191	30	0.29	0.592	8	0.29	0.592	0	3.00	0.083
	Negative Reinforcement	6	3.57	0.587	41			26			6			3		
Q30	Negative Punishment	1			17	19.28	0.001	19	5.79	0.016	9	1.14	0.285	0	3.00	0.083
	Negative Reinforcement	6	3.57	0.587	54			37			5			3		

Table A5. Results of Likert scale questions based on age.

	18–30	31–45	46+	Prefer Not to Answer
Aesthetics	4.39	4.30	4.14	3.84
Ethos	4.40	4.25	3.96	3.56
Logos	3.63	3.432	3.26	3.32
Pathos	4.05	4.05	3.87	3.32

Table A6. Analysis of Likert scale questions based on age. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

Comparison of Persuasion Techniques	18–30		31–45		46+		Prefer Not to Answer	
	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value
Ethos with Pathos	2.47	0.019	1.69	0.063	0.6957	0.2532	1.54	0.080
Ethos with Logos	1.80	0.054	2.42	0.020	2.41	0.021	0.55	0.297
Aesthetics with Ethos	0.10	0.460	0.82	0.217	2.57	0.016	1.19	0.133
Aesthetics with Pathos	2.57	0.016	2.04	0.037	2.14	0.032	1.99	0.040
Aesthetics with Logos	1.80	0.054	2.57	0.016	3.07	0.007	1.07	0.155
Logos with Pathos	0.96	0.181	0.75	0.059	1.95	0.042	0.00	0.500

Table A7. Results of Likert scale questions based on gender.

	Male	Female	Non-Binary	Prefer Not to Mention
Aesthetics	4.26	4.31	4.30	3.80
Ethos	4.13	4.29	4.30	3.66
Logos	3.46	3.47	2.90	3.13
Pathos	3.93	4.04	3.90	3.46

Table A8. Analysis of Likert scale questions based on gender. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

Comparison of Persuasion Techniques	Male		Female		Non-Binary		Prefer Not to Mention	
	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value
Ethos with Pathos	1.59	0.075	1.94	0.044	2.52	0.017	1.50	0.086
Ethos with Logos	2.50	0.018	1.91	0.045	2.45	0.019	0.96	0.181
Aesthetics with Ethos	2.15	0.031	0.30	0.385	0.00	0.500	1.00	0.173
Aesthetics with Pathos	2.50	0.018	2.24	0.027	2.52	0.017	1.76	0.057
Aesthetics with Logos	2.95	0.009	1.97	0.041	2.45	0.019	1.17	0.137
Logos with Pathos	1.60	0.073	1.3060	0.1139	1.76	0.057	0.58	0.287

Table A9. Results of Likert scale questions based on awareness.

	Tremendous	High	Moderate	Little
Aesthetics	4.44	4.28	4.15	4.75
Ethos	4.51	4.22	4.02	4.50
Logos	3.27	3.50	3.46	3.55
Pathos	4.08	4.05	3.82	4.00

Table A10. Analysis of Likert scale questions based on awareness. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

Comparison of Persuasion Techniques	Tremendous		High		Moderate		Little	
	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value	t-Value	p-Value
Ethos with Pathos	3.18	0.006	1.64	0.069	1.19	0.132	1.58	0.076
Ethos with Logos	3.08	0.007	2.09	0.034	1.51	0.084	3.16	0.006
Aesthetics with Ethos	1.13	0.144	1.24	0.123	1.77	0.057	1.82	0.052
Aesthetics with Pathos	2.68	0.013	2.27	0.026	2.10	0.034	2.17	0.030
Aesthetics with Logos	2.90	0.009	2.28	0.025	1.90	0.046	3.63	0.003
Logos with Pathos	1.92	0.045	1.55	0.079	0.92	0.191	1.03	0.166

Table A11. Results of Likert scale questions based on recycling efforts.

	Tremendous	High	Moderate	Little	Very Little
Aesthetics	4.00	4.44	4.17	3.97	4.73
Ethos	3.68	4.42	4.02	3.97	5.00
Logos	2.91	3.46	3.54	3.42	3.00
Pathos	3.74	4.20	3.82	3.42	4.86

Table A12. Analysis of Likert scale questions based on recycling efforts. (Green highlight indicates that the results are statistically significant at $p \leq 0.05$).

Comparison of Persuasion Techniques	Tremendous		High		Moderate		Little		Very Little	
	<i>t</i> -Value	<i>p</i> -Value	<i>t</i> -Value	<i>p</i> -Value	<i>t</i> -Value	<i>p</i> -Value	<i>t</i> -Value	<i>p</i> -Value	<i>t</i> -Value	<i>p</i> -Value
Ethos with Pathos	0.48	0.320	1.77	0.056	1.37	0.103	3.55	0.003	1.00	0.173
Ethos with Logos	1.53	0.081	2.40	0.021	1.50	0.085	1.65	0.068	7.17	0.001
Aesthetics with Ethos	2.55	0.016	0.23	0.411	2.77	0.012	0.00	0.500	1.37	0.103
Aesthetics with Pathos	2.44	0.020	1.88	0.048	2.40	0.021	2.48	0.018	0.56	0.293
Aesthetics with Logos	2.17	0.030	2.44	0.020	1.97	0.042	1.49	0.087	5.09	0.001
Logos with Pathos	1.66	0.067	1.80	0.054	0.81	0.219	0.00	0.500	6.03	0.001

Appendix B

Survey questionnaires

- Q1 Definitions: Recycling process—You place the cardboard box in the dedicated recycle bin or return it to the dedicated recycling yard, which is then recycled to make a new cardboard box. Reusing process—You place the cardboard box in the dedicated reuse bin or return it to the dedicated reuse yard, where it is reused for shipping goods, and then the cardboard box is cleaned and prepared for another use.
- I understood the difference between these two processes.
- Q2 Please enter your email id—_____
- Q3 What gender do you identify as?
- Male
 - Female
 - Non-binary
 - Prefer not to answer
- Q4 What is your age?
- 0–17 years old
 - 18–30 years old
 - 31–45 years old
 - 46+
 - Prefer not to answer
- Q5 What are your current recycling efforts?
- Very Little
 - Little
 - Moderate
 - High
 - Tremendous
- Q6 How much awareness do you have of the environment and climate change?
- Very Little
 - Little
 - Moderate
 - High
 - Tremendous
- Q7 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin—
- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I assign to the reusing process.
 - A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I assign to the reusing process.
- Q8 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin—

- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I assign to the reusing process.
 - I get a suitable cash reward for each box I assign to the reusing process.
- Q9 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I assign to the reusing process.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I assign to the reusing process.
- Q10 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I assign to the reusing process.
 - I get a suitable cash reward for each box I assign to the reusing process.
- Q11 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I assign to the reusing process.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I assign to the reusing process.
- Q12 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get a suitable cash reward for each box I assign to the reusing process.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I assign to the reusing process.
- Q13 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I return to the reuse yard.
 - A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I return to the reuse yard.
- Q14 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I return to the reuse yard.
 - I get a suitable cash reward for each box I return to the reuse yard.
- Q15 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I return to the reuse yard.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I return to the reuse yard.
- Q16 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I return to the reuse yard.
 - I get a suitable cash reward for each box I return to the reuse yard.
- Q17 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –

- A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I return to the reuse yard.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I return to the reuse yard.
- Q18 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get a suitable cash reward for each box I return to the reuse yard.
 - A charitable organization committed to keeping my city clean gets a suitable donation for each box I return to the reuse yard.
- Q19 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get a suitable cash reward for each box I assign to the reuse process.
 - I get penalized with a suitable cash penalty for not assigning the boxes to the reuse process.
- Q20 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get a suitable cash reward for each box I assign to the reuse process.
 - My product discount is taken away from me which was offered to me for every cardboard box I assign to the reuse process.
- Q21 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get a suitable cash reward for each box I assign to the reuse process.
 - My shipping charges are waived after I assign a suitable number of boxes to the reuse process.
- Q22 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get penalized with a suitable cash penalty for not assigning the boxes to the reuse process.
 - My product discount is taken away from me which was offered to me for every cardboard box I assign to the reuse process.
- Q23 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- I get penalized with a suitable cash penalty for not assigning the boxes for the reusing process.
 - My shipping charges are waived after I assign a suitable number of boxes to the reuse process.
- Q24 Which one is more likely to influence you for assigning the cardboard box to the reuse bin rather than the recycling bin–
- My product discount is taken away from me which was offered to me for every cardboard box I assign to the reuse process.
 - My shipping charges are waived after I assign a suitable number of boxes to the reuse process.
- Q25 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get a suitable cash reward for each box I return to the reuse yard.
 - I get penalized with a suitable cash penalty for not returning the boxes to the reuse yard.
- Q26 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get a suitable cash reward for each box I return to the reuse yard.

- My product discount is taken away from me which was offered to me for every cardboard box I return to the reuse yard.
- Q27 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get a suitable cash reward for each box I return to the reuse yard.
 - My shipping charges are waived after I return a suitable number of boxes to the reuse yard.
- Q28 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get penalized with a suitable cash penalty for not returning the boxes to the reuse yard.
 - My product discount is taken away from me which was offered to me for every cardboard box I return to the reuse yard.
- Q29 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- I get penalized with a suitable cash penalty for not returning the boxes to the reuse yard.
 - My shipping charges are waived after I return a suitable number of boxes to the reuse yard.
- Q30 Which one is more likely to influence you for returning the cardboard box to the reuse yard rather than the recycling yard –
- My product discount is taken away from me which was offered to me for every cardboard box I return to the reuse yard.
 - My shipping charges are waived after I return a suitable number of boxes to the reuse yard.
- Q31 I am likely to assign a cardboard box to the reuse process rather than assigning it to the recycling process if—(Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree) (NO QUESTION)
- Q32 A charitable organization committed to preventing environmental degradation gets a suitable donation for each box I assign to the reuse process.
- Q33 A charitable organization committed to helping Florida panthers from going extinct gets a suitable donation for each box I assign to the reuse process.
- Q34 I get a suitable cash reward for each box I assign to the reuse process.
- Q35 A charitable organization committed to keeping my city clean gets a suitable donation for each box I assign to the reuse process.
- Q36 A charitable organization trying to reduce global warming gets a suitable donation for each box I assign to the reuse process.
- Q37 I am likely to assign a cardboard box to the reuse process rather than assigning it to the recycling process if—(Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree) (NO QUESTION)
- Q38 A charitable organization trying to repair the ozone layer gets a suitable donation for each box I assign to the reuse process.
- Q39 I save money off my shipping charges for each box I assign to the reuse process.
- Q40 A charitable organization committed to preventing the addition of trash into landfills gets a suitable donation for each box I assign to the reuse process.
- Q41 A charitable organization committed to reducing pollution gets a suitable donation for each box I assign to the reuse process.
- Q42 A charitable organization committed to helping polar bears from going extinct gets a suitable donation for each box I assign to the reuse process.
- Q43 I am likely to assign a cardboard box to the reuse process rather than assigning it to the recycling process if—(Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree) (NO QUESTION)

- Q44 I get a suitable discount on my favorite shopping brands for each box I assign to the reuse process.
- Q45 A charitable organization committed to cleaning the trash in my city gets a suitable donation for each box I assign to the reuse process.
- Q46 A charitable organization trying to decrease the depletion of fossil fuel gets a suitable donation for each box I assign to the reuse process.
- Q47 A charitable organization committed to helping endangered species gets a suitable donation for each box I assign to the reuse process.
- Q48 I get public recognition after I assign a suitable number of boxes to the reuse process.
- Q49 I am likely to assign a cardboard box to the reuse process rather than assigning it to the recycling process if—(Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree) (NO QUESTION)
- Q50 A charitable organization committed to keeping our environment clean gets a suitable donation for each box I assign to the reuse process.
- Q51 A charitable organization committed to reducing climate change gets a suitable donation for each box I assign to the reuse process.
- Q52 A charitable organization committed to preserving the environment for future generations gets a suitable donation for each box I assign to the reuse process.
- Q53 I get a gift card for my favorite fast-food brand for each box I assign to the reuse process.
- Q54 A charitable organization committed to decreasing dirty landfills gets a suitable donation for each box I assign to the reuse process.
- Q55 I prefer driving sustainable electric cars over gasoline-powered cars.
- Q56 I prefer environment-friendly fabric bags over cheap plastic bags in grocery stores.
- Q57 I routinely donate food/money to the less fortunate.
- Q58 I work hard to receive praise from my boss.
- Q59 I avoid losing important documents by organizing them in the first place.

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