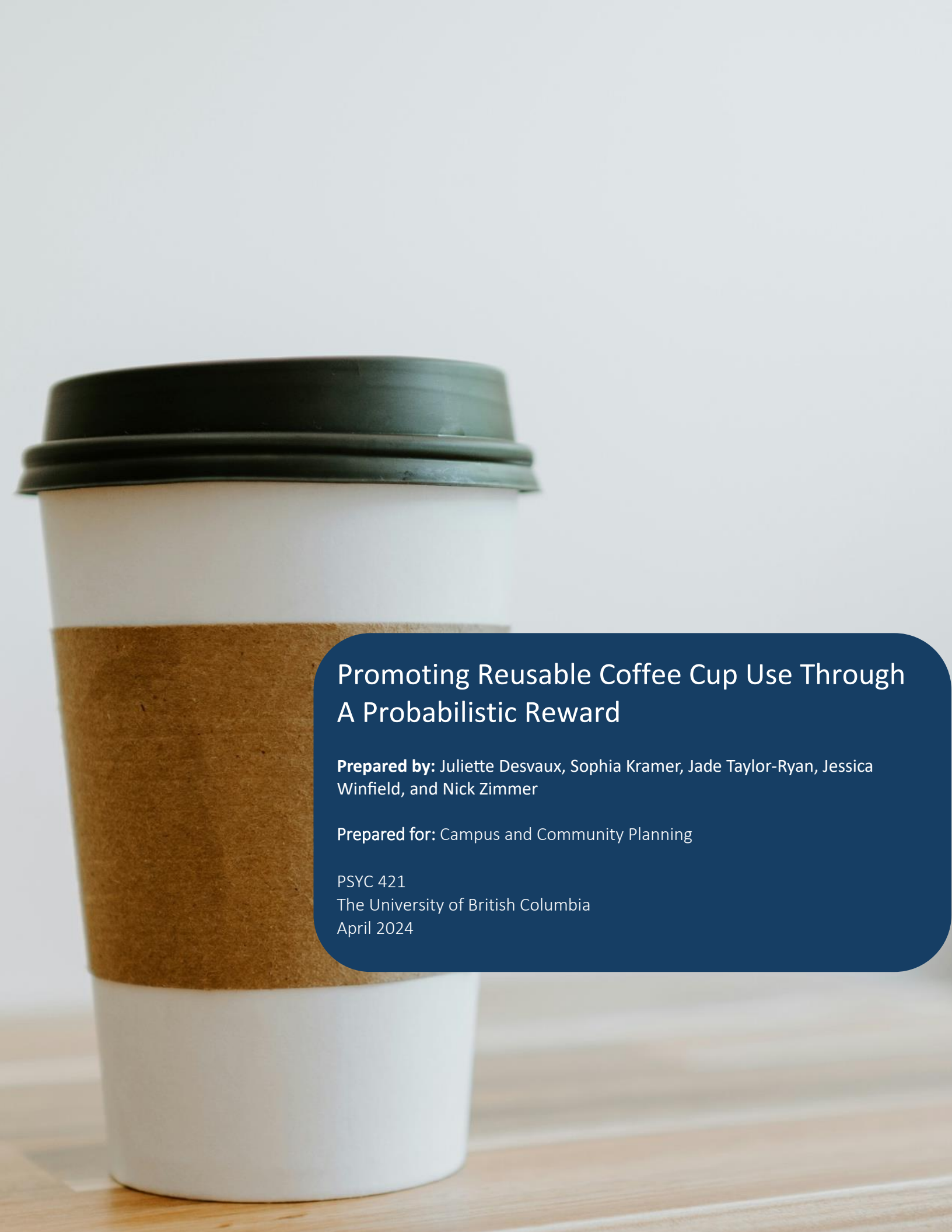

Promoting Reusable Coffee Cup Use Through A Probabilistic Reward

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SEEDS Sustainability Program

Executive Summary

Introduction

This study assesses the impacts of a probabilistic reward on disposable mug use at Blue Chip Cafe on the University of British Columbia campus.

Research Question and Hypothesis

The research question asks how a probabilistic reward intervention, in the form of a spin-the-wheel, will impact reusable mug use among patrons at the Cafe. The research hypothesis suggests that reusable mug usage will increase during the implementation of a probabilistic reward intervention strategy in the form of a spin-the-wheel when compared to baseline.

Methods

This between-subjects design study consisted of a baseline condition and an intervention condition with 216 and 189 participants, respectively. Data was collected by three researchers observing customers as they entered, purchased, and received their beverages. The independent variable was the spin-the-wheel intervention, and the dependent variable was the rate at which patrons brought a reusable mug.

Results

The findings of this study exhibited weak strength, yet it held statistical significance.

Recommendations

Given this, we recommend some alterations such as implementing this as an electronic system. This would allow Blue Chip Cafe, as well as the wider UBC community, to reduce disposable mug usage. If successful at these local locations, this study has the potential to be implemented in other places too.

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Introduction

In a day and age when success hinges on efficiency and time is considered one of the most valuable resources, convenience is often prioritized. These ideologies have resulted in an increase in disposable mug usage among coffee shop patrons, specifically in North America (Open Case Studies, 2016). In the city of Vancouver alone, 2.6 million disposable mugs get thrown out each week (Saltman, 2017). Research conducted on the life cycle of these disposable cups reveals significant environmental and social costs linked to their manufacturing and usage (Reuters, 2017). Just to convert one ton of raw materials into manufactured disposable mugs takes "9000-12000 kg of steam, 960- 1000 kWh electrical power and 50m^3 cooling water" (Open Case Studies, 2016, p. 1). In order for Canada to meet its net-zero emissions by 2050, it will ultimately have to adopt some form of waste reduction. With this though, comes the issue of required human behaviour change.

It is vital for research to identify optimal strategies for reducing the rates of disposable mugs so that impactful mitigation can be achieved. Combining this objective with cognitive behaviour strategies was the goal of our study. Previous literature has studied temporal discounting which is the everyday experience of valuing more immediate rewards over those in the future. This phenomenon was studied by Poortinga and Whitaker (2018), who found that an immediate $0.25 fee for a disposable mug, along with environmental messaging, changed behaviour and slightly increased reusable cup usage. While this study was somewhat successful in reducing disposable mug use, it did not produce lasting behaviour change. In comparison, another study by Diamond and Loewy (1991) examined the effects of probabilistic reward on recycling attitudes and behaviours, but instead of using monetary losses as the incentive for behaviour change, it incorporated a lottery system. The study concluded that lotteries are an "effective tool for attitude change" (Diamond & Lowey, 1991, p. 2). The authors suggest that varying forms of lottery systems could be a potential way to target sustainable behaviour practices. With this in mind, we designed a study to do exactly this. We wanted to combine the behaviour changes seen in Poortinga and Whitaker's (2018) study with the techniques used by Diamond and Lowey (1991). Our hope was that a combination of the two would provide us with results that saw behaviour change among coffee shop patrons at the University of British Columbia (UBC).

Research Question

How will a probabilistic reward intervention, in the form of a spin-the-wheel, impact reusable mug use among patrons at a local coffee shop?

Hypothesis

Reusable mug usage will increase during the implementation of a probabilistic reward intervention strategy in the form of a spin-the-wheel compared to baseline.

Methods

Participants

Participants for this study included customers of UBC Vancouver's campus Blue Chip Cafe. While these patrons are not a part of a particular demographic, our customers mainly consisted of UBC students, staff, and members of the local community. Given this variety, we did not consider demographic information in the study. After conducting a power analysis with a minimum effect size of 0.2, an alpha level of 0.05, a power of 0.95, and two between-subjects conditions, we determined the target sample size to be $n = 325$. We completed the study with a sample size of 405 participants.

Conditions

We had two conditions, a baseline condition and an intervention condition. Based on our target sample size of 325 participants we needed a sample of $n \geq 163$ in each condition. We completed our study with 216 participants in the baseline condition and 189 in the intervention condition. Our independent variable (IV) was the implementation of a spin-the-wheel-to-win reward system for bringing one's own reusable mug/cup. In our baseline condition, there was no implementation of the spin-the-wheel-to-win intervention, we simply recorded the amount of reusable and disposable cups used in the given time frame (11:00 to 13:30) with no manipulation. In our intervention condition, there was an implementation of the spin-the-wheel-to-win incentive. In this condition, we recorded how many participants brought a reusable cup, how many of whom spun the wheel, how many won, and the number of disposable cups used. The IV was operationalized as either being in effect (having the implementation of the spin-the-wheel-to-win incentive) or not.

Measures

Our dependent variable (DV) was personal reusable cup use. In both our baseline and intervention conditions, we measured the DV by recording the number of mugs that participants brought and used when purchasing a beverage at Blue Chip Cafe. Each person who purchased a beverage during the times of our study was recorded with a participant number and either a yes (if they brought a reusable mug) or a no (if they did not). We counted the number of 'yes' responses to record the amount of personal reusable mugs.

Procedure

We collected data over four days. Two days were used to collect for the baseline condition and two days for the intervention condition. On Wednesday, March 6th, 2024 from 12:38 pm to 13:36 pm, and Thursday, March 7th, 2024 from 11:23 am to 12:30 pm, we collected data for the baseline condition (for a total of 2 hours and 5 minutes). Data collection involved two to three researchers watching the drink counter at Blue Chip Cafe and recording the number of drinks made for customers and whether they were in disposable or reusable mugs/cups. We recorded the number of drinks purchased throughout this time frame and assigned a 'yes' to those drinks made in reusable cups and a 'no' to those made in disposable cups. There was no discrepancy between the researchers' collection. After acquiring this baseline data, we began to advertise our spin-the-wheel-to-win reward system for bringing your reusable mug/cup by putting up posters in and around Blue Chip Cafe. The poster included the date for when this spin-the-wheel game

would start (March 13th was the date displayed, however we ended up starting a day later on March 14th) with large text reading ‘Spin the Wheel to Win!’ and smaller text stating ‘bring your reusable cup and get the chance to win an AMS gift card!’ To see what these posters looked like, refer to *Figure A1*. These posters were put up on Thursday, March 7th, 2024, and left up for the remainder of our study. On Thursday, March 14th, 2024 from 12:35 to 13:42 and Friday, March 15th, 2024, from 12:11 to 13:23, we implemented the spin-the-wheel-to-win incentive and began data collection for the intervention condition (for a total of 2 hours and 19 minutes). Data collection followed a similar procedure to that of the baseline condition. Two to three researchers recorded the amount of beverages made and assigned a ‘yes’ to those drinks made in reusable cups and a ‘no’ to those made in disposable cups. Every participant who brought and used a reusable mug was asked by a researcher if they wanted to spin the wheel for a chance to win an AMS gift card (which could be used at several establishments at UBC Vancouver). We then recorded whether those who brought a reusable cup chose to spin the wheel (a yes was assigned) or not (a no was assigned) and whether they won (yes) or not (no). Participants who won were asked for their email which we then recorded and used to send them the gift card virtually. Participants had a five percent chance of winning a gift card when they span the wheel. The virtual wheel contained numbers 1 to 20 and participants who chose to spin were asked to pick a number and if it landed on their number they won a $5 AMS gift card. That being said, it should be noted that no participant asked about the probability associated with winning the wheel spinning. Informal questioning was performed to understand reusable mug awareness of the spin-the-wheel. To see what this virtual wheel looked like, refer to *Figure A2*. Data collection went smoothly and no challenges occurred during our procedure.

Results

After data collection was complete, we analyzed our data using a chi-squared test conducted on the Social Science Statistics online calculator. A chi-squared test was appropriate to use as our data consisted of random samples and the variables in question were categorical in nature. This would allow us to determine if our observed data varied from our expected data and whether this difference was due to chance. We had 216 participants in our baseline condition and 189 in our intervention condition. This gave us a total of 405 participants. In the baseline condition, ten people used their own mug (4.6%) and during the intervention, 26 people used their own mugs (13.8%). A chi-squared test showed that participant use of reusable mugs in coffee shops during the spin-the-wheel intervention was statistically significant, X^2 (1, N = 405) = 10.37, p = .001, V = .16, suggesting that the spin-the-wheel intervention is likely an effective method to increase reusable mug usage in coffee shops. However, while the results are statistically significant, the result is also weak since $V \leq .2$. Overall, this supported our initial hypothesis which stated that reusable mug usage would increase after the implementation of advertisement and a probabilistic reward intervention strategy. Reference *Figure B1* in the Appendix to see the results of the chi-squared test.

Discussion

This study examined how a probabilistic reward intervention would impact reusable mug use among patrons at Blue Chip Cafe at the University of British Columbia, as measured by the percentage increase in reusable cup usage during a spin-the-wheel reward intervention. Reusable cup usage increased by 9.2% when the spin-the-wheel intervention was in play, compared to when it was not. This suggests that the spin-the-wheel advertisements perhaps served as a motivation for participants to bring their reusable mug to the coffee shop. This is an important implication of this study; that a probabilistic reward intervention produced an increased use of reusable mugs. This finding offers a new strategy to decrease the significant environmental and social costs of disposable mugs (Reuters, 2017). This implication is relevant for UBC on its path to fulfill its Climate Action Plan 2030 target of a 50% reduction in waste (The University of British Columbia Sustainability, 2023). Beyond the university campus, this probabilistic reward strategy could be implemented on a wider scale to reduce the overall social and environmental costs of disposal mugs.

Limitations of this study include the short baseline and data collection period, with the spin-the-wheel implementation only active for three hours total over two days. This period was likely not long enough for participants to become accustomed to the game and make it a habit to bring a reusable mug so that they may participate. This suggests that the increase in reusable mugs seen was due to the spin-the-wheel advertisements versus actual participation. Running the study over a longer time period could ensure that the results reflect participation in the probabilistic reward intervention. Another challenge of the study design was that data was collected by hand through observing participants. This could have led to data collection errors. The hectic environment of the busy coffee shop made it challenging to keep track of all drink orders being collected. Though it was not possible with this study's constraints, collecting the data from the coffee shop's data system would have perhaps been more accurate.

During the debriefing session, we found that most people who had brought their own reusable mug and spun the wheel were unaware of the spin-the-wheel advertisements and study that was happening that day. Given this, it is remarkable that we were still able to observe a significant increase in reusable mugs during the spin-the-wheel intervention since most participants in the game did not know it was taking place. This suggests that conscious thought may not be required to elicit a behaviour change to bring a reusable mug and act in a sustainable manner. Perhaps, coffee shop patrons subconsciously noticed the spin-the-wheel advertisements instructing them to bring a reusable mug. This is consistent with previous research indicating a lack of correlation between awareness of messaging and the adoption of pro-environmental behaviors (Luo et al., 2022; Nolan et al., 2008).

Another important finding was that many people in line at Blue Chip Cafe without a reusable mug, who spoke with our researchers during the spin-the-wheel intervention, were disappointed they could not play the game. They indicated that they would bring a reusable mug in the future to play. This suggests that with greater advertisement and intervention visibility, the use of reusable mugs may increase more than we saw in our study.

To further understand how a probabilistic reward intervention can increase reusable mug usage in coffee shops, future studies should examine if putting the spin-the-wheel game on an iPad at

checkout instead would have a varying effect than poster advertisements and a human-run game. Perhaps, if the spin-the-wheel was visibly present at the till, coffee shop patrons would pay more attention to it. It would also make new customers aware of the intervention. Future studies should also examine if there is a differentiation in behaviour change determined by the winning chance of the spin-the-wheel intervention. The current study examined a five percent chance of reward, however, it would be interesting to understand if a higher or lower winning proportion would influence long-term participation in the game. Given that none of our participants asked about winning probability, it leads us to believe that perhaps, behaviour change is not dependent on this proportion. Though not examined in this study, future analyses should also test if a probabilistic reward intervention also produces an attitude change as seen in Diamond and Loewy's (1991) study on probabilistic rewards on recycling attitudes and behaviour. This study exercised a short-term behaviour change, however, to ensure long-term prosocial behaviour it is critical that attitudes remain positive (Diamond & Loewy, 1991).

Recommendations

To enhance sustainable practices here on UBC's campus, we recommend implementing the spin-the-wheel game throughout all UBC coffee shops. Placing an iPad next to the checkout area that has the spin-the-wheel incorporated already can offer a quick, efficient, and digital spin-the-wheel experience, which would be particularly useful during busy times to encourage the use of reusable mugs. Additionally, to ensure the success and awareness of this initiative, we believe promoting this campaign via online advertisements and posters will not only advertise the spin-the-wheel game but also promote the benefits of reusable mugs, addressing the current gap in awareness and concern regarding the existing fee, as well as the environmental impact disposable mugs have. This dual approach aims to make sustainability both rewarding and visible, fostering a more eco-conscious campus culture.

While our results led to a statistically significant increase in reusable mug usage after implementing a probabilistic reward via the spin-the-wheel game and its advertisement, the results are considered weak due to our small effect size. Further research on this topic is imperative to continue to explore and challenge the findings of this study using the recommendations included in this section. To build on the initial success of our study, future studies could experiment with different reward structures to explore how variations in rewards impact user engagement. Additionally, examining other psychological or situational factors might enhance the effectiveness of the spin-the-wheel game. Conducting a more longitudinal study would help assess whether the changes in behaviour are sustained over time while testing the strategy in different campuses or settings could assess its generalizability. Gathering more quantitative and qualitative feedback would also provide deeper insights into different perceptions, motivations, and barriers. This ongoing exploration is vital for universities like UBC to reach their environmental goals, offering a valuable piece in understanding how we, together, can work towards a healthier and greener planet.

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Appendices

Appendix A: Materials Used

Figure A1: The poster used to advertise the spin-the-wheel experiment.

Figure A2: The virtual wheel that participants spun when they brought their own mugs.

Appendix B: Results

	Reusable Mug	No Reusable Mug	*Marginal Row Totals*
Baseline	10 (19.2) [4.41]	206 (196.8) [0.43]	216
Intervention	26 (16.8) [5.04]	163 (172.2) [0.49]	189
Marginal Column Totals	36	369	405 (Grand Total)

The chi-square statistic is 10.368. The *p*-value is .001282. Significant at $p < .05$.

Figure B1: Chi-squared test results.