



The Effects of Motivational and Informative Signage on Intentions to Minimize Food Waste in A University All-Access Dining Hall

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Executive Summary

Introduction

How does informative and motivational messaging on signage affect intentions to finish all the food taken in all-access university dining halls? Past research has indicated that messaging that creates optimism, hope, and motivation effectively influences intentions and behaviour, with more mixed findings on the effectiveness of informative messaging. However, there is a gap in the literature comparing the effectiveness of informative signage and motivational signage in the context of food waste prevention.

Research Question

How does informative and motivational messaging on signage affect intentions to finish all the food individuals take in an all-access university dining hall?

Methods

We created a between-subjects design study in the form of an online survey, wherein participants ($N = 229$) were assigned to one of three conditions: control, informative, and motivation. They were presented with a corresponding poster and asked about their intention to finish the food they took.

Results

Results showed no significant difference between conditions, with participants reporting similar degrees of intent to finish food. These findings deviate from previous research regarding the effectiveness of informative and motivational messaging, and this may be due to a lack of personal relevance of all messaging or comprehension of numbers provided in the informative condition.

Recommendations

Rotating signage periodically can prevent habituation, maintain student engagement, and ensure messaging remains fresh and resonates with the diverse student population. UBC Food Services can also refine messaging strategies to maximize their impact by actively seeking feedback from students and analyzing data on behaviour change. Finally, UBC Food Services can incorporate subtle cues or prompts in signage that guide individuals towards more sustainable choices.

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Introduction

With the switch to all-access dining in food halls at the University of British Columbia, increased food waste and the possibility of dining hall attendees taking more food than they can finish has become a growing concern. Given the university's objective to create a more sustainable and environment-friendly future, this potential trend is concerning. While this is the case, various kinds of behavioural interventions and nudges have been shown to be effective in encouraging the reduction of food waste. These include information-based interventions that direct individuals' attention to specific knowledge associated with food waste, or interventions that influence behaviour by eliciting certain emotions (Tian et al., 2022).

Several studies looking at the role of framing have found motivational, hopeful, and optimistic messages to be an effective way to impact intentions and behaviour; Khalil et al. (2022) found that participants who felt hope after reading messages of gain (as opposed to loss) showed greater intention not to waste food at the household level, and Peter and Honea's (2012) research around disposable bottled water consumption found that eliciting various emotions such as guilt, hope, pride, and especially optimism, encouraged people to set intentions to change behaviour and manage personal consumption to meet a desirable social outcome.

Hampton et al. (2009) found that informative messaging is effective for those already contemplating a behaviour change, but contrastingly, that evoking emotion is necessary to induce change in people who have not yet considered altering their behaviour. Other existing research has also undermined the effectiveness of informational messaging when presented alone; Abrahamese et al. (2005) investigated interventions to reduce household energy consumption and similarly found that informational interventions alone are insufficient for behavioural change.

With mixed evidence regarding the effectiveness of informative messaging, and fairly consistent findings regarding the effectiveness of optimism and hope-related messaging in significantly impacting waste-reduction-related behaviour, this may suggest that overall, the latter form of messaging is more effective in altering both intentions and behaviours to reduce food waste. Despite this, it might still be possible that creating an informative message that seeks to raise awareness on food wastage may be effective if individuals are already contemplating behavioural changes, and simply need an extra push or reminder.

However, through a review of existing research on behavioural interventions and food waste reduction, we discovered a gap in the literature not only in terms of the effectiveness of informational messaging specifically relating to food waste, but also more generally in directly comparing the effectiveness of various different kinds of messaging in the context of food waste. Through investigating which forms of messaging are most effective in altering food waste-related intentions and behaviours, and uncovering the potential utility of using informational messaging that specifically provides information on the waste of particular locations, all-access dining facilities can optimize the messaging they use, resulting in a higher reduction of food waste.

Research Question

Based on the findings of past research in our literature review, we see evidence that optimism and motivation-related messaging is effective, whereas informative messaging can be effective under specific circumstances. However, there is a lack of studies directly comparing the two in food waste prevention. We are interested in comparing how these two kinds of messaging on signage affect peoples' intentions to finish their food at an all-access dining hall, and in seeing which of the two might be more effective. Thus, our research question is as follows:

How does informative and motivational messaging on signage affect intentions to finish all the food individuals take in an all-access university dining hall?

In this context, “informative” messaging informs and increases individuals’ awareness of knowledge relating to food waste in a particular dining hall, whereas “motivational” messaging seeks to motivate individuals through optimism and hope. Messaging is to be placed on signage, as signage has been shown to be an effective method of short-term information sharing and in increasing awareness and the salience of certain kinds of information (Choquette & Hand, 2021).

Hypothesis

We hypothesize that both the motivational and informative messaging on signage will be more effective than neutral messaging on signage in increasing intentions to finish all the food individuals take in an all-access university dining hall. Our secondary hypothesis is that motivation messaging on signage will have the greatest effect in increasing intentions compared to both neutral and informative messaging on signage.

Methods

Participants

Using a minimum effect size *Cohen's d* = 0.20, α =0.05, power = 0.80, and three between-subjects conditions in our a priori power analysis run in R, we estimated that the experiment needed at least 246 participants to achieve statistical power. Our sample included UBC students, staff, and other university-affiliated groups recruited through social media, class announcements, and word of mouth. After finishing data collection and applying exclusion criteria, we had a total of $n = 229$ participants who successfully passed the attention check and fully completed the main portion of the survey. The majority of our population were domestic students (Appendix, Figure 1) living outside campus (Appendix, Figure 2), which was crucial for us to determine due to the importance of participants' familiarity with the all-access dining halls in campus residences. Additionally, most participants identified as women ($n = 132$), 71 as men, 12 as non-binary, 6 as gender-fluid, and 8 did not disclose their identity (Appendix, Figure 3); the age in our sample ranged from 16 to 43 years with an average age of 21.5 years ($SD = 3.46$).

Conditions

We created an online between-subjects design in which participants were randomly assigned to one of three conditions; the control had 63 participants, whereas the informative and motivation conditions included 82 and 84 participants, respectively. Each participant was first tasked with visualizing the same experience of being in line for food at UBC's Open Kitchen all-access dining hall and, while waiting in line, seeing a poster (see Appendix). Depending on the condition they were assigned to, they would see a different poster. Regardless of condition, each poster began with the uniform header: "Take what you want, Eat what you take", and a unique message attached to the bottom catering to their condition. The control poster condition had a neutral message displaying the Open Kitchen mealtime hours. The informative poster condition highlighted the food waste at Open Kitchen: "People dining at Open Kitchen waste 1400+ kg of food every week". Meanwhile, the motivation condition was geared towards being uplifting, reading: "Creating hope, not food waste. Let us cultivate a greener tomorrow together".

By designing three different posters that each emphasized neutral, informative, and motivational messaging, we were able to operationalize the effects of different types of signage. This allowed us to investigate the impact of different types of poster messaging on participants' attitudes and behaviours towards food waste within the context of UBC's Open Kitchen.

Measures

In terms of measures, participants were asked a single question on a 7-point Likert scale: "How likely are you to finish all the food you took?" The online survey question focused on our research objective of determining whether signage messaging influences food waste intentions. By

focusing on their likelihood to consume all the food they selected, we aimed to determine the effectiveness of specific signage messaging.

Procedure

On the first page of the survey, the participants filled out a consent form and were then asked to imagine themselves in a hypothetical scenario. In this scenario, participants were told to imagine themselves entering a UBC all-access dining hall and waiting in line for food. Afterwards, they were told that when standing in line, they viewed a poster. Upon clicking to the next survey page, participants viewed the condition poster that they were randomly assigned to view. This was followed by an attention check question, “What was the message on the poster about?” and ended with our experimental question, “How much food are you likely to throw away?”. Finally, they completed a demographic survey. We collected the data from March 6, 2024, to April 6, 2024, via Qualtrics. Our survey was distributed by group members through social media, friends and family, in-person at UBC, and classroom announcements.

Results

As one of the assumptions of the Analysis of Variance (ANOVA) - the normality of data - was not met (Appendix, Figure 5 and Table 1), we performed the Kruskal-Wallis test on the scores of three groups (control, informative, and motivation). The results showed no significant difference among conditions, the test statistic ($2, N = 229$) = 3.43, $p = 0.18$, $\eta^2 = 0.006$ (Appendix, Table 4). Since the p-value is greater than the conventional significance level of 0.05, it suggests that there is no statistically significant difference among conditions, and there is insufficient evidence to support both our primary and secondary hypotheses. According to our descriptive statistics (Appendix, Table 2), as well as the descriptives plot (Appendix, Figure 4), the mean likelihood of participants' willingness to finish the food in the control condition is 5.51 ($SD = 1.28$), whereas the means from the informative ($SD = 0.99$) and motivation ($SD = 1.00$) conditions are both equal to 5.87.

Discussion

Implications

Based on our study's results, our data have proved insufficient to support both our primary and secondary hypotheses, implying that neither motivational nor informative messaging is particularly effective in altering food waste intentions. This is inconsistent with our earlier review of past literature, which has found that hopeful and optimistic messaging, as well as informative messaging in certain contexts, are effective in altering intentions and behaviour. This lack of significant difference between conditions may be attributed to various factors, such as participants not being inspired to change their intentions due to the lack of personal relevance in the messaging of all the condition posters. The messaging in our motivation condition may have been more effective had we targeted participants' personal values and individual interests or if the messaging had been centred on each participant's food waste to increase consciousness and awareness of one's own food waste.

The messaging in our informative condition may have been ineffective due to the sheer size of the number we reported. The idea of 1400+ kilograms of food being wasted per week may be hard for participants to conceptualize, thus being an ineffective method of creating change. Alternatives such as reporting information on the daily amount of food wasted create a smaller kilogram number and may be more tangible for individuals. Although we tried to target personal relevance in the informative condition by using a message reporting the weekly food waste of a specific dining hall, it's possible this was still too general or that the data still afforded participants anonymity, therefore not inspiring any change in behaviour.

Limitations

One of the major limitations of our study relates to the exclusion criteria applied to the participants. While we nearly achieved our statistical power by making 229 observations out of the 246 required by the power analysis, our results may have been affected by a lack of participants in the control condition ($n = 63$) compared to the informative ($n = 83$) and motivation ($n = 84$) conditions. During the application of the exclusion criteria, we had to eliminate eight participants from the control condition due to their failure to respond to the attention check question correctly. Instead of selecting the answer "A message about the operating hours of the dining hall," these participants chose "Other" (Appendix, Survey Questions, Page 4 - Condition 1 [Control]). Participants who selected "Other" emphasized the sustainability and food waste-related implications of the "Take what you want, Eat what you take" message in the heading of the control poster.

Another potential limitation is the messaging on the top of all the posters used in our survey created a ceiling effect in the results. Across all conditions, participants, on average, said they were between somewhat likely (a five on the Likert scale) to likely (a six on the Likert scale) to finish all the food they took, indicating a fairly positive response across all conditions. The

“Take what you want, Eat what you take” message was intended to serve as a uniform neutral message on the signage. However, it may have influenced all participants to think about their food waste habits — explaining the lack of significant difference between conditions.

An additional limitation of our research was that it was conducted through an online survey and, therefore, only measured intentions rather than actual behaviour. It is known that individuals may not consistently align their actions with their intentions, particularly when considering hypothetical scenarios or versions of themselves. In fact, there is a significant gap between intention and behaviour, specifically in the context of food waste reduction in young people (Fraj-Andrés et al., 2023). Thus, we cannot be confident that these intentions to prevent food waste would be reflected in a real-world setting, where various other factors might be at play.

Future Studies

Although our findings were not statistically significant, we noted in our study a numerical difference between the average likelihood of participants’ willingness to finish the food in the control condition, which had a mean of 5.51, compared to the informative and motivation conditions, which both had a mean of 5.87. Although the size of this difference was not large enough to be considered statistically significant, these findings may suggest that a subtle effect not captured by our data does exist and that further research utilizing larger sample sizes or different methods might be able to explore such an effect more fully.

In future studies, the potential ceiling effect that may have resulted from the “Take what you want, Eat what you take” message could be avoided by choosing a message entirely unrelated to food waste or removing extra messaging from the signage altogether. Additionally, having an increased range on the Likert scale or exploring alternative response formats might offer an advantage in enhancing sensitivity to differences in participant responses. Future studies should consider alternative measures and experimental designs and also consider combining multiple response formats to create a richer view of participants' attitudes.

The exploration of alternative messaging approaches also holds promise for promoting food waste reduction behaviours. Future research into innovative strategies such as gamification, social norms, or blending informative and motivational messaging can provide new insights into effective ways to engage individuals toward sustainable behaviour. By diversifying messaging strategies, researchers can identify novel approaches that resonate with students and drive meaningful behaviour change.

Given that our study was conducted online and only measured intentions rather than real behaviour, future research could further extend and build on the findings of our study by exploring the effectiveness of different forms of messaging on signage in real university dining halls. Real-world implementation studies are crucial for evaluating the long-term effectiveness and sustainability of signage interventions. By conducting follow-up studies in dining hall settings, researchers can assess behaviour changes in a naturalistic environment and provide valuable insights into the real-world impact of messaging interventions.

Recommendations

UBC Food Services should implement a multifaceted approach to signage messaging. First and foremost, diversifying messaging content is crucial. Rotating signage periodically can prevent habituation, maintain student engagement, and ensure messaging remains fresh and resonates with the diverse student population. Moreover, collaboration with existing sustainability initiatives at UBC is critical. By aligning messaging efforts with broader sustainability goals, UBC Food Services can amplify their impact and foster a culture of sustainability on campus by leveraging existing resources and expertise.

Continuous evaluation and adaptation of signage messaging strategies are essential components of effective food waste reduction initiatives. Regular monitoring of the effectiveness of signage through feedback mechanisms and data analysis enables UBC Food Services to gauge student response and make informed adjustments as needed. By actively seeking feedback from students and analyzing data on behaviour change, UBC Food Services can refine messaging strategies to maximize their impact. This iterative approach ensures that messaging remains relevant and resonates with students over time.

Furthermore, integrating behavioural nudges into signage messaging can be an effective strategy for promoting food waste reduction behaviours. By incorporating subtle cues or prompts that guide individuals towards more sustainable choices, UBC Food Services can harness the power of behavioural economics to influence behaviour change in dining hall settings.

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Appendices

Figure 1

Distribution of Participants Based on Affiliation to UBC

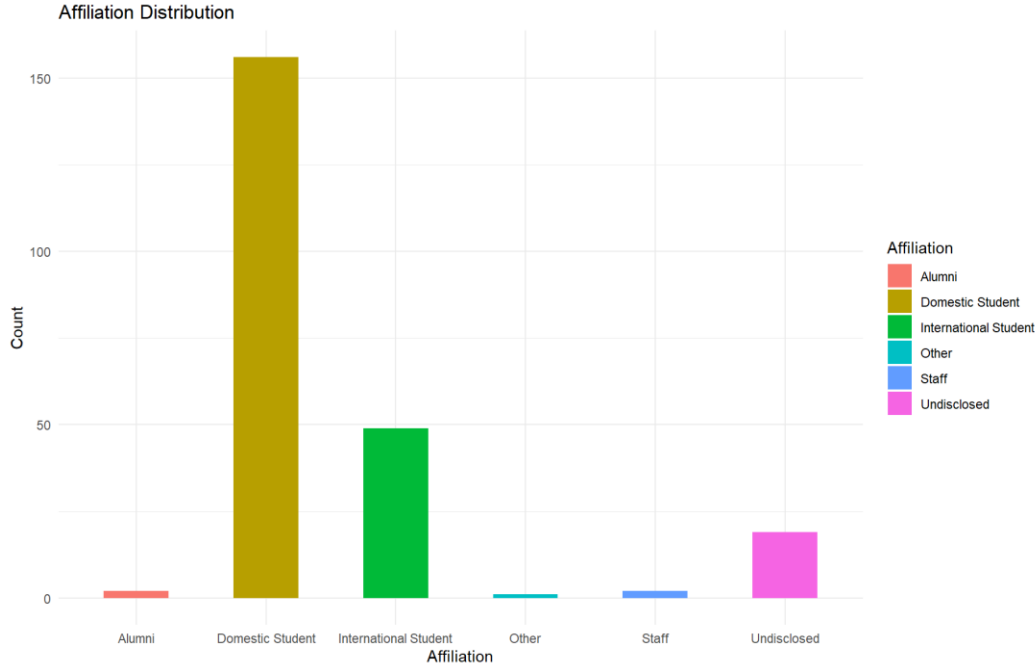


Figure 2

Distribution of Participants Based on Residence

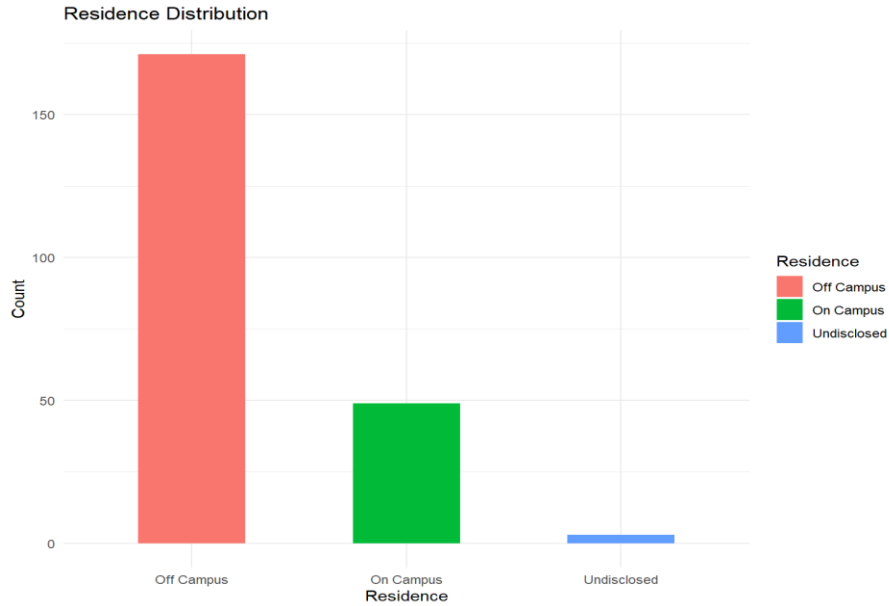


Figure 3

Pie Chart Depicting the Gender Identity of Participants

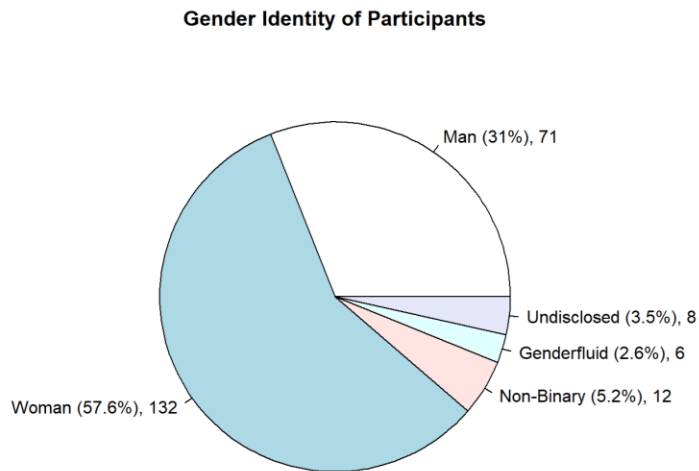
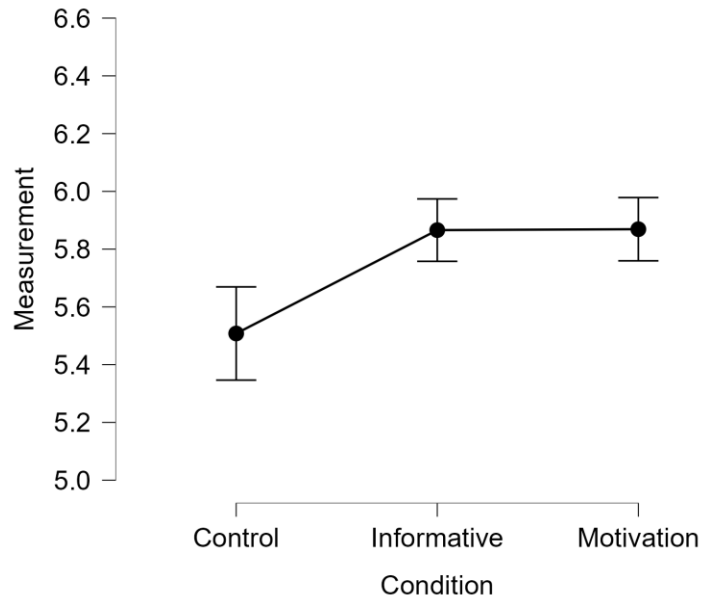


Figure 4

Descriptive Plot of the Mean Rating of Participants' Likelihood to Finish All Food They Are Taking in the All-Access Dining Hall in Each Condition



Note. Error bars display the standard error for each condition.

Figure 5

Quantile-Quantile Plot to Measure the Distribution Patterns of the Data

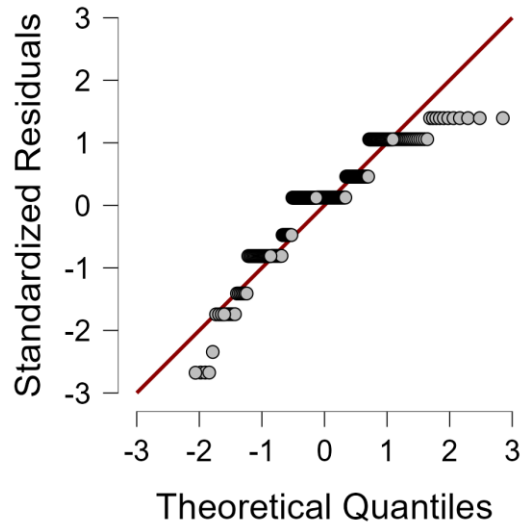


Table 1

Analysis of Variance (ANOVA) Results with Eta Squared Effect Sizes
ANOVA - Measurement

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Condition	5.904	2	2.952	2.538	0.081	0.022
Residuals	262.830	226	1.163			

Note. Type III Sum of Squares

Table 2

Descriptive Statistics: Mean Rating of Participants' Likelihood to Finish All Food They Are Taking in the All-Access Dining Hall

Descriptives - Measurement

Condition	N	Mean	SD	SE	Coefficient of variation
Control	63	5.508	1.281	0.161	0.233
Informative	82	5.866	0.978	0.108	0.167
Motivation	84	5.869	1.003	0.109	0.171

Table 3

Kruskal-Wallis Test Results

Kruskal-Wallis Test

Factor	Statistic	df	p
Condition	3.432	2	0.180

Note. Test statistic (2, $n = 229$) = 3.43, $p = 0.18$, $\eta^2 = 0.006$ *formula for η^2 in Kruskal-Wallis test: $\eta^2[H] = (H - k + 1)/(n - k)$, assuming that test statistic is equal to H

Survey Flow

Block: Consent (2 Question)

Block: Hypothetical Scenario (1 Question)

Block Randomizer: 1 - One of three conditions randomly shown to the participant

 Standard: Condition 1 (3 Questions)

 Standard: Condition 2 (3 Questions)

 Standard: Condition 3 (3 Questions)

Block: Demographic Survey (5 Questions)

Block: Debrief

End of Survey

Survey Questions

Page 1-2: Consent

Below is the consent form. Please read through it carefully.



UNIVERSITY OF BRITISH COLUMBIA

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Consent Form

Class Research Projects in PSYC 421 - Environmental Psychology

Principal Investigator: Dr. Jiaying Zhao
Course Instructor
Department of Psychology
Institute for Resources, Environment and Sustainability
Email: jiaaying@psych.ubc.ca

Introduction and Purpose

Students in the PSYC 421 - Environment Psychology class are required to complete a research project on the UBC campus as part of their course credit. In this class, students are required to write up a research proposal, conduct a research project, collect and analyze data, present their findings in class, and submit a final report. Their final reports will be published on the SEEDS online library (<https://sustain.ubc.ca/teaching-applied-learning/seeds-sustainability-program>). Their projects include online surveys and experiments on a variety of sustainability topics, such as waste sorting on campus, student health and wellbeing, food consumption and diet, transportation, biodiversity perception, and exercise habits. The goal of the project is to train students to learn research techniques, how to work in teams and work with UBC clients selected by the UBC SEEDS (Social Ecological Economic Development Studies) program.

Study Procedures

If you agree to participate, the study will take about 10 minutes of your time. You will answer a few questions in the study. The data will be strictly anonymous. Your participation is entirely voluntary, and you can withdraw at any point without any penalty. Your data in the study will be recorded (e.g., any answer you give) for data analysis purposes. If you are not sure about any instructions, please do not hesitate to ask. Your data will only be used for student projects in the class. There are no risks associated with participating in this experiment.

Confidentiality

Your identity will be kept strictly confidential. All documents will be identified only by code number and kept in a locked filing cabinet. You will not be identified by name in any reports of the completed study. Data that will be kept on a computer hard disk will also be identified only by code number and will be encrypted and password protected so that only the principal investigator and course instructor, Dr. Jiaying Zhao and the teaching assistants will have access to it. Following the completion of the study, the data will be transferred to an encrypted and password protected hard drive and stored in a locked filing cabinet. Please note that the results of this study will be used to write a report which is published on the SEEDS library.

Remuneration

There is no remuneration for your participation.

Version 4: June 28, 2022 (Ethics ID: H17-02929)

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UNIVERSITY OF BRITISH COLUMBIA

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Contact for information about the study

This study is being conducted by Dr. Jiaying Zhao, the principal investigator. Please contact her if you have any questions about this study. Dr. Zhao may be reached at (604) 827-2203 or jiaaying@psych.ubc.ca.

Contact for concerns about the rights of research subjects

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSHL@ors.ubc.ca or call toll free 1-877-822-8598.

Consent: Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time. You also may postpone your decision to participate for 24 hours. You have the right to choose to not answer some or any of the questions. By clicking the "continue" button, you are indicating your consent to participate; hence, your signature is not required. The researchers encourage you to keep this information sheet for your records. Please feel free to ask the investigators any additional questions that you have about the study.

Ethics ID: H17-02929

Version 4: June 28, 2022 (Ethics ID: H17-02929)

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Page 3:
Hypothetical
Scenario

Imagine you have just stepped into a UBC Open Kitchen all-access dining hall and plan on having a meal. You grab a plate and now you are standing in line to take some food from the stands. As you go to grab your food, you spot a poster.



Page 5 - Demographics: Questions 4-8

Now that you've completed the survey, we would like to gather some information about you.

How old are you (in years)?

What gender do you identify as?

Man

Woman

Nonbinary

Genderfluid

Other (please specify):

Prefer not to say

What is your current affiliation with UBC?

Domestic student

International student

Staff

Other (please specify):

Prefer not to say

Do you currently live in one of the UBC residences?

Yes

No

Other (please specify):

Prefer not to say

Page 6 - Debrief

Thank you for participating in our study! This study aimed to look at how posters with messaging relating to food waste would affect the food waste intentions of UBC students in all-access dining halls on campus. More specifically, we wanted to look at whether informative or motivational messaging relating to food waste would be most effective in changing student food waste intentions. If you have any questions regarding this study, feel free to email us at jjayingz@psych.ubc.ca.



Page 7 - End of Survey

We thank you for your time spent taking this survey.
Your response has been recorded.