

Sustainable sips: The impact of framing on reusable cup adoption

Prepared by: Chastity Leong Ka See, Gabrielle Fisher, John Wirth, Luke Forrester, Melissa Olana, and Nanaki Sangha

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Executive Summary

Introduction

Single-use cups impose significant environmental costs, and despite increased awareness of the climate crisis, many still find it difficult to switch from single-use cups to reusable ones.

Research Questions

1) How does framing using reusable cups as a personal (self-positive frame) versus a collective benefit (other-positive frame) affect intentions to use reusable cups? 2) Does barrier perception mediate the impact of framing on intended reusable cup use? (exploratory)?

Methods

To investigate this, we conducted an online survey manipulating which reusable cup framing type participants saw by randomly assigning 161 participants to read one of three frames: reusable cups as personally beneficial, collectively beneficial, or a control. We then measured how these framing types affected reusable cup use intentions and whether this was mediated by perceived barriers to using them.

Results

We found no significant differences in reusable cup use intention or perceptions of barriers between conditions, and therefore no mediation of perceived barriers. However, exploratory analyses found a significant negative correlation between perceived barriers against reusable cup use and people's intent to use them. Additionally, we found that participants consistently reported that remembering to use reusable cups, saving space for them, and having to wash them were prominent barriers against reusable cup use.

Recommendations

Our findings indicate that instead of framing interventions, perceived barriers to reusable cups should be directly addressed by partnering with Reusables to switch from single-use containers to a reusable default.

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Introduction

Since the invention of the disposable paper cup in 1907^{1,2,3} and the rising popularity of coffee-to-go culture beginning in the 1960s^{4,5}, disposable cups have grown into a staple of modern everyday living. However, this invention, while convenient, imposes heavy environmental costs^{6,7,8}. This, in addition to the growing climate crisis^{9,10,11}, shows that interventions promoting sustainable behaviors (actions that preserve the earth and natural and social resources¹²) are urgent. To address this need, our study investigates a framing intervention designed to increase intent to use reusable cups, potentially through the mechanism of reducing perceived barriers. Ultimately, by evaluating the effectiveness of framing interventions, we aim to elucidate the most effective mechanisms through which we can encourage people to make climate action decisions that align with their values.

Barriers to reusable cup use

Literature has identified many barriers to adopting personal reusable cups^{8,13,14,15,16,17}. From the inconvenience of having to carry a reusable coffee cup¹³ to the pervasiveness of to-go coffee culture⁸, it is evident that consumers find it challenging to give up single-use coffee cups. Many of these barriers are personal in nature, requiring people to sacrifice their own time, convenience, effort, and money. The need to sacrifice one's own comfort and energy to help the environment by using reusable cups, for example, are major obstacles to its adoption^{11,18,19}. Moreover, one study showed that relative to climate change concern and knowledge, a willingness to sacrifice comfort and convenience was the strongest predictor of adopting environmentally sustainable behaviors¹¹. This means that for individuals unwilling to give up their everyday comforts, using a reusable personal cup might not be a behavior they would be interested in executing.

Message Framing interventions on climate action

One avenue to address perceived barriers is framing interventions^{20,21,22}. Framing interventions aim to change how individuals perceive an event or object by altering how information about that event or object is presented^{20,21}. Framing interventions can be broken down into several different types: a positive versus negative frame focusing on the benefits or costs of a behavior, a self versus other frame highlighting how a behavior affects the individual or others, and a concrete versus abstract frame that either gives specific or vague information²². Research so far has focused on the effectiveness of single-frame interventions (e.g., only using a positive versus negative frame or concrete versus abstract frame, and not both simultaneously), but less has investigated the effectiveness of combined frames (e.g., positive-self frame)²².

Current Study

Our study contributes to the budding literature on the effectiveness frames by examining two combined frames — a self-positive (personal benefit) frame and an other-positive (collective benefit) frame. Additionally, research on the potential mechanisms of framing interventions is

lacking. Therefore, we hope to add to the theory by focusing on a potential mechanism behind framing effects: a reduction in perceived barriers to sustainable behavior.

Research Question

1) How does framing using reusable cups as a personal (self-positive frame) versus a collective benefit (other-positive frame) affect intentions to use reusable cups? 2) Does barrier perception mediate the impact of framing on intended reusable cup use? (exploratory)?

Hypothesis

Research Question 1. Given that most barriers to reusable cup use are personal in nature (e.g., convenience¹³, not having to clean a cup¹⁵, etc.), we hypothesize that the personal benefit frame (PBF) participants will show the highest intent to use reusable cups, followed by the collective benefit frame (CBF) participants, and finally, the control frame (CF) participants.

Research Question 2. We hypothesize that individuals in the PBF frame condition will report that barriers to reusable cup use are easier to overcome (i.e., lowest barrier perception), followed by the CBF, and finally, the control frame, and that these different barrier perception levels will drive participants' behavioral intent to use reusable cups, with lower barrier perception leading to higher behavioral intent to use reusable cups.

Method

Participants

A priori power analysis determined we needed a minimum sample of 246 participants to detect an effect size of $F = 0.2$, given $\alpha = .05$ and power = .8. However, we only managed to recruit a convenience sample of 161 individuals ages 17 to 71 ($M = 34.40$, $SD = 14.90$). Within the sample, 106 (65.84%) identified as women, 45 (27.95%) as men, 7 (4.25%) as non-binary, 1 (0.62%) as other, and 2 (1.24%) did not answer. See Appendix A for detailed demographics.

Conditions

Our independent variable was the framing type participants read, and we operationalized framing with three conditions: the personal benefit of using reusable cups, the collective benefit of using reusable cups, and a neutral control frame. Participants in the PBF condition ($n = 56$) saw a statement about the adverse health effects of disposable paper cup use, while those in the CBF ($n = 52$) saw a statement regarding the adverse effects of disposable cup use on aquatic life. Lastly, the CFcondition ($n = 53$) saw a neutral statement regarding the founders of KeepCup—a reusable personal cup. For the exact framing statement shown to participants, see Appendix B.

Measures

Our dependent variable, behavioral intent, was operationalized as how likely participants would be to use a reusable cup the next time they ordered from a cafe. When measuring behavioral intent, there is no consensus on what scale to use and what factors may comprise it^{24, 25, 26, 27}. Therefore, we implemented our own face-valid behavioral intent measure via a 7-point Likert scale (1 = “*extremely unlikely*”; 7 = “*extremely likely*”), asking participants, “*How likely are you to use a reusable cup for a drink order at a cafe the next time you go.*”

For our exploratory analysis, we operationalized barrier perception as how much participants endorsed a set of barriers preventing them from using reusable cups. This was measured using a 6-point Likert scale (1 = “*makes it impossible*”; 6 = “*does not stop me*”), and we based the 7 individual barriers we chose on identified barriers in literature^{8,13,14,15,16,17}. For the list of selected barrier questions, see Appendix B.

Procedure

The experiment ran from February 27 to March 29 on Qualtrics (see Appendix B for the full survey), and we recruited a convenience sample by posting posters around UBC, sharing them on social media (e.g., Instagram), and word-of-mouth (see Appendix C for promotional poster). After consenting, we randomly assigned participants to read one of the three framing statements. Then participants reported their intention to use reusable cups, how strongly they felt certain barriers stopped them from using reusable cups, and their demographic information.

Results

On average, the PBF participants scored 4.21 ($SD = 1.93$) on intention to use reusable cups and 2.41 ($SD = 0.74$) on barrier perception. As for the CBF, they had an average intention score of 4.30 ($SD = 1.94$) and an average of 2.45 ($SD = 1.13$) on barrier perception. Finally, the CF scored an average of 4.40 ($SD = 2.06$) on intention and $M = 2.49$ ($SD = 0.97$) for barrier perception. This indicated that across conditions, participants thought they were “*neither unlikely nor likely*” to use reusable cups and, in general, felt that the barriers against reusable cup use made it slightly difficult to use them. Since our data violated the assumption of normality, we performed nonparametric tests for all our analyses (except for the two-way mixed design ANOVA, as that test has no nonparametric equivalent).

Main Analysis

To investigate if framing conditions affected participants' intention to use a reusable cup, we conducted a Kruskal-Wallis test. We found a non-significant difference between the three frames [$\chi^2(2) = 0.60, p = .74$], with a negligible effect size of $\varepsilon^2 = .009$ (Cohen, J., 1992). This runs contrary to our hypothesis that those in the PBF will report the highest intent to use reusable cups, followed by participants in the CBF, then the CF. See Appendix D for the graph.

Exploratory Analysis

To explore the potential role barrier perception played in framing intervention effectiveness, we conducted a Kruskal-Wallis to see if the different frames affected participants' barrier perceptions. There was no significant difference in overall barrier perception [$\chi^2(2) = 0.48, p = .79, \varepsilon^2 = .01$] or individual barrier perceptions across conditions. The effect size for each barrier was also negligible. Additionally, a mixed two-way ANOVA also revealed no interaction between perceived barriers and framing conditions [$F(12, 948) = 1.20, p = .28$]. See Appendix E for the Kruskal-Wallis graph and table of the Kruskal-Wallis results for each barrier.

Additionally, we wanted to investigate if intent to use reusable cups correlated with participant's perception of barriers against using reusable cups. Using Spearman's correlation, we found a small and significant negative correlation between overall barrier perception and intent to use reusable cups ($\rho = -.38, p < .001$). More specifically, of the seven investigated barriers, a lack of space for reusable cups ($\rho = -.29, p < .001$), needing to wash reusable cups ($\rho = -.42, p < .001$), difficulty in remembering to use reusable cups ($\rho = -.37, p < .001$) and peers not using reusable cups ($\rho = -.22, p = .004$) resulted in a significant negative correlation with intent to use reusable cups. Effect sizes for these barriers range from small to medium (Cohen, J., 1992). See Appendix F for the Spearman correlation graph of the barrier average and individual barrier correlation matrix.

Moreover, pairwise Wilcoxon signed rank test with Holm-Bonferroni corrections between the individual barriers found that participants reported needing to remember to use reusable cups as the most difficult barrier to overcome ($Mdn = 4$), followed by needing to wash reusable cups ($Mdn = 3$), the barrier of baristas not asking about reusable cups ($Mdn = 2$), lacking space to bring a reusable cup ($Mdn = 2$), the monetary costs of reusable cups' ($Mdn = 2$), peers not using reusable cups ($Mdn = 1$), and finally reusable cups causing the drink to taste

different ($Mdn = 1$). See Appendix G for the graph of the pairwise comparisons and means of each barrier.

All exploratory results go against our hypothesis that barrier perception mediates the impact of framing on intentions to use reusable cups, as framing type did not change barrier perception or behavioral intent to use reusable cups. However, we found that barrier perception is an important factor to tackle, as it is negatively correlated with intent to use reusable cups.

Discussion

Main

Contrary to our hypotheses, framing reusable cup use as a personal or collective benefit did not affect participants' intentions to use a reusable cup. This suggests that combined frames may not be an effective intervention to increase sustainable behaviors, which is consistent with prior research documenting the inconsistent effects of framing on climate-friendly actions²². This shows that more investigation is necessary to determine why and when framing interventions are effective in encouraging pro-environmental behaviors (e.g., using reusable cups).

Exploratory

As for our exploratory analysis of the effect of framing on barrier perception, we found no evidence that framing affected barrier perception against reusable cup use. However, we did find that participants who perceived lower barriers to reusable cup use had higher intentions to use reusable cups relative to participants who perceived higher barriers, especially for the barriers of needing to wash the cups, forgetting to use them, lacking space to bring them, and their peers not using reusable cups. Additionally, the finding that lower barriers to adopting reusable cups are associated with higher intent to use reusable cups is consistent with previous research showing that higher behavioral costs predict a lower likelihood of engaging in eco-friendly behavior^{11,18, 19}. This is because higher perceived barriers might signal higher costs associated with sustainable behaviors, leading to reduced adoption of climate-friendly actions.

Our exploratory analysis also found that participants' inability to remember to bring reusable cups was the hardest barrier to overcome, followed by needing to wash them, baristas not asking about them, and lacking space for a reusable cup, which mostly maps onto the barriers that were significantly negatively correlated to reusable cup use intentions. The other three barriers were only endorsed as slightly difficult to overcome.

Overall, these findings suggest that it would be more effective to directly address and reduce the perceived barriers against reusable cup use (e.g., by providing free returnable reusable cups at cashier counters) rather than relying on inconsistent framing effects and interventions to reduce perceived barriers and increase intentions of reusable cup use. However, since this current finding is correlational and exploratory, future research should test this using an experimental design. For example, by designing a reminder intervention installed on people's phones and seeing if the presence or absence of the intervention affected people's reusable cup use intentions and behaviors.

Implications

The lack of differences between our treatment and control groups reflects past findings that demonstrate mixed effects of framing messages²². One insight we can extrapolate from our findings is that framing messages may be ineffective at influencing intentions to use reusable cups. Adopting sustainable behaviors may potentially be related to deeper underlying attitudes about environmental or economic policies, especially since climate action has become a highly

polarized political issue²⁸, and it is possible that framing messages may be ineffective at changing more deeply held opinions about the environment.

Additionally, these findings add understanding to the complex effects of framing on pro-environmental behaviors by highlighting another potential explanation for why framing effects might or might not affect intent to adopt sustainable behaviors. This provides new avenues for research to investigate the potential role barrier perception plays in promoting sustainable behaviors and how it could affect the effectiveness of framing interventions.

On the practical side, since our framing manipulation found essentially no effect, future interventions to promote reusable cup use should instead focus on addressing barriers against reusable cup use directly. Although the negative correlation found between perceived barriers with intent to use was small to medium, small effects can have substantial impacts when scaled up to a population^{29,30,31,32}. Addressing barriers may be a more effective solution, as influencing barrier perception may be easier than changing deeply held attitudes towards environmental behavior. Given that the highest reported barrier to using reusable cups was forgetting, it appears that the majority of our sample did accept some degree of personal responsibility for helping the environment; this implies that future interventions should not only address attitude change but also focus on *facilitating* sustainable actions that may already be in line with people's pro-environmental attitudes.

Limitations and Future Directions

Though we did not find evidence that framing was effective at increasing intentions to use reusable cups, some key limitations to our study provide caution against over- interpreting our results. For one, our sample did not reach our a priori power analysis and only achieved 5.10% power²³. Consequently, we need to interpret our null main results carefully, as there is a high chance of our study making a type II error.

Other than increasing our sample size, future studies should also aim to strengthen our framing manipulation. Since our framing messages were extremely short and did not require participants to deeply engage with the information, this weakened our framing manipulation and decreased our effect size³³. Therefore, future study iterations could strengthen our manipulation by incentivizing deeper processing with a monetary reward or forcing participants to engage with the material thoughtfully by having them write their thoughts on the frames before answering our measures. Another method of increasing the potency of framing manipulations would be to include a visual aspect, as past work has found that images elicit stronger framing effects on behavioral intentions relative to text, possibly due to the emotions they elicit and their salience³⁴.

Finally, measuring behavioral intentions is not the same as measuring behavior. Even if our study were to find an effect of framing on intent to use reusable cups, past research has documented a gap between people's intentions and actions³⁵. Therefore, to implement long-term change regarding reusable cup use behavior rather than intention, future studies should aim to collect real-world, longitudinal behavioral data via ecological momentary assessments or daily diaries asking about reusable cup use after interventions.

Recommendations

Given that framing conditions had little to no effect on participants' reusable cup use, we do not recommend investing in posters and messaging interventions as it is unlikely to make a noticeable difference; instead, we recommend that more aggressive infrastructural changes directly addressing barriers against reusable cup use must be considered to meet UBC's 2030 Zero Waste Action Plan. We found that remembering to bring a reusable cup, needing to wash them, and lacking bag space for them came up consistently as perceived barriers to reusable cup use. To overcome these, the AMS should consider partnering with the company Reusables, which uses stainless steel food and beverage containers. Reusables has no deposit fee and tracks all containers by scanning a QR code at dissemination and return at a collection receptacle — see Appendix H. For containers not returned within 14 days, Reusables will charge a refundable deposit of up to \$20. This is already implemented in grocery stores and campuses (e.g., SFU) across Canada, seeing great success with a 99% return rate³⁶. There would be no partnering cost other than the cost of the collection receptacles, which UBC will have to request a quote for. These collection receptacles should be conveniently scattered across heavily trafficked campus locations to maximize return ease and convenience. Returned containers can be collected during regular waste collection cycles, sanitized, and redistributed. According to previous literature, having to opt-in to alternative options, such as opt-in green energy programs, decreases its adoption^{37,38,39}. Therefore, to maximize intervention effectiveness, the AMS should implement Reusables as the default container option across UBC cafes rather than disposable cups.

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Appendix A: Detailed Demographic Table

Table 1
Detailed Sample Demographics

Variable	Sample Statistic
Gender	<i>n</i> (%)
Woman	106 (65.84)
Man	45 (27.95)
Non-binary person	7 (4.25)
Other	1 (0.62)
Not answered	2 (1.24)
Age	<i>M</i> (<i>SD</i>)
	34.40 (14.90)
Income (CAD)	<i>Mdn</i>
	10916.67
Political Spectrum	<i>n</i> (%)
Liberal	74 (45.96)
Middle of the road	26 (16.15)
Conservative	34 (21.12)
Not answered	27 (16.77)
UBC Affiliation	<i>n</i> (%)
Undergraduate	67 (41.61)
Faculty/staff	7 (4.34)
Graduate	5 (3.11)
Other	47 (29.19)
Not answered	35 (21.74)

b. Barrier Perception

Please rate how much these reasons stops you **personally** from using a reusable cup.

	Makes it impossible	Makes it very difficult	Makes it difficult	Makes it moderately difficult	Makes it slightly difficult	Does not stop me
Cost of reusable cups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having to save space for a reusable cups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having to remember to bring a reusable cup	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of my friends use reusable cups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having to wash a reusable cups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A reusable cups affects the taste of the drink	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barista does not ask about using a reusable cups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Demographics

- a. What gender do you identify as?
 - Woman
 - Man
 - Non-binary Person
 - Prefer not to answer
 - Other
- b. What is your age (in full years)?
- c. Which of the following best describes your political views?
 - Strongly liberal
 - Liberal
 - Slightly liberal
 - Middle of the road
 - Slightly conservative
 - Conservative
 - Strongly conservative
 - Prefer not to answer
- d. What is your affiliation towards UBC?
 - Undergraduate student
 - Graduate student
 - Faculty/Staff
 - Other
 - Prefer not to answer
- e. What is your total annual household income before tax (in CAD)?

- Less than \$10,000
 - \$10,000 - \$19,999
 - \$20,000 - \$29,999
 - \$30,000 - \$39,999
 - \$40,000 - \$49,999
 - \$50,000 - \$59,999
 - \$60,000 - \$69,999
 - \$70,000 - \$79,999
 - \$80,000 - \$89,999
 - \$90,000 - \$99,999
 - \$100,000 - \$109,999
 - \$109,999 - \$119,999
 - \$119,999 - \$129,999
 - \$129,999 - \$139,999
 - \$139,999 - \$149,999
 - More than \$150,000
 - Prefer not answer
- f. How many people are there in your household (including yourself)?

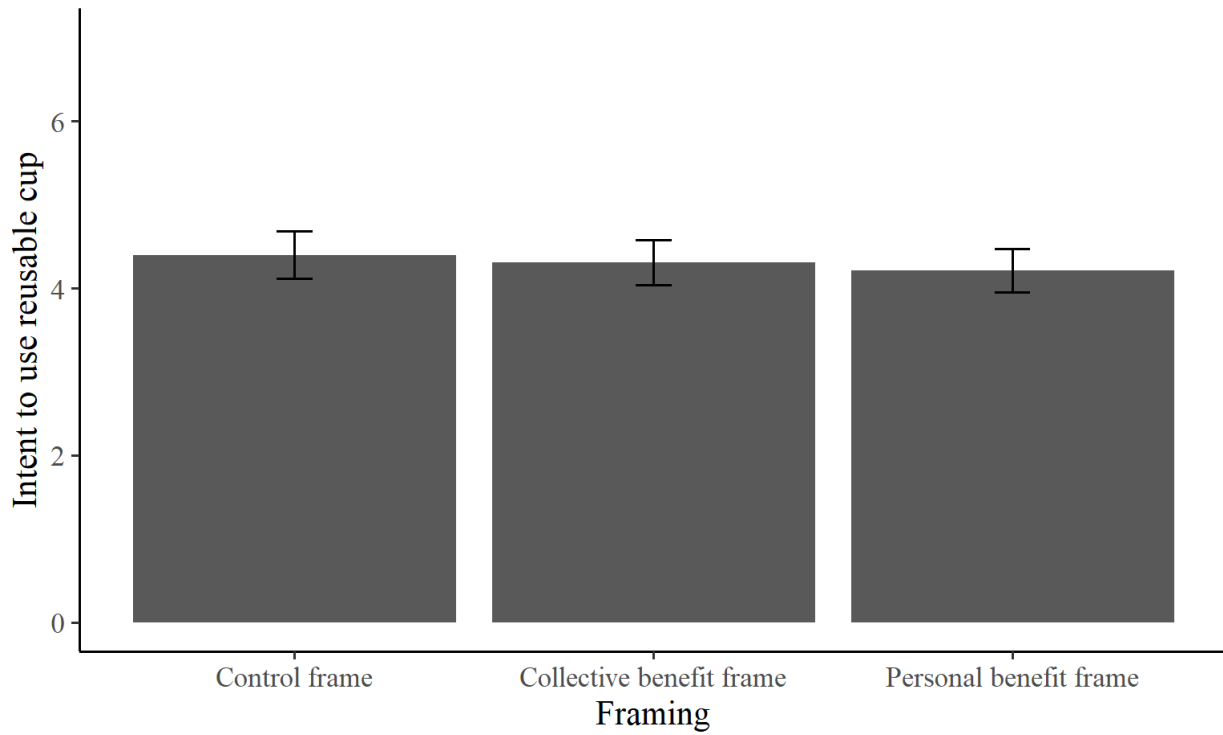
Appendix C: Promotional Poster



Appendix D: Behavioral Intent Kruskal-Wallis Analysis by Condition

Figure D

Intent to use personal reusable cups score by framing condition

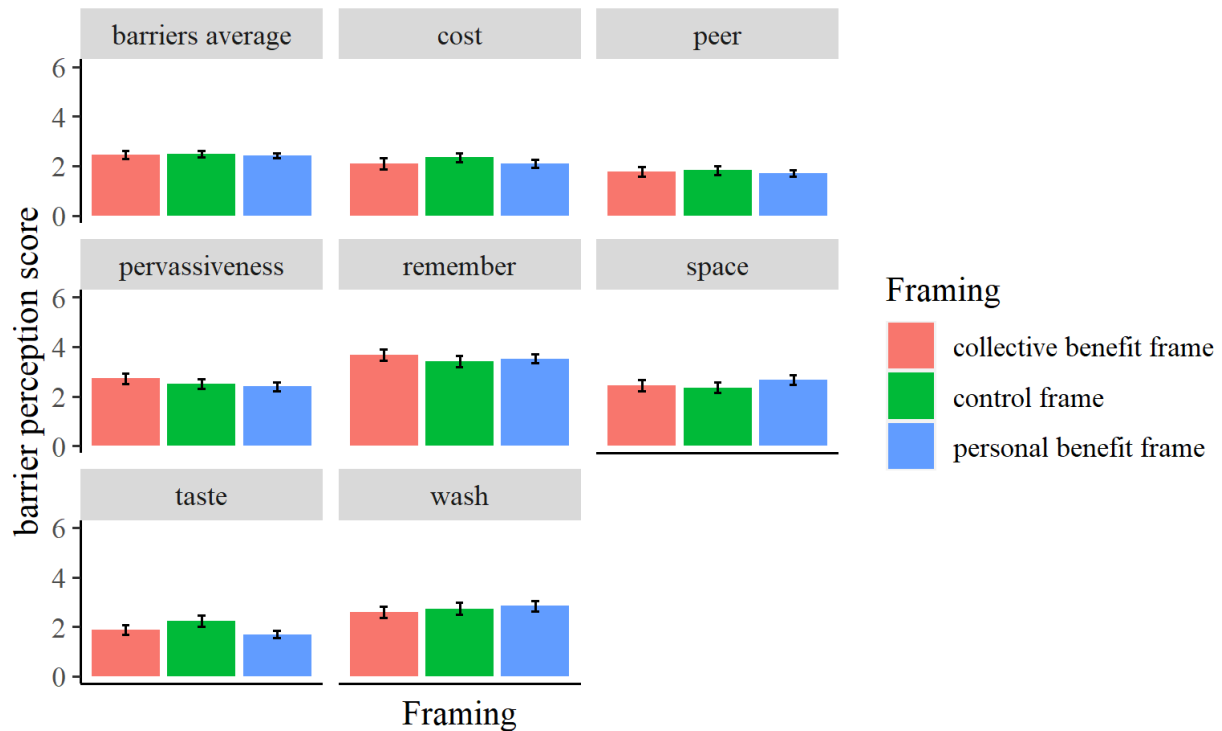


Note. ^a Error bars reflect ± 1 SEM

Appendix E: Barrier Perception Kruskal-Wallis Test Analysis by Condition

Figure E.1

Barrier perception for each barrier by framing condition



Note. ^a Error bars reflect ± 1 SEM. ^b Pervasiveness means baristas not asking about reusable cups. ^c Peer means peers not using reusable cups. ^d Taste means reusable cups affecting the drink's taste. ^e Cost means reusable cups are too expensive. ^f Space means not having enough space to bring reusable cups. ^j Wash means having to wash reusable cups. ^h Remember means having to remember to wash reusable cups.

Table E
Kruskal-wallis test results for individual barriers across conditions

Barrier	χ^2 (2)	p	ϵ^2
Cost of reusable cup	2.27	.32	.002
Lacking space to bring reusable cup	2.07	.35	< .001
Forgetting to use reusable cup	0.72	.70	.008
Peers not using reusable cups	0.35	.84	.01
Needing to wash reusable cups	0.71	.70	.008
Reusable cup affects the drink's taste	2.49	.29	.003
Barista does not ask about using reusable cups	1.13	.57	.005

Appendix F: Barrier Perception Spearman Correlation Analysis

Table F

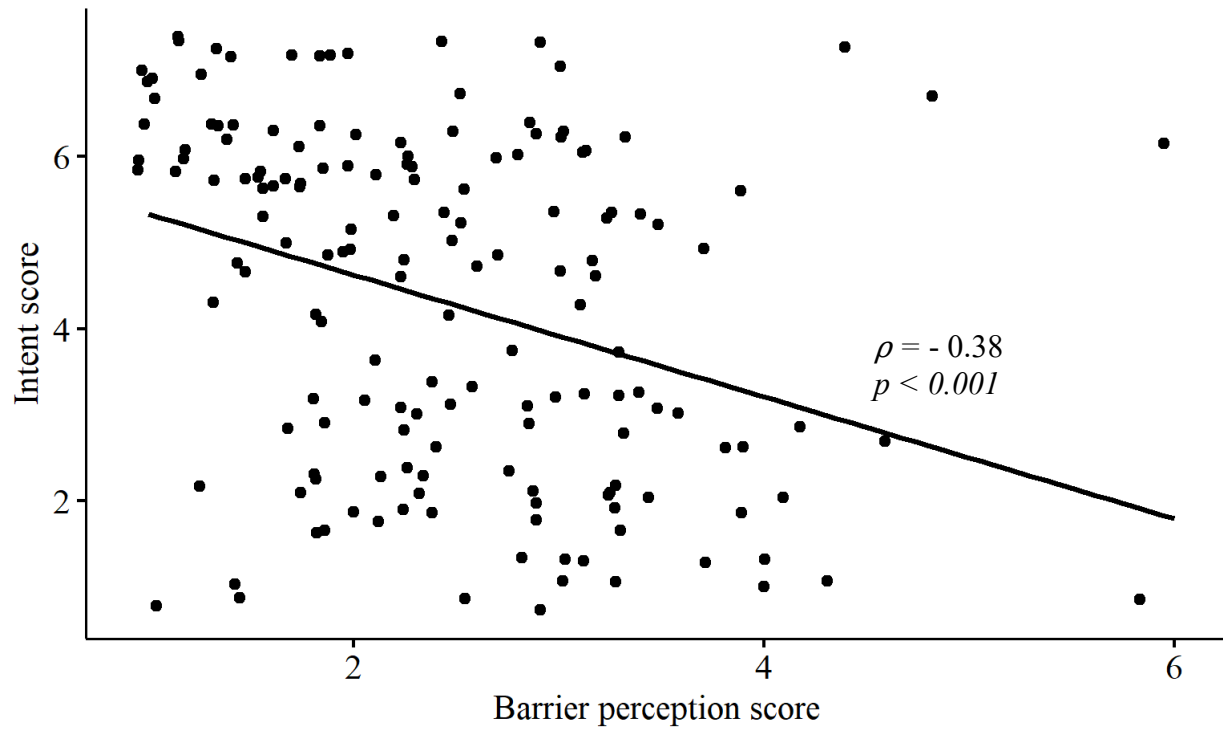
Correlation matrix for each barrier's correlation to intent to use reusable cups

Barrier	ρ with intent	p
Cost of reusable cup	-.05	0.52
Lacking space to bring reusable cup	-.29	< 0.001***
Forgetting to use reusable cup	-.37	< 0.001***
Peers not using reusable cups	-.22	0.004***
Needing to wash reusable cups	-.42	< 0.001***
Reusable cup affects the drink's taste	-.14	0.082
Barista does not ask about using reusable cups	-.15	0.054

Note. ^a. *** $p < .01$

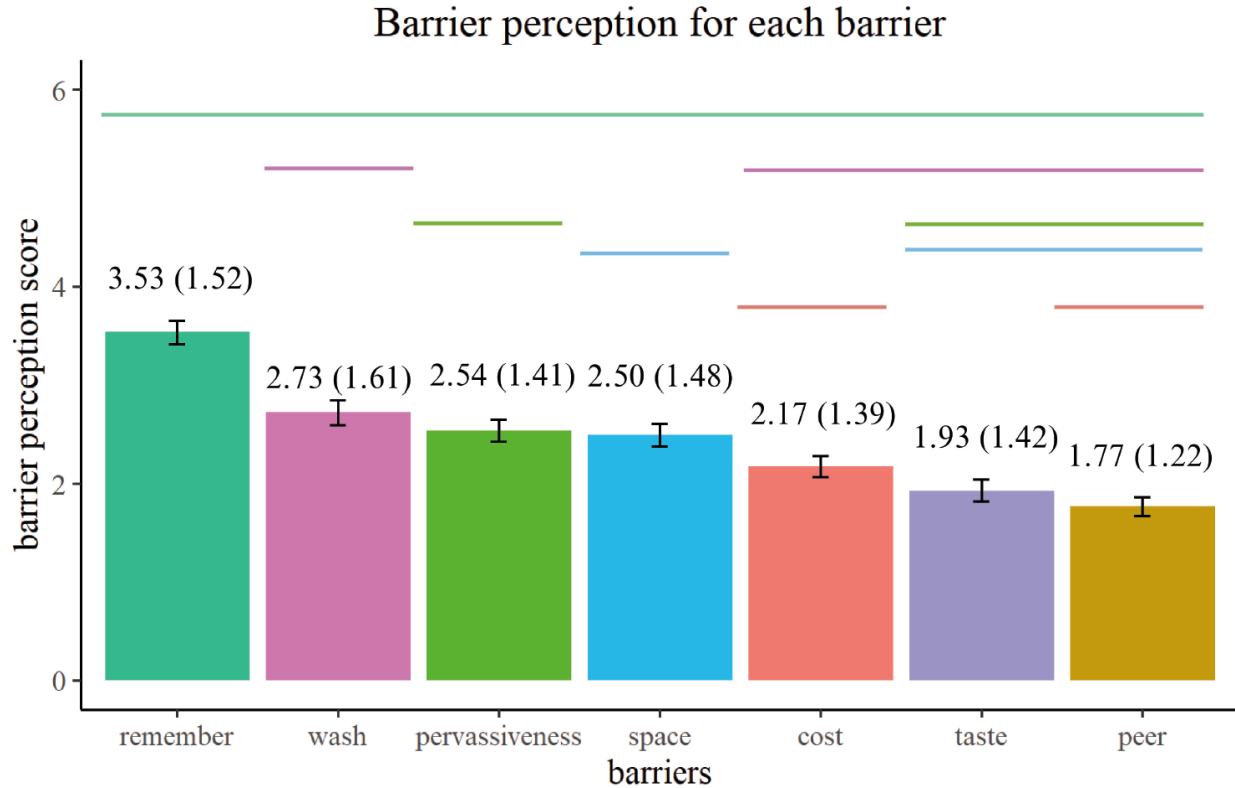
Figure F

Spearman correlation of perceived barriers with intent to use reusable



Appendix G: Wilcoxon Signed-Rank Test Pairwise Analysis between Individual Barriers

Figure G



Note. ^a Error bars reflect ± 1 SEM. ^b Data labels represent means and standard deviation. ^c Pervasiveness means baristas not asking about reusable cups. ^d Peer means peers not using reusable cups. ^e Taste means reusable cups affecting the drink's taste. ^f Cost means reusable cups are too expensive. ^g Space means not having enough space to bring reusable cups. ^h Wash means having to wash reusable cups. ⁱ Remember means having to remember to wash reusable cups. All significance markers symbolize $p < .01$, except for the difference between cost and peer which is $p = .01$.

Appendix H: Reusables' Container and Cup Deposit Systems

Figure H.1

Functionality of reusables' cup deposit system



Testing the new smart return bin
for our Reusable takeout cups

Note. Reusables featuring their new cup deposit system that features scannable QR mechanisms synonymous with their container collection system. From Reusables [@reusables_takeout]. (2023 July). *The future is here and it's circular and sustainable* [Video]. Instagram.

<https://www.instagram.com/p/CuupbOotUYK/>

Figure H.2

Instructions of reusables' cup deposit system



Note. Close up image of Reusables' reusable cup deposit container implemented at Capitol Hill, Seattle. From Reusables [@reusables_takeout]. (2023 May). *Hey Seattle 🙌 We're bringing our latest n' greatest reuse tech to the coffee capital of the world! ...*[Photograph]. Instagram. https://www.instagram.com/p/Cr4k0hDRIDn/?img_index=2

Figure H.3

Reusables' container deposit system



Note. Reusables featuring their container deposit system on SFU campus. From Reusables [[@reusables_takeout](#)]. (2023 October). *Sustainability pros knows that reuse > single-use ...* [Photograph]. Instagram. https://www.instagram.com/p/CyoHEeTxml6/?img_index=1

Figure H.4

Functionality of reusables' container deposit system



Note. Reusables showing the container deposit system's return process. From Reusables [@reusables_takeout]. (2023 October). *Tap to Reuse™— yes, it's that easy.* ... [Video]. Instagram. <https://www.instagram.com/p/CyEH6HoRjdY/>