



# Bats and Perception: Enhancing Human-Bat Interactions Through Bat-Related Facts

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# Executive Summary

## Introduction

A collaborative project between SEEDS and UBC students to address residential concerns regarding the discovery of a *M. lucifugus* roost on UBC's Vancouver campus found that many people still harbour negative attitudes towards bats despite their tremendous benefit to humans and the surrounding ecosystem. Our study explored the effect of education on people's perception of bats. Specifically, our team investigated whether the demystification of myths surrounding bats or presenting facts of bat-related benefits impact human perception of bats.

## Research Question

How does demystification of myths surrounding bats and bat-related benefits impact human perception of bats?

## Methods

We created a between-subject survey to test the effectiveness of three different infographics, differing only in the type of fact presented (bat-neutral, bat-benefit, and bat-demystifying), on the participant's perception of bats. Our hypotheses were threefold: 1) participants exposed to demystification facts about bats will have a more positive perception of bats than those exposed to neutral bat-related facts, 2) participants exposed to demystification facts about bats will have a more positive perception of bats than those exposed to beneficial facts about bats, and 3) participants exposed to beneficial facts about bats will have a more positive perception of bats than those exposed to neutral bat-related facts.

## Results

Results show that participant's perception of bats did not significantly differ between the three conditions, failing to support our hypotheses.

## Recommendations

Firstly, future studies should aim to recruit people in direct contact with bats such as those living or working near Auditorium Annex Offices located in UBC's Vancouver campus. Additionally, future surveys should add a section asking what the participant's preconceived beliefs are regarding bats and whether the participants believe the educational information presented. Finally, future studies should utilize different educational methods to convey bat-related facts and explore how these varying mediums can affect the public's perception of bats.

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# Introduction

As of 2014, *Myotis lucifugus* (hereafter *M. lucifugus*), commonly known as the little brown bat, has been designated an endangered species due to the rapid spread of white-nose syndrome (WNS) [1]. The sighting of a *M. lucifugus* roost raised residential concerns regarding bat activity on UBC campus, prompting a collaborative project between SEEDS and several UBC students to install a bat box [2]. This installation aimed to mitigate these concerns whilst providing alternative housing for little brown bats, enhancing protection for the endangered species [2]. However, despite the tremendous ecological benefits bats provide as a natural insecticide, negative attitudes towards them persist due to common misconceptions surrounding the species [3]. These negative attitudes can significantly impede the implementation of effective conservation strategies, such as Bartha and colleagues' bat box initiative, by creating barriers to public support and engagement [3]. Previously conducted research has indicated that enhancing community member's knowledge about bats, achieved through an advanced level of education, will improve negative perceptions [6]. Thus, education presents as a promising approach for improving participation and effectiveness of conservation efforts [6].

There is a gap in knowledge regarding which types of information are most effective in dispelling these misconceptions and fostering positive attitudes toward bats. This motivated our study to take a targeted approach to determine the effect of differently presented information, and the specificity of our conditions aims to provide a pathway into more informed and definitive educational approaches in future research. Building on prior findings that underscore the role of misconceptions and myths in shaping negative attitudes toward bats [3], we structured our study conditions, incorporating demystification and emphasizing benefits, to directly address these prevalent attitudes. Understanding which aspects of educational content are most influential in shifting public perceptions is critical for designing effective conservation strategies.

# Research Question and Hypotheses

## Research Question

How does demystification of myths surrounding bats and bat-related benefits impact human perception of bats?

## Hypotheses

Our hypotheses were threefold: 1) Participants exposed to demystification facts about bats will have a more positive perception of bats than those exposed to neutral bat-related facts, 2) participants exposed to demystification facts about bats will have a more positive perception of bats than those exposed to beneficial facts about bats, and 3) participants exposed to beneficial facts about bats will have a more positive perception of bats than those exposed to neutral bat-related facts.

# Methods

## Participants

The survey was distributed by our team and aimed at the general population of British Columbia. Based on our power analysis of Cohen's  $f$  small effect size of 0.2, alpha of .05, power of 0.8, and 3 between-subjects conditions, we need a minimum of ( $N = 246$ ) participants to complete an online Qualtrics survey to reach our desired power of 0.8.

As of March 29th, 2024, our group has collected 259 total responses on Qualtrics. Our target sample size requires a minimum of ( $N = 246$ ) participants to reach our desired power level; however, after data cleaning, only ( $N = 239$ ) responses were usable. Results from participants who did not complete the survey were not analysed. In total, there were 20 unusable responses as these responses were incomplete; they were not assigned a condition and did not answer any survey questions. We were 7 complete responses away from meeting our target, thus our study did not reach our desired power level of 0.8. While the desired power level was not reached, the study was very close to reaching it.

Out of the 239 participants in our study, 236 participants responded to the question "*What is your age? Please enter in numerical form (e.g., "25" not "twenty-five"). You can also choose not to disclose this information*". We found that the participants were on average 24.49 years old ( $SD = 10.17$ ). Out of the 239 participants, approximately 55% identified as a woman, 38% as a man, 3% as a non-binary person, 3% preferred not to disclose their gender, and 3% did not select an option.

## Conditions

The independent variable for this study was the type of bat-related facts presented to participants. In the survey, participants in all conditions were shown an infographic; the only difference among conditions was the text information in the title and description (*Figure 1*). The visual aesthetics of the infographic (e.g., colour, image, etc.) was kept consistent in all three conditions. All participants in all three conditions received the same set of 11 survey questions presented in the same order. Participants were randomly assigned to one of our three conditions: 1) control condition ( $N = 78$ ), 2) bat-benefit condition ( $N = 81$ ), and 3) bat-demystification condition ( $N = 80$ ).

The study consisted of a control group (bat-neutral) and two experimental groups: 1) bat-benefit and 2) bat-demystification. The control group viewed an infographic with 5 neutral facts about *M. lucifugus*. Bat-neutral facts included random *M. lucifugus* facts that do not attempt to put bats in a positive or negative light such as the number of bones in a bat's body, the average wingspan of bats in British Columbia, etc. (*Figure 2*). The benefit experimental group was provided with an infographic with 5 facts detailing the benefits of *M. lucifugus*, including facts such as how bats can help the ecosystem, bats as an effective driver for disease control, etc. (*Figure 3*). The demystification group was provided with an infographic with 5 facts dispelling common myths and misconceptions regarding *M. lucifugus*, including information clarifying their food sources



and their ability to carry diseases harmful to humans (*Figure 4*). Depending on which of the three between-subjects conditions participants were randomly assigned to, they will be shown one of the three infographics.

## Measures

To measure individuals' perceptions of bats, participants were asked a total of eleven 5-point Likert scale questions. The scale ranged from 1 (most negative) to 5 (most positive), with questions eight, ten, and eleven reverse-coded to fit the aforementioned scale during data analysis. All questions were analyzed separately as they measured different aspects of human perception. These questions were presented below the infographic, which allowed the participants to refer back to the infographic while answering the survey. The order of all eleven questions remained identical for all participants. *Figure 5* shows the exact questions and scales used in our survey to measure our dependent variables.

## Procedure

Participants were recruited through various online platforms such as Discord (e.g. class or club group chats), Messenger, direct messages to friends, and Email, as well as in-person recruitment at the UBC Nest. Our study targeted UBC-affiliated personnel (e.g. students, faculty, etc.), however, some participants may not be UBC-affiliated since our survey is posted online and anyone with the QR code or link could participate. The data was collected over 16 days from March 13th, 2024, to March 29th, 2024. All participants completed a consent form prior to the survey. Participants were then randomly assigned to one of three conditions and asked to read the infographic that matched their respective conditions. The eleven Likert scale survey questions were presented below the infographic for participants to fill out. The participants were able to refer to the infographic whilst answering the survey questions. After completing the survey, participants then move on to the demographic section at the end of our survey. This includes the participant's gender (options include "Woman", "Man", "Non-binary person", and "Prefer not to disclose") and age. The survey ends after the demographic section is completed.

All data analysis was conducted using *RStudio*. We have created a keyword to refer to each measure (*Table 1*). These will be used to refer to our measures in the results section.

# Results

In total, we received 259 responses to our online survey, of which 20 were removed during data analysis because they were incomplete. All the data from these 20 participants were excluded and not used, so we ended up with only 239 complete responses.

We found no statistically significant effect of different bat-related facts on all 11 measures at the  $p < .05$  level. In this experiment, all three groups had a slightly negative to neutral response to each of our study's measures. *Table 2* reports the mean and standard deviation for all measures for each condition. *Figure 6 - Figure 16* illustrates the mean and standard error bar of each measure for each condition.

To start, we checked the assumptions of ANOVA. Specifically, we conducted a test for normality using the Shapiro-Wilk test for each of our eleven measures. After conducting the Shapiro-Wilk test on all eleven measures, our group found that the p-values for all measures were  $p < .05$  (*Table 3*). Since our chosen alpha value was .05, any p-values less than .05 means that the data is not normally distributed. This means the data for all 11 measures were not normally distributed. This violates the assumption of normality for the ANOVA thus we cannot conduct an ANOVA test on our data: In order to conduct an ANOVA, the data has to be normally distributed. Instead, our group conducted a Kruskal-Wallis test.

A Kruskal-Wallis test was conducted to compare the effect of different bat-related facts on the eleven measures for 1) the bat-benefit condition, 2) the bat-demystification condition and 3) the bat-neutral condition (control group). *Table 4* shows the p-value, chi-square statistic and effect size for all our eleven measures. We corrected the p-value for multiple comparisons using Bonferroni correction because we conducted multiple statistical tests which can increase the risk of a type I error. As you can see, there is no statistically significant effect of different bat-related facts on all eleven measures at the  $p < .05$  level. Our results do not support any of our hypotheses. Since none of our measures had statistically significant results, no post-hoc was conducted.

## Discussion

Based on the final results from the study, we can conclude that we found no significant difference between the perception of bats for participants in all three conditions across all eleven measures. Assuming the null results are true, our results suggest that people's perception towards bats was no different whether they were exposed to either bat-neutral, bat-benefit, or bat-demystification bats. Our findings contrast most prior literature exploring the effects of education on public bat perception. Most studies conclude and recommend educational interventions as an effective avenue in improving public bat perception [2,3,5,6].

While all our results were null, our "*Rabies*" Measure was marginally close to being significant. This could be because the word "rabies" might have elicited an unconscious negative response in people. Interestingly, those exposed to bat-benefit facts had a more negative response compared to those in the bat-neutral or bat-demystification conditions. This may be because only the bat-benefit condition had mention of human and bat co-existence. While people may not detest bats, the idea that humans have to co-exist with bats might trigger a negative response in people even though the bat-benefit infographic encouraged co-existence.

There are a few limitations that may have influenced our study. While our study was close to reaching our desired power, it is important to note that our sample did not reach the intended minimum number of participants and thus our study did not reach the power level of .80. This means our study may not have detected a true effect when there actually is a true effect and ran a higher risk of committing a Type II error. Additionally, we conducted our study during UBC's final season. Given that most of our respondents were students, it is possible that the participants completing the survey were particularly interested due to the highly stressful exam period. While our infographic aimed to be educational, participants may have either 1) not found it educational or 2) not found the information presented believable. Compared to lecture slides and textbooks, infographics present information in a more unconventional manner. Despite infographics becoming more commonplace as an educational tool [7], students may not be accustomed to information presented in this format, thus decreasing its educational effects. Additionally, during in-person data collection, some participants expressed skepticism towards the information presented on the benefit and demystification infographics. This skepticism could be the reason why demystification and benefit facts did not lead to a more positive perception of bats than those exposed to neutral facts.

To address these limitations, future studies should first collect enough complete survey responses to reach the desired power level. To avoid ineffective transfer of information, future studies should compare different mediums of education (e.g. videos versus infographics, textbooks versus seminars) to find the most effective method to educate the public on bat-related content. Additionally, future surveys should add a section asking participants to what degree they believe in the information presented regarding bats. This will help rule out belief, which was a major confound present in our current study.

# Recommendations

While our study did not produce significant results, what was learnt throughout the project's process could be used as reference for future studies aiming to raise public perception of bats through education.

Firstly, future studies should aim to recruit people in direct contact with bats such as those living or working near Auditorium Annex Offices located in UBC's Vancouver campus. Many of this study's participants were not aware of a bat roost on campus. The lack of relevance this topic has to the majority of our participant's daily lives may nullify the effect education has on their perception regarding bats - some participants may not have formed any opinions on bats either. As discussed in our results section, the coexistence of bats and humans could be the source of people's negative perception towards bats, thus studies targeting populations that coexist with bats will better inform researchers as to the effectiveness of educational interventions on public perception.

Additionally, future surveys should add a section asking what the participant's preconceived beliefs are regarding bats and whether the participants believe the educational information presented. Studies exploring participant's preconceived beliefs regarding topics such as COVID-19 have shown that while increased education is linked to increased perception, people's preconceived beliefs regarding these topics could block the positive effects of education [9]. Participant's preconceived beliefs regarding bats and their belief of the educational materials should be examined in future studies to see whether belief is another factor driving the public's perception of bats.

Our last suggestion to the client involves exploring different mediums of education such as videos. For example, future studies can compare the effectiveness of a short video dispelling myths regarding bats and an infographic containing the same information at educating the public and improving the public's perception of bats. Numerous prior research has shown videos to be an effective means at improving student learning in biology courses [10, 11]. The null results from our study may be from the ineffectiveness of infographics at conveying bat-related facts. Therefore, future studies should utilize different educational methods to convey bat-related facts and explore how these varying mediums can affect the public's perception of bats.

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[https://doi.org/10.3389/fpubh.2022.911518nt/d/129HUBow\\_nD9JmeO4YCyjkRtEXn20pLjSrJlplKQPA/edit](https://doi.org/10.3389/fpubh.2022.911518nt/d/129HUBow_nD9JmeO4YCyjkRtEXn20pLjSrJlplKQPA/edit)
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# Appendix A

Figure 1

*Infographic of the bat-benefit, bat-demystifying, and bat-neutral condition (from left to right)*



*Note.* This figure displays the infographics presented in the bat-benefit (left), bat demystifying (middle), and bat-neutral (right) condition. The font size, font color, layout, background color, and images remain consistent in all three infographics to reduce any potential confounds.

## Figure 2

### *Infographic of the bat-neutral (control) condition*





Figure 3

*Infographic of the bat-benefit condition*



Figure 4

*Infographic of the bat-demystifying condition*

## DEMYSTIFYING THE LITTLE BROWN BAT

**Are bats just disease carriers?**  
**NO**  
Only about 0.5% of bats are infected with rabies in BC. It is incredibly rare to encounter these bats as rabies is deadly to even them.



**Bats are pests?**  
**NOPE**  
The Little Brown Bat's diet is made up of insects, helping control the population of mosquitoes and reducing insect borne diseases.



**Bats are rodents?**  
**Actually NO**  
Bats are not actually rodents; they are actually related closer to primates and humans than they are to mice or rats.



**Bats drink blood?**  
**NAH**  
Only 0.0007% of bat species worldwide feed on blood, and none are in Canada. Bats as a whole feed on a variety of things, from insects to even fruit.



**Bats intentionally attack humans?**  
**NOPE**  
Bats are just as scared of people as many people are of them! Healthy Bats avoid humans wherever they can.



## Figure 5

All eleven survey questions (measures) in order

**How much do you like bats?**

Dislike a great deal    Dislike somewhat    Neither like or dislike    Like somewhat    Like a great deal

**How likely are you to do the following?**

**1) Donate to a campaign such as 'Save the Bats'**

Extremely unlikely    Somewhat unlikely    Neither likely nor unlikely    Somewhat likely    Somewhat unlikely

**2) Attend a bat-awareness event**

Extremely unlikely    Somewhat unlikely    Neither likely nor unlikely    Somewhat likely    Somewhat unlikely

**3) Tell your friends about bats**

Extremely unlikely    Somewhat unlikely    Neither likely nor unlikely    Somewhat likely    Somewhat unlikely

**How scary are bats to you?**

Extremely scary    Very scary    Moderately scary    Slightly scary    Not scary at all

**How much do you agree with the following statement on a scale of 1 (completely agree) to 5 (completely disagree)**

**1) I believe bats are pests**

1    2    3    4    5

**2) I believe bats are a public health concern**

1    2    3    4    5

**3) UBC should install more bat houses to help bats**

1    2    3    4    5

**4) I am afraid of contracting rabies from bats**

1    2    3    4    5

**5) I am curious to learn more about protecting bats**

1    2    3    4    5

**6) I believe spreading bat awareness is important**

1    2    3    4    5

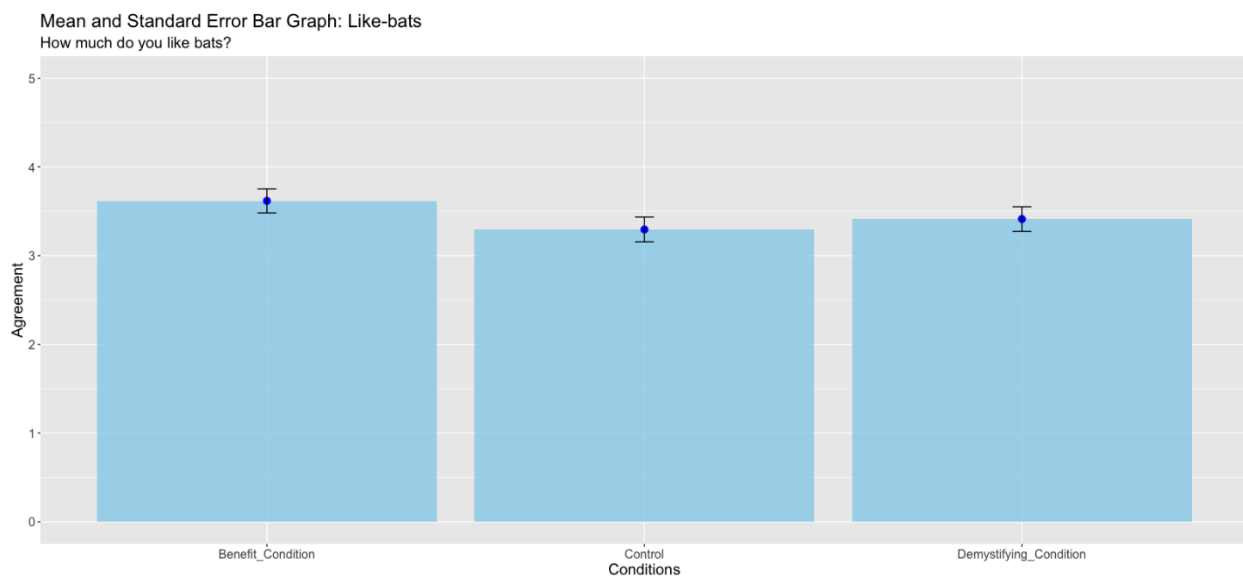
*Note.* This figure is an infographic of all survey questions in the order it appears on this study's Qualtrics survey. Please refer to *Appendix B* for the official Qualtrics survey. Participants were first asked, "How much do you like bats?". Their response options were "Dislike a great deal", "Dislike somewhat", "Neither like or dislike", "Like somewhat", and "Like a great deal" (1 to 5

points respectively). For questions two to four the participants were asked “How likely are you to do the following?”: “Donate to a campaign such as ‘Save the Bats’”, “Attend a bat-awareness event”, and “Tell your friends about bats”. Participant

response options were “Extremely unlikely”, “Somewhat unlikely”, “Neither likely nor unlikely”, “Somewhat likely”, and “Extremely likely”. Question five asked the participants “How scary are bats to you?”. Their response options were “Extremely scary”, “Very scary”, “Moderately scary”, “Slightly scary”, and “Not scary at all”. Lastly, questions six to eleven asked the participants “How much do you agree with the following statement on a scale of 1 (completely agree) to 5 (completely disagree)”. The statements were “I believe bats are pests”, “I believe bats are a public health concern”, “UBC should install more bat houses to help bats”, “I am afraid of contracting rabies from bats”, “I am curious to learn more about protecting bats”, and “I believe spreading bat awareness is important” respectively.

## Figure 6

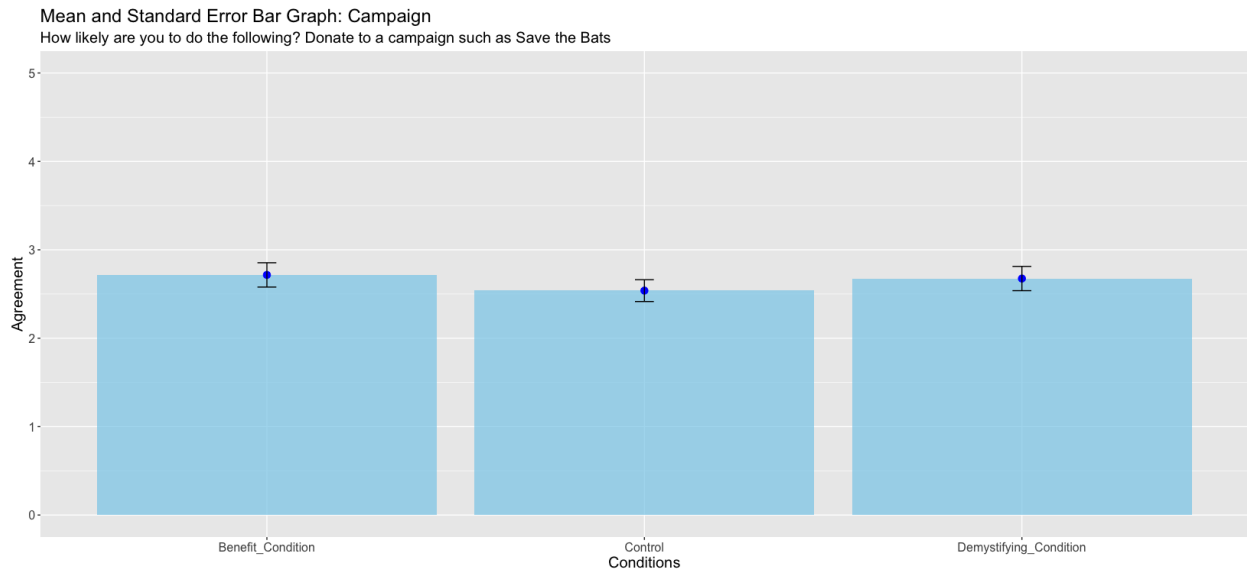
Mean and Standard Error Bar Graph: Like-bats



Note. The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 3.62, SD = 1.22), Control (M = 3.29, SD = 1.24), and Demystification: (M = 3.41, SD = 1.24)

## Figure 7

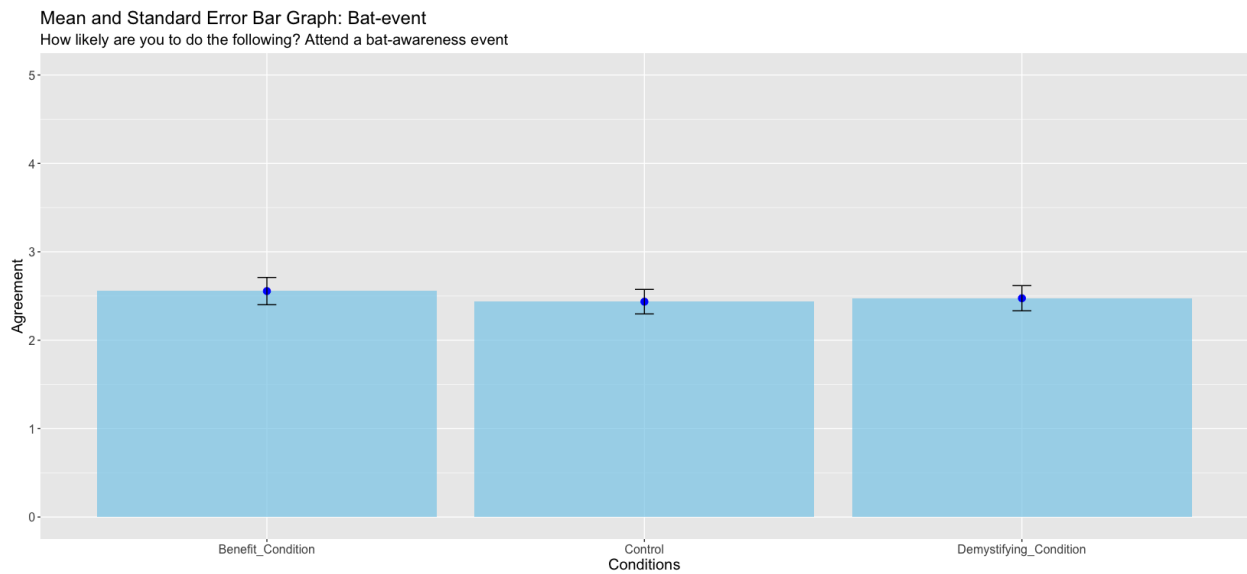
### *Mean and Standard Error Bar Graph: Campaign*



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit ( $M = 2.72$ ,  $SD = 1.24$ ), Control ( $M = 2.54$ ,  $SD = 1.09$ ), and Demystification ( $M = 2.68$ ,  $SD = 1.23$ ).

## Figure 8

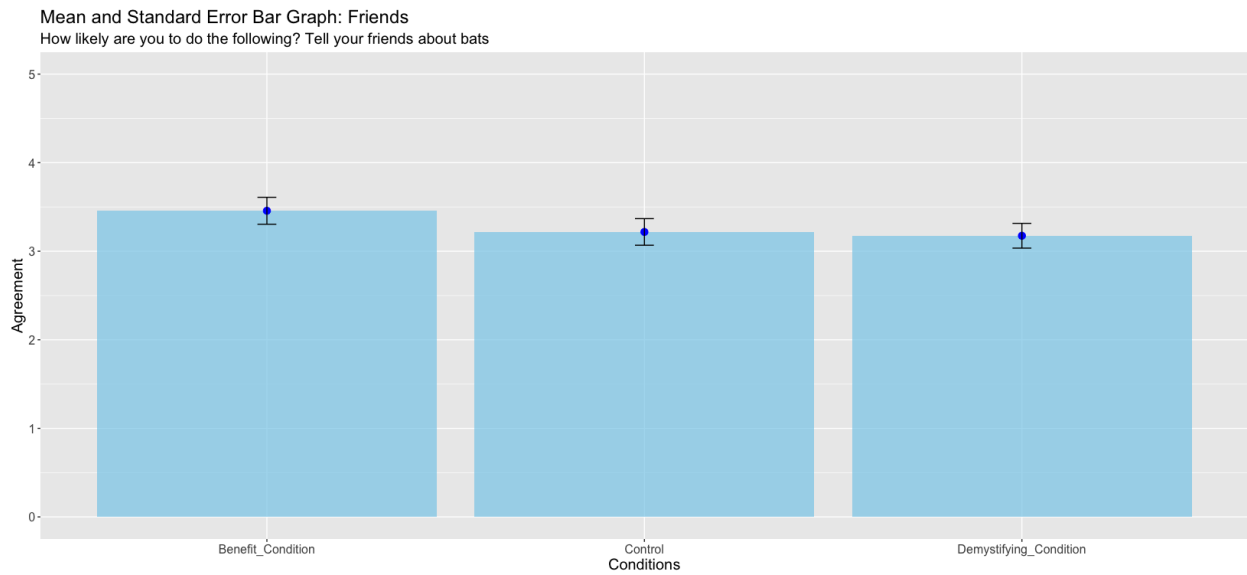
### *Mean and Standard Error Bar Graph: Bat-event*



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 2.56, SD = 1.39), Control (M = 2.44, SD = 1.22), and Demystification (M = 2.48, SD = 1.27).

## Figure 9

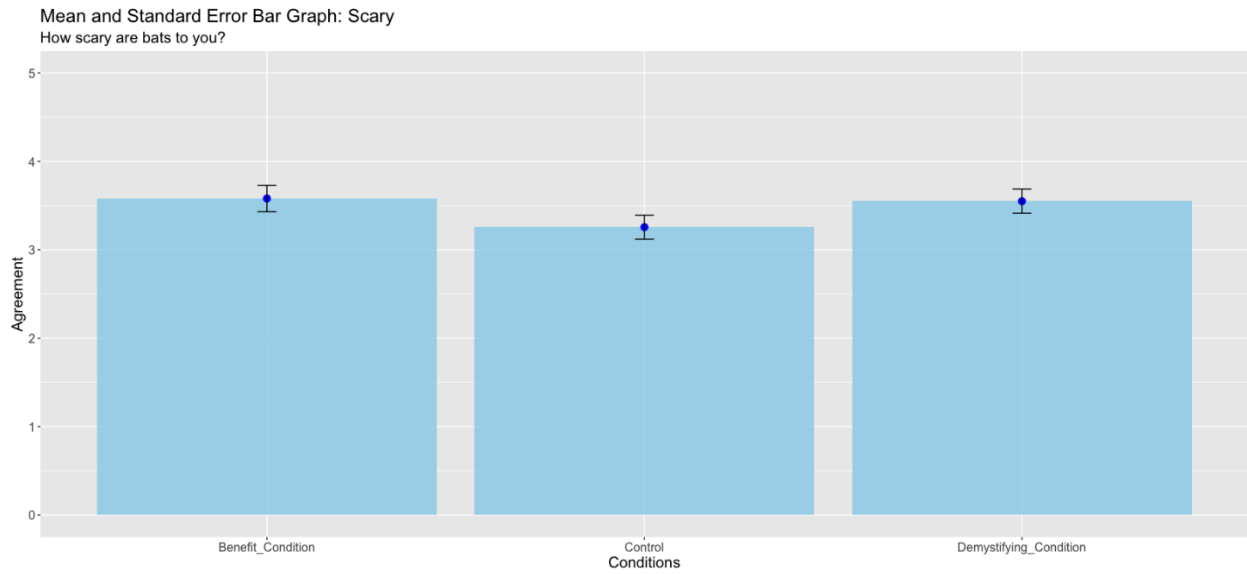
*Mean and Standard Error Bar Graph: Friends*



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 3.46, SD = 1.37), Control (M = 3.22, SD = 1.33), and Demystification (M = 3.18, SD = 1.25).

# Figure 10

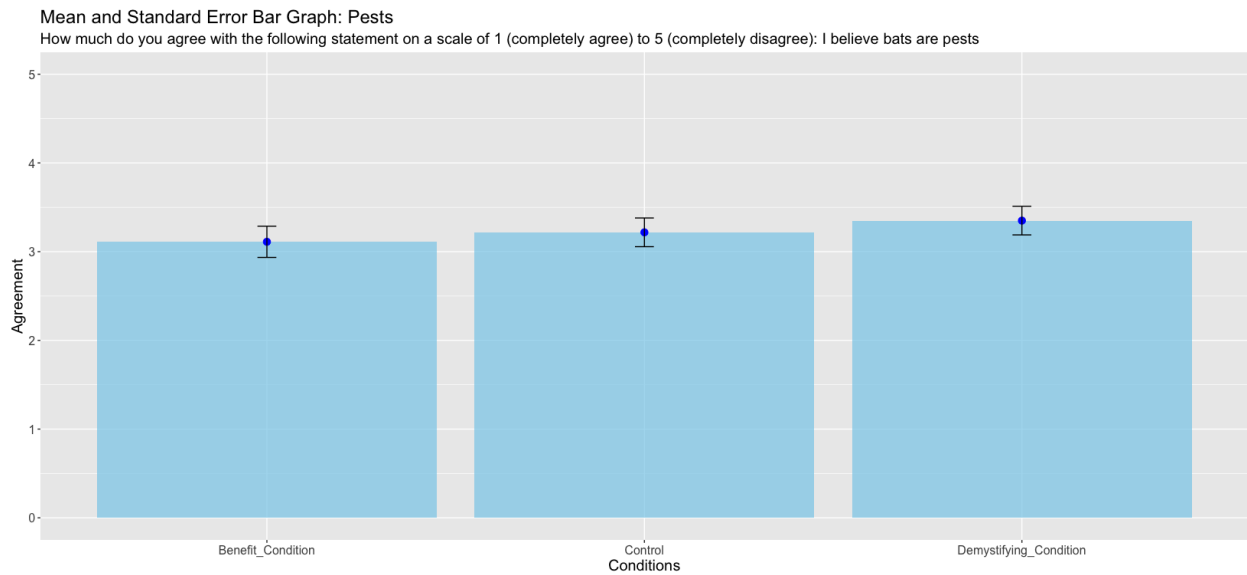
## Mean and Standard Error Bar Graph: Scary



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit ( $M = 3.58$ ,  $SD = 1.35$ ), Control ( $M = 3.26$ ,  $SD = 1.20$ ), and Demystification ( $M = 3.55$ ,  $SD = 1.22$ ).

# Figure 11

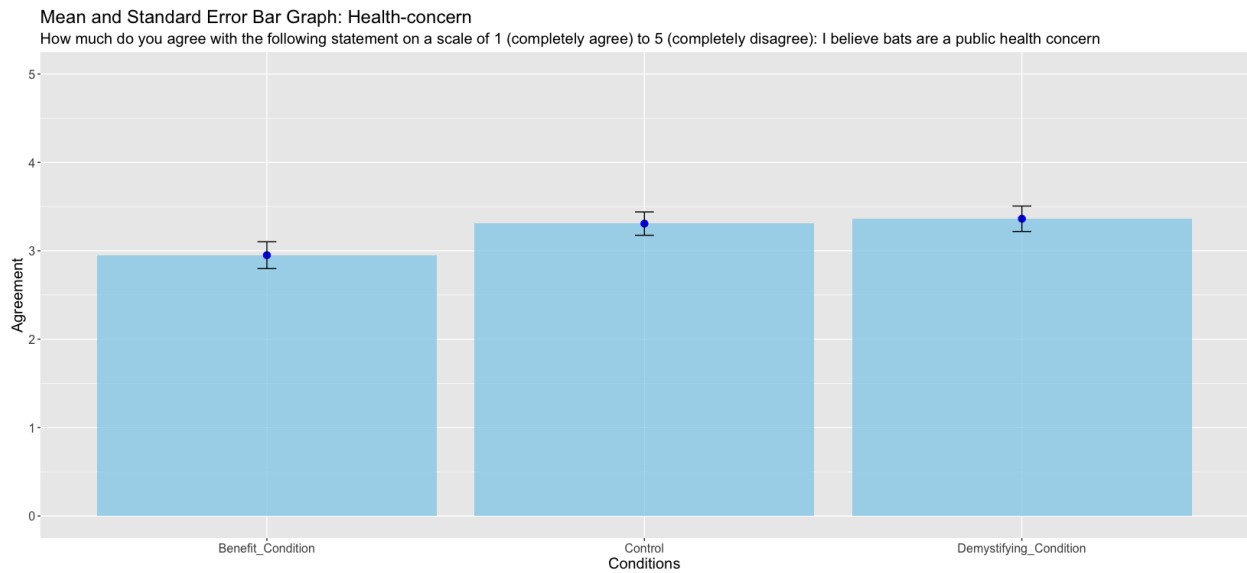
## Mean and Standard Error Bar Graph: Pests



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 3.11, SD = 1.58), Control (M = 3.21, SD = 1.43), and Demystification (M = 3.35, SD = 1.44).

## Figure 12

*Mean and Standard Error Bar Graph: Health-concern*

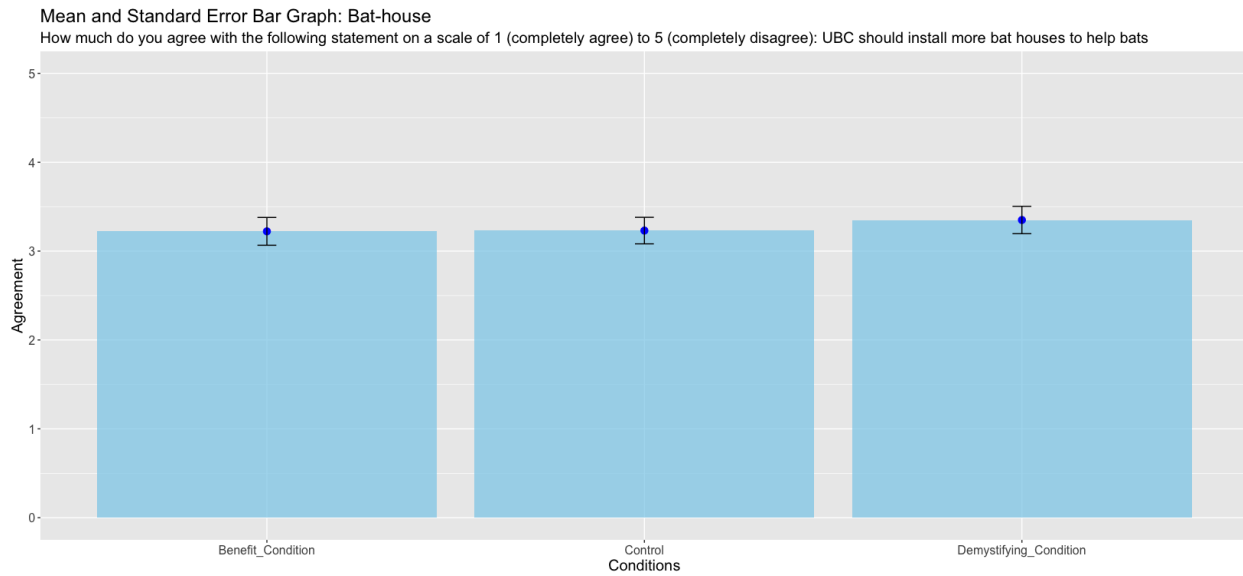


*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 2.95, SD = 1.37), Control (M = 3.31, SD = 1.17), and Demystification (M = 3.36, SD = 1.29).



# Figure 13

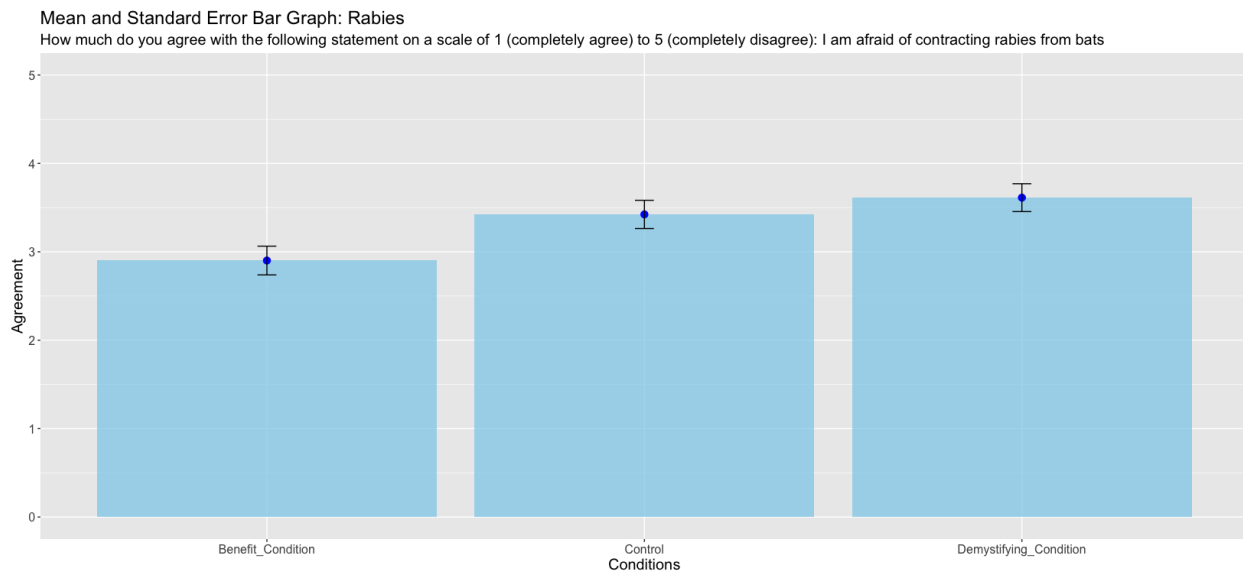
## Mean and Standard Error Bar Graph: Bat-house



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit ( $M = 3.22$ ,  $SD = 1.41$ ), Control ( $M = 3.23$ ,  $SD = 1.32$ ), and Demystification ( $M = 3.35$ ,  $SD = 1.38$ ).

# Figure 14

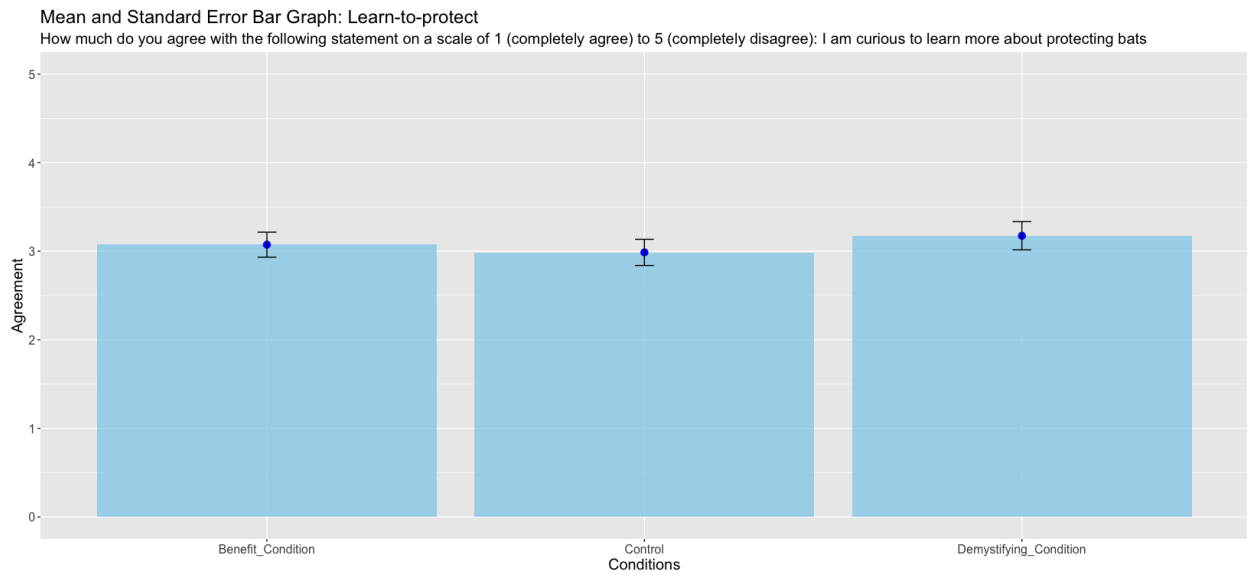
## Mean and Standard Error Bar Graph: Rabies



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 2.90, SD = 1.46), Control (M = 3.42, SD = 1.41), and Demystification (M = 3.61, SD = 1.41).

## Figure 15

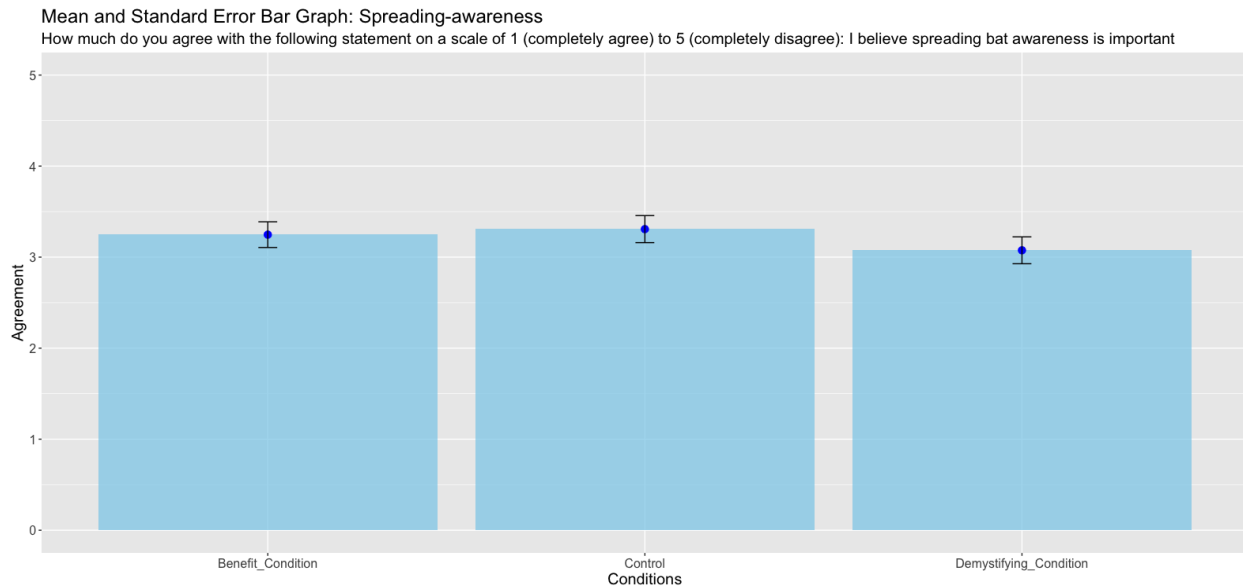
*Mean and Standard Error Bar Graph: Learn-to-protect*



*Note.* The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 3.07, SD = 1.27), Control (M = 2.99, SD = 1.30), and Demystification (M = 3.17, SD = 1.42).

Figure 16

Mean and Standard Error Bar Graph: Spreading-awareness



Note. The following is the mean and standard deviation for each condition (from left to right): Benefit (M = 3.25, SD = 1.27), Control (M = 3.31, SD = 1.31), and Demystification (M = 3.08, SD = 1.32).

Table 1

Keyword used to refer each of our study's measure

Original Measure	Measure Key
How much do you like bats?	Like-bats
Donate to a campaign such as 'Save the Bats'	Campaign
Attend a bat-awareness event	Bat-event
Tell your friends about bats	Friends
How scary are bats to you?	Scary
I believe bats are pests	Pests
I believe bats are a public health concern	Health-concern
UBC should install more bat houses to help bats	Bat-house
I am afraid of contracting rabies from bats	Rabies
I am curious to learn more about protecting bats	Learn-to-protect
I believe spreading bat awareness is important	Spreading-awareness

*Note.* This table contains the keywords used to refer to each of our eleven measures. These keywords will replace the full measure name in the “*Result*” section tables.

Table 2

*Mean and Standard Deviation for the A) Control, B) Demystifying, and C) Benefit conditions for all measures*

**A**

	measure_name	mean_all_control	sd_all_control
1	Like-bats	3.294872	1.239071
2	Campaign	2.538462	1.089410
3	Bat-event	2.435897	1.223044
4	Friends	3.217949	1.325548
5	Scary	3.256410	1.199956
6	Pests	3.217949	1.429262
7	Health-concern	3.307692	1.165608
8	Bat-house	3.230769	1.318432
9	Rabies	3.423077	1.409792
10	Learn-to-protect	2.987179	1.304275
11	Spreading-awareness	3.307692	1.312356

**B**

	measure_name	mean_all_demystifying	sd_all_demystifying
1	Like-bats	3.4125	1.239577
2	Campaign	2.6750	1.230159
3	Bat-event	2.4750	1.272643
4	Friends	3.1750	1.250569
5	Scary	3.5500	1.221122
6	Pests	3.3500	1.441694
7	Health-concern	3.3625	1.285201
8	Bat-house	3.3500	1.378864
9	Rabies	3.6125	1.409675
10	Learn-to-protect	3.1750	1.421133
11	Spreading-awareness	3.0750	1.319522

**C**

	measure_name	mean_all_benefit	sd_all_benefit
1	Like-bats	3.617284	1.220327
2	Campaign	2.716049	1.237281
3	Bat-event	2.555556	1.387444
4	Friends	3.456790	1.369757
5	Scary	3.580247	1.349668
6	Pests	3.111111	1.581139
7	Health-concern	2.950617	1.368404
8	Bat-house	3.222222	1.405347
9	Rabies	2.901235	1.462916
10	Learn-to-protect	3.074074	1.272574
11	Spreading-awareness	3.246914	1.270146

*Note.* Please refer to Table A for more clarification on what the “*measure\_name*” column represents.

Table 3

*Shapiro-Wilk test's p-value for each measure*

	<b>measure_name</b>	<b>Shapiro_Wilk_p_value</b>
<b>1</b>	Like-bats	2.590866e-12
<b>2</b>	Campaign	4.405944e-11
<b>3</b>	Bat-event	3.085250e-13
<b>4</b>	Friends	3.142197e-13
<b>5</b>	Scary	2.037621e-12
<b>6</b>	Pests	8.317056e-14
<b>7</b>	Health-concern	3.573255e-11
<b>8</b>	Bat-house	2.081567e-12
<b>9</b>	Rabies	1.237641e-13
<b>10</b>	Learn-to-protect	1.771717e-11
<b>11</b>	Spreading-awareness	2.310597e-11

*Note.* All measures, after conducting a Shapiro-Wilk test, had a  $p < .05$  which violates the assumption of normality for the ANOVA test.

Table 4

*The p-value, chi-square, and effect-size statistics for each measure after conducting the Kruskal-Wallis test*

▲	Measure	p_value	chi_square_stat	effect_size
1	Like-bats	1.00000000	3.4621701	0.006195636
2	Campaign	1.00000000	0.8107544	-0.005039176
3	Bat-event	1.00000000	0.1321136	-0.007914773
4	Friends	1.00000000	3.1554860	0.004896127
5	Scary	1.00000000	3.9964016	0.008459329
6	Pests	1.00000000	0.8127077	-0.005030899
7	Health-concern	1.00000000	4.7498634	0.011651964
8	Bat-house	1.00000000	0.4879905	-0.006406820
9	Rabies	0.05941643	10.4421594	0.035771862
10	Learn-to-protect	1.00000000	0.7203580	-0.005422212
11	Spreading-awareness	1.00000000	1.2761143	-0.003067312

# Appendix B: Survey

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## So Bat It's Good

### Start of Block: Consent form

#### Consent Form **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:** jiayingz@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.

### **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 [jiayingz@psych.ubc.ca](mailto:jiayingz@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 [RSIL@ors.ubc.ca](mailto:RSIL@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 **“Yes, I have read and understand the above information and agree to participate in this study”** 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**

Yes, I have read and understand the above information and agree to participate in this study (1)

No, I do not agree to participate in this study (2)

**End of Block: Consent form**

**Start of Block: Infographic 1 (Benefits Facts)**





Please read the following poster carefully. You may be asked questions about it later.

## BENEFITS OF THE LITTLE BROWN BAT

**Bats are a part of the ecosystem**  
The circle of life is true! Bats are major predators of the forest, not agricultural pests; they are a vital part of a healthy ecosystem.

**Bats help with the mosquitos**  
One little brown bat can eat up to 600 mosquitoes in an hour! By doing so they help control viruses spread by the insects.

**Guano is more than just crap**  
Bats also produce guano (their manure) which is rich in nitrogen; this natural by-product is used to fertilize lawns and gardens.

**Bats are not dangerous and need help**  
Bats are losing their habitat and hunting territory. They need places to raise their pups.

**Humans and bats can coexist**  
Bat boxes and protected areas help ensure that human and bat interactions are minimal- and safe for both species.

How much do you like bats?

Dislike a great deal (1) Dislike somewhat (2) Neither like nor dislike (3) Like somewhat (4) Like a great deal (5)

How likely are you to do the following?

Donate to a campaign such as "Save the Bats"

Attend a bat-awareness event

Tell your friends about bats

Extremely unlikely (1)

Somewhat unlikely (2)

Neither likely nor unlikely (3)

Somewhat likely (4)

Extremely likely (5)

How scary are bats to you?

Extremely scary (1)

Very scary (2)

Moderately scary (3)

Slightly scary (4)

Not scary at all (5)

How much do you agree with the following statement on a scale of 1 (completely agree) to 5 (completely disagree):

I believe bats are pests (1)

I believe bats are a public health concern (2)

UBC should install more bat houses to help bats (3)

I am afraid of contracting rabies from bats (4)

I am curious to learn more about protecting bats (5)

I believe spreading bat awareness is important (6)

**End of Block: Infographic 1 (Benefits Facts)**

**Start of Block: Infographic 2 (Demystifying Facts)**

Please read the following poster carefully. You may be asked questions about it later.

# DEMYSTIFYING THE LITTLE BROWN BAT

## Are bats just disease carriers? **NO**

Only about 0.5% of bats are infected with rabies in BC. It is incredibly rare to encounter these bats as rabies is deadly to even them.



## Bats are pests? **NOPE**

The Little Brown Bat's diet is made up of insects, helping control the population of mosquitos and reducing insect borne diseases.



## Bats are rodents? Actually **NO**

Bats are not actually rodents; they are actually related closer to primates and humans than they are to mice or rats.



## Bats drink blood? **NAH**

Only 0.0007% of bat species worldwide feed on blood, and none are in Canada. Bats as a whole feed on a variety of things, from insects to even fruit.

## Bats intentionally attack humans? **NOPE**

Bats are just as scared of people as many people are of them! Healthy Bats avoid humans wherever they can.



How much do you like bats?

Dislike a great deal (1) Dislike somewhat (2) Neither like nor dislike (3) Like somewhat (4) Like a great deal (5)

How likely are you to do the following?

Donate to a campaign such as "Save the Bats"

Attend a bat-awareness event

Tell your friends about bats

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Somewhat unlikely (2)

Neither likely nor unlikely (3)

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How scary are bats to you?

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How much do you agree with the following statement on a scale of 1 (completely agree) to 5 (completely disagree):

I believe bats are pests (1)

I believe bats are a public health concern (2)

UBC should install more bat houses to help bats (3)

I am afraid of contracting rabies from bats (4)

I am curious to learn more about protecting bats (5)

I believe spreading bat awareness is important (6)

**End of Block: Infographic 2 (Demystifying Facts) Start of Block: Control**

Please read the following poster carefully. You may be asked questions about it later.

# LITTLE BROWN BAT

## Bat size

Little brown bats have a total body length of 8.0–9.5 cm (3.1–3.7 in) and weigh 5.5–12.5 g (0.19–0.44 oz).



## Bat senses

The Little Brown Bat has a more sophisticated system of echolocation to make up for their reduced sense of smell and sight.



## Bat social behaviour

Bats are social creatures and they live in colonies containing up to 190,000 individuals.



## Bat flight

Bats can fly at about 6 km/h (3.7 mph) and have an average wingspan of 22–27 cm (8.6–10.6 in).

## Bat reproduction

The Little Brown Bats mate during the fall, and most bats give birth to one baby pup a year.



How much do you like bats?

Dislike a great deal (1) Dislike somewhat (2) Neither like nor dislike (3) Like somewhat (4) Like a great deal (5)

How likely are you to do the following?

Donate to a campaign such as "Save the Bats"

Attend a bat-awareness event

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Extremely unlikely (1)

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Somewhat likely (4)

Extremely likely (5)

How scary are bats to you?

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How much do you agree with the following statement on a scale of 1 (completely agree) to 5 (completely disagree):

I believe bats are pests (1)

I believe bats are a public health concern (2)

UBC should install more bat houses to help bats (3)

I am afraid of contracting rabies from bats (4)

I am curious to learn more about protecting bats (5)



I believe spreading bat awareness is important (6)

**End of Block: Control**

**Start of Block: Demographic**

Demographic: Gender. Do you identify as a woman, man, or non-binary person? You can also choose not to disclose this information.

Woman (1)

Man (2)

Non-binary person (3)

Prefer not to disclose (4)

Demographic: Age. What is your age? Please enter in numerical form (e.g., "25" not "twenty-five"). You can also choose not to disclose this information.

---

**End of Block: Demographic**