University of British Columbia

Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Releafing Stress: Assessing Effects of Biophilia on Cognitively Stressful Tasks

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Executive Summary

Biophilia can reduce stress in two ways: i) by being present around stressors or ii.) by serving as breaks. However, past research has not compared which is more optimal for maximising stress reduction. We investigated if biophilia being present during a break from a cognitively stressful task decreased perceived stress levels more than having biophilia present during the cognitively stressful task or not having biophilia present either during the task or the break. We hypothesised that presenting biophilia only during breaks would reduce perceived levels of stress the most out of our three conditions. However, our outcome yielded opposite results to our initial prediction. Using results extrapolated from a survey completed by 165 participants, we found that perceived levels of stress decreased, and that the cognitively stressful task was found to be stress-reducing across the entire sample. There was no statistical significance in perceived stress reduction in the condition with biophilia present only during the break in comparison to the other two conditions.

Keywords: biophilia, cognitive stress, classical conditioning, stress, cognitive task

Introduction

Findings show that urban environments are stressful. For instance, urban-deprived communities with more biophilic elements have lower cortisol levels than those in more urban environments (Roe et al., 2013). In urban populations, students seem particularly stressed as universities are found to be stress-inducing as a function of course load, for example (Gulwadi et al., 2019). However, additional research shows how biophilia, a design ideology encouraging the use of natural elements in urban design (Kellert, 2008), can be a stress-reducing intervention in urban environments.

Biophilia can reduce stress in two ways: i.) by being around stressors and ii.) serving as breaks from stressors. When biophilia is around stressors, Gulwadi et al. (2019) found positive correlations between greenspace and all four components of quality of life (QOL): psychological (including stress), physical, social and environmental. Cross-cultural data also supports this notion where Chinese university students living in cities with more greenspace were shown to have less uncertainty stress than students in urban cities (Yang et al., 2019). The findings about biophilia around stressors show overall health benefits, including stress reduction.

Benefits are also shown when biophilia serves as a break. Berg et al. (2015) found positive associations between the amount of greenspace around people's homes and perceived mental and general health (including stress); this was also associated with lower mortality. In addition, Hähn et al. (2021) showed that, compared to biophilia around people's workplaces, biophilia in break rooms led to higher workplace satisfaction and restorative effects against fatigue. Thus, biophilic breaks can also reduce stress and improve health.

Biophilia also affects cognitive performance. Hähn et al. (2021) found increased perceived attention, creativity and productivity regardless of whether biophilia served as breaks or was around stressors. However, perceived attention and productivity decreased only when biophilia was removed from stressors, not from breaks. Thus, both biophilic strategies can improve cognitive functioning.

Biophilia is beneficial as a stress reducer for breaks or around stressors. However, research has not explored which has the best stress reduction. This leads us to our research question: how do biophilic breaks affect perceived stress levels during a cognitively stressful task? Literature on classical conditioning suggests biophilia around stressors could result in suboptimal stress reductions. Classical conditioning is a type of associative learning where animals are exposed to an unconditioned stimulus (US) and a conditioned stimulus (CS), where the US naturally elicits an unconditioned response (UR). After repeated exposures, the animal starts responding to the CS as if it were the US (i.e. conditioned response or CR; Lafontaine et al., 2020). Animal and human studies have supported this, where initially neutral stimuli can cause fear or stress after classical conditioning (Barreto et al., 2006; Knight et al., 2005). Thus, biophilia around stressors could be associated with stress where stress reductions become suboptimal. Also, biophilic breaks could retain stress reductions because associations with the stressors do not occur.

We tested this idea using a between-subjects design where participants took a survey with cognitive stressors and intermittent breaks. We manipulated biophilic presence in the breaks or around the cognitive stressor and measured stress reductions. From this, we hypothesised that taking biophilic breaks during a cognitively stressful task in a non-biophilic environment will decrease perceived stress levels more than having biophilia only present during the stressful task or having breaks and tasks completed in a non-biophilic environment. Potential findings can inform practical directions to optimise biophilic stress reductions in infrastructure and interior design, especially in stressful urban settings where people stay long-term (e.g. universities).

Methods

Participants

For our study, we needed a minimum of 159 participants to meet the power analysis requirements (assuming a minimum effect size of 0.25, alpha = 0.05, power = 0.8) (Appendix A). We received responses from 215 participants. However, 50 were excluded: 1 did not consent to participate, 3 did not meet our age requirements (adults aged 18–65), and 46 did not fully complete our experiment. Therefore, we had a final participant count of 165. Regarding education demographics, approximately 75% of our participants were upper-year students, either at the University of British Columbia (UBC) or at other post-secondary institutions. The remaining participants had already graduated or were not enrolled in any post-secondary studies. Regarding gender demographics, about 65% percent of participants identified as women, with the rest identifying as men, non-binary and transgender. The question was designed to give the participant autonomy to disclose as much or as little information as they wanted, which is why men and women were not labelled as cisgender or transgender, as it was up to the individual to select the components that they felt most comfortable choosing.

Conditions

For our study, we used a Qualtrics survey. There were three conditions: the control condition and two experimental conditions (Appendix J). The participants were randomly assigned to one of these conditions. During the break and task, no biophilia was present in the control condition. However, biophilia was present only during the break in the biophilic break condition (biophilia only during break condition) and only throughout the task in the biophilic stress condition (biophilia only during task condition). In other words, the presence of biophilia was the independent variable (IV). During either the break or the cognitive task, the existence of biophilia was operationalized as an image of the forestry building at UBC. To maintain experimental control, an image of a classroom was used when biophilia was not present so our results would not be due to the presence of an image.

Measures

Our dependent variable was the change in participants' perceived stress levels, measured using the stress subscale of the DASS-21. Both the DASS and its subscales have been demonstrated to have construct validity (Henry & Crawford, 2005). It is a short-form measure consisting of 7 items that are rated from 0 being "did not apply to me at all" to 3 being "applied to me very much or most of the time." This was administered once at the beginning of the survey (pre-test) and again at the end (post-test) upon completion of the experiment. To better understand participants' current stress levels, we changed the DASS-21 prompt that asked participants to reflect on the listed statements from "the past week" to "the past 15 minutes" for the pre-test and "in this moment" for the post-test. To calculate the change in participants' stress levels (delta), participants' score on the pre-test were subtracted from their score on the post-test, so a negative value would indicate a decrease in stress.

Procedure

The survey structure was as follows: participants completed informed consent, then completed the pre-test (the DASS stress subscale), were shown an introduction block explaining the survey expectations and how the survey would proceed. Next, they completed the Stroop trials, and completed the survey post-test (the DASS stress subscale). At the end, they were given the option to answer demographic questions (Appendix J & L).

Regardless of the condition participants were sorted into, all respondents completed three untimed incongruent Stroop trials with eight questions each, and a 15-second break between each trial. In these Stroop trials, participants were presented with a colour spelled out for exactly one second, and then were asked to select a multiple-choice answer that displays what colour the word is written in rather than the word itself. We implemented our IV (biophilic or non-biophilic images) as the background for the Stroop words. The participants were recruited through a combination of social media, other classes, and friends and family (Appendix K). To facilitate participation in the study, we distributed a QR code in addition to sharing the link to our survey. The data was collected between March 10th and March 28th. Some difficulties we encountered during data collection was that we received anecdotal feedback that some participants did not find the Stroop trials (our intended cognitive stressor) stressful. We completed our data analysis using JASP, with the CSV file downloaded from our Qualtrics survey.

Results

Our results showed no significant difference in stress reduction between our three conditions. Using a one-way ANOVA, it was revealed that the degree of stress reduction did not differ between conditions. A one-sample t-test revealed that participants' stress levels were significantly reduced from the pre-test to the post-test.

A one-way ANOVA revealed that there was not a statistically significant difference in the change in participants' perceived stress levels between the three conditions [$F(2, 162) = 0.28$, $p = 0.76$, $\eta^2=0.003$]. (Appendix B.2)

A one-sample t-test showed that participants' perceived stress levels were significantly reduced from the pre-test to the post-test across the entire sample ($t\ (164) =-5.01$, $p<.001$) (Appendix C). Using a one-sample t-test on each condition, we found that participants' perceived stress levels were significantly reduced from pre-test to post-test in our control condition ($t\ (55) =-3.74$, $p<.001$) (Appendix D). However, participants' perceived stress levels were not significantly reduced from pre-test to post-test in our biophilia only during break condition ($t\ (53) = -2.57$, $p=.01$) (Appendix E), or our biophilia only during task condition ($t\ (54) = -2.41$, $p=.02$) (Appendix F).

After filtering delta for positive values (participants whose stress increased), a one-way ANOVA revealed that there was not a statistically significant difference between the three groups [$F(2, 71) = 0.88$, $p = 0.41$, $\eta^2=0.024$] (Appendix G.2).

The results from our study do not support our hypothesis that having biophilia present during breaks while completing a cognitively stressful task reduces perceived stress levels the most in comparison to the other two conditions (i.e. biophilia around stressors and having tasks and breaks in non-biophilic environments). Biophilia did not seem to impact stress reduction, regardless if it was presented during a cognitively stressful task, or a break from a cognitively stressful task.

Discussion

Expanding on our results, there was no observed difference in stress reduction between groups [$F(2, 162)=0.28$, $p=0.76$, $\eta^2=0.003$], indicating that the type of environment, such as urban/biophilic, creates no difference in stress.

When looking at the sample as a whole, we found a significant difference in stress before and after the Stroop trials ($t(164) = -5.01$, $p < .001$), indicating that all participants had significant stress reductions after the Stroop trials. Given that our stressor and measure differ in stress constructs (e.g. physiological stress; Nath & Caban-Holt, 2020; emotional reactivity; Bradbury, 2013), this may imply that the DASS's stress subscale may not be sensitive to cognitive stress (Henry & Crawford 2005). Subsequently, it is possible that inducing cognitive stress can decrease stress constructs that the DASS stress subscale is sensitive to (Hjemdahl et al., 1989).

However, when testing stress reductions per condition, we only found significant stress reduction in the control group ($t(55) = -3.74$, $p < .001$) but not in the biophilia only during break ($t(53) = -2.57$, $p = 0.01$) or the biophilia only during task ($t(54) = -2.41$, $p = 0.02$) conditions. In other words, the control condition was stress-reducing while the conditions with biophilia (in breaks or around stressors) did not have an impact on perceived stress levels; this suggests several possibilities.

First, image switching between biophilic and non-biophilic environments may be stressful, since eye strain could be an additional stressor (Arefin et al., 2022). This could explain why the condition-specific t-test shows that the control condition was stress-reducing but not the biophilic conditions (around stressors or as breaks). However, this assumption would predict increased stress in the biophilic conditions which we did not find. This leads to the second possibility that biophilia in both conditions reduced stress, while image switching could have increased stress (Arefin et al., 2022). This could explain the absence of changes in perceived stress levels in the biophilic conditions. Additionally, stress reductions may have also been induced by the cognitive stressor (Hjemdahl et al., 1989), as seen in the control group's significant stress reductions. Thus, it is possible that the stress reduction from biophilia and cognitive stress both mitigated the increased stress from image switching.

Limitations

Our study had several limitations. First, classical conditioning was our main theoretical framework. However, our research did not measure for association. It is possible that three trials of eight multiple-choice Stroop questions were not enough to associate cognitive stress and biophilia, especially when the study was constrained to take less than five minutes.

Second, the stress induced by the Stroop trials may not be measured by the DASS stress subscale. Our classical conditioning manipulation depended on cognitive stress (UR) from the Stroop trials (US) being associated with biophilia (CS). However, we measured stress reductions using a stress subscale with more emotional (e.g. agitation and irritability), and behavioural (e.g. difficulty relaxing) components. We could have failed to accurately measure and manipulate stress due to the difference in stress constructs.

Suggestions for Future Replications

To create better replications, future studies should first consider running a manipulation check or a pilot study in order to establish the presence of any conditioning or association occurring in the study. Second, stressors and stress measures must relate to the same stress construct. If replications use the DASS stress subscale, stressors that produce emotional and behavioural effects are preferable. Applying these could yield significant results.

Implications

Our main results did not support our hypothesis. However, it is possible that this was due to the two important limitations previously listed. If better replications still find no significant stress reductions between groups, it is possible that the sources of stress differed. For example, the control group may be stressed solely by the stressor. On the other hand, the conditions with biophilia may have had stress from image switching (Arefin et al., 2022) and the stressors, but were offset by biophilic stress reductions as suggested by our t-tests per condition. Such findings could describe how implementing biophilic stress reductions may incorporate other stressors (e.g. eye strain, classical conditioning) where urban designers, for example, should be sensitive to such nuances. Our t-tests hint at cognitive stress being inversely related to other stress constructs (Curl, 2008). In other words, cognitive stressors, such as the Stroop task, may be stress reducers (Hjemdahl et al., 1989). Thus, future research should investigate cognitive stress as a new avenue for reducing other stress constructs.

Recommendations

Our study did not reveal a significant difference in participants' perceived stress levels between our three conditions. We originally anticipated commenting on how the stress-reducing effects of biophilia could be impacted or compromised depending on the context it is presented in (i.e., during breaks, or during stressful situations, like completing cognitively stressful tasks). However, given our results, this commentary is limited. While our study is restricted in providing data that addresses our original goal of determining the most strategic way UBC can incorporate biophilia into building design to maximise the effectiveness of its stress-reducing effects, our study does present another interesting consideration.

The key finding revealed from our data was that participants' stress levels were significantly reduced across the entire sample, which presents the idea that cognitively challenging tasks may have stress-reducing effects, especially when they serve as breaks from other stressors (Hjemdahl et al., 1989). This finding suggests that UBC could use this idea to find ways to allow or encourage students to engage in cognitively challenging tasks to help reduce stress, particularly during stressful periods, such as before tests, during final exam season, etc. For instance, UBC could develop QR codes that can be scanned and would bring individuals to a cognitively challenging game that could be played. These QR codes could be posted strategically around areas that students tend to associate with stress, such as in the line-up for the UBC Bookstore at the beginning of the term, and could serve as cognitive breaks from these stressful situations or environments. Additionally, this concept has the potential to extend to UBC's digital communications and infrastructure as well. For example, students could be sent a link to a cognitively challenging game in UBC's digital newsletters during stressful points in the term, such as during course registration, or the release of final grades.

Although our study was not able to meaningfully contribute to the conversation around ways to consciously incorporate biophilic design into UBC's architecture, future studies can continue to explore these ideas using the suggestions included in our discussion section. As UBC considers the best way to design its physical spaces to maximise student well-being, the capabilities of digital and technological spaces, and the way these tools can be used to achieve those same goals must be considered as well. As UBC continues these conversations, a greater emphasis should be placed on how to strategically (re-)design its digital spaces and physical spaces concurrently, to increase student wellness and decrease student stress in numerous capacities.

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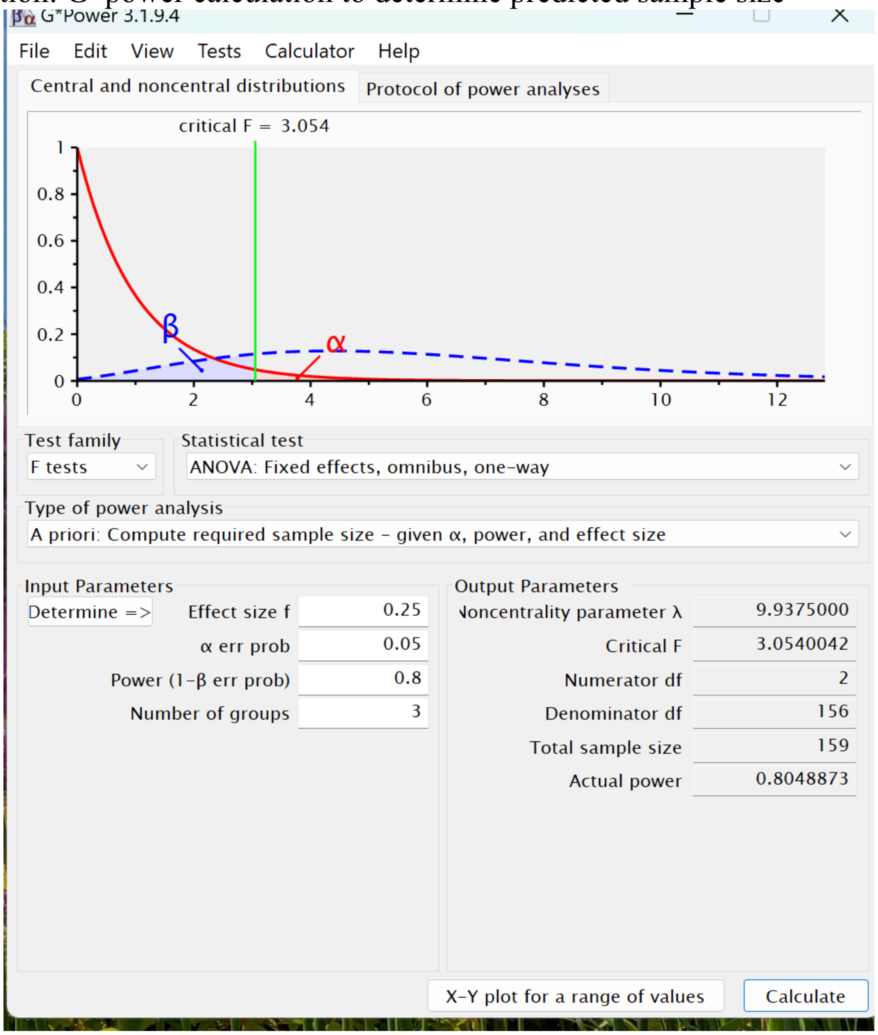
Appendix

Appendix A

Power Calculation: G*power calculation to determine predicted sample size



Appendix B

Dass-Delta Analysis – One-Way ANOVA

Descriptives plots ▼

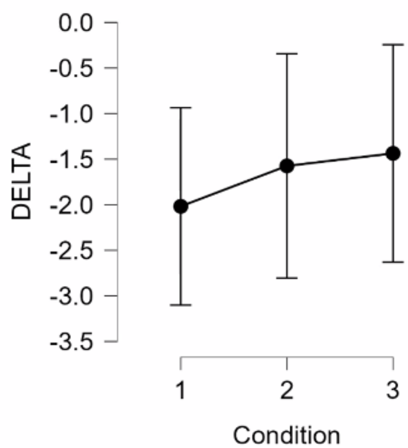


Figure B.1 – A graph showing delta (change in participants' perceived stress levels) on the y-axis and condition (control, biophilia only during break, biophilia only during task) on the x-axis. Error bars indicate there is no significant difference between conditions.

Descriptives ▼

Descriptives - DELTA

Condition	N	Mean	SD	SE	Coefficient of variation
1	56	−2.018	4.043	0.540	−2.004
2	54	−1.574	4.508	0.613	−2.864
3	55	−1.436	4.413	0.595	−3.072

Table B.2 – A table containing the mean delta, standard deviation and number of participants in each condition.

ANOVA ▼

ANOVA - DELTA

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Condition	10.263	2	5.131	0.275	0.760	0.003
Residuals	3027.713	162	18.690			

Note. Type III Sum of Squares

Figure B.2 - A table containing between-subjects effects

Appendix C

Entire Sample – One Sample T-Test

One Sample T-Test

One Sample T-Test

	t	df	p
DELTA	−5.010	164	< .001

Note. For the Student t-test, the alternative hypothesis specifies that the mean is different from 0.
Note. Student's t-test.

A table showing delta for the entire sample. Results indicate that the decrease in participants' perceived stress levels is statistically significant.

Appendix D

Control Condition – One Sample T-Test

One Sample T-Test

One Sample T-Test

	t	df	p
DELTA	−3.735	55	< .001

Note. For the Student t-test, the alternative hypothesis specifies that the mean is different from 0.
Note. Student's t-test.

A table showing delta for the control condition. Results indicate that the decrease in participants' perceived stress levels is statistically significant.

Appendix E

Condition 2 – One Sample T-Test

One Sample T-Test

One Sample T-Test

	t	df	p
DELTA	−2.566	53	0.013

Note. For the Student t-test, the alternative hypothesis specifies that the mean is different from 0.
Note. Student's t-test.

A table showing delta for the biophilia only during break condition. Results indicate that the decrease in participants' perceived stress levels is not statistically significant.

Appendix F

Condition 3 – One Sample T-Test

One Sample T-Test ▼

One Sample T-Test

	t	df	p
DELTA	−2.414	54	0.019

Note. For the Student t-test, the alternative hypothesis specifies that the mean is different from 0.
Note. Student's t-test.

A table showing delta for the biophilia only during task condition. Results indicate that the decrease in participants' perceived stress levels is not statistically significant.

Appendix G

Positive Dass-Delta Analysis – One-Way Anova

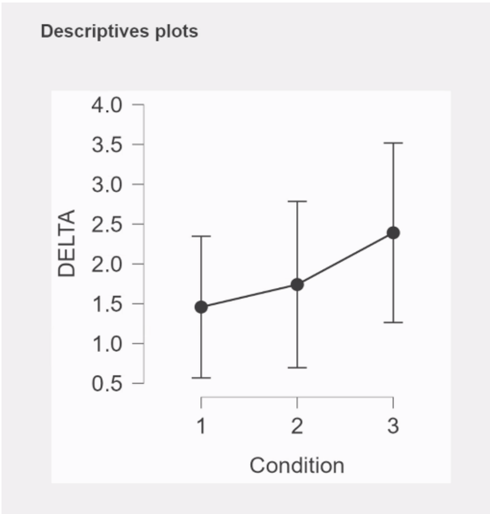


Figure G.1 – A graph showing delta for participants whose perceived stress levels increase on the y-axis and condition (control, biophilia only during break, biophilia only during task) on the x-axis. Error bars indicate there is no significant difference between conditions.

Descriptives

Descriptives - DELTA

Condition	N	Mean	SD	SE	Coefficient of variation
1	24	1.458	2.105	0.430	1.444
2	27	1.741	2.640	0.508	1.516
3	23	2.391	2.607	0.544	1.090

Table G.2 – A table containing the mean delta, standard deviation and number of participants in each condition.

ANOVA

ANOVA - DELTA

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Condition	10.743	2	5.372	0.882	0.419	0.024
Residuals	432.622	71	6.093			

Note. Type III Sum of Squares

Figure G.2 – A table containing between-subjects effects.

Appendix H

Entire Sample – Task Performance

Descriptive Statistics ▼

Descriptive Statistics

	TACC FINAL
Valid	165
Missing	0
Mean	95.707
Std. Deviation	14.481
Minimum	0.000
Maximum	100.000

Figure H.1 – A table showing participants' mean task performance (accuray) on the Stroop trials and standard deviations for the entire sample

Appendix I

Conditions - Task Performance

Task Performance

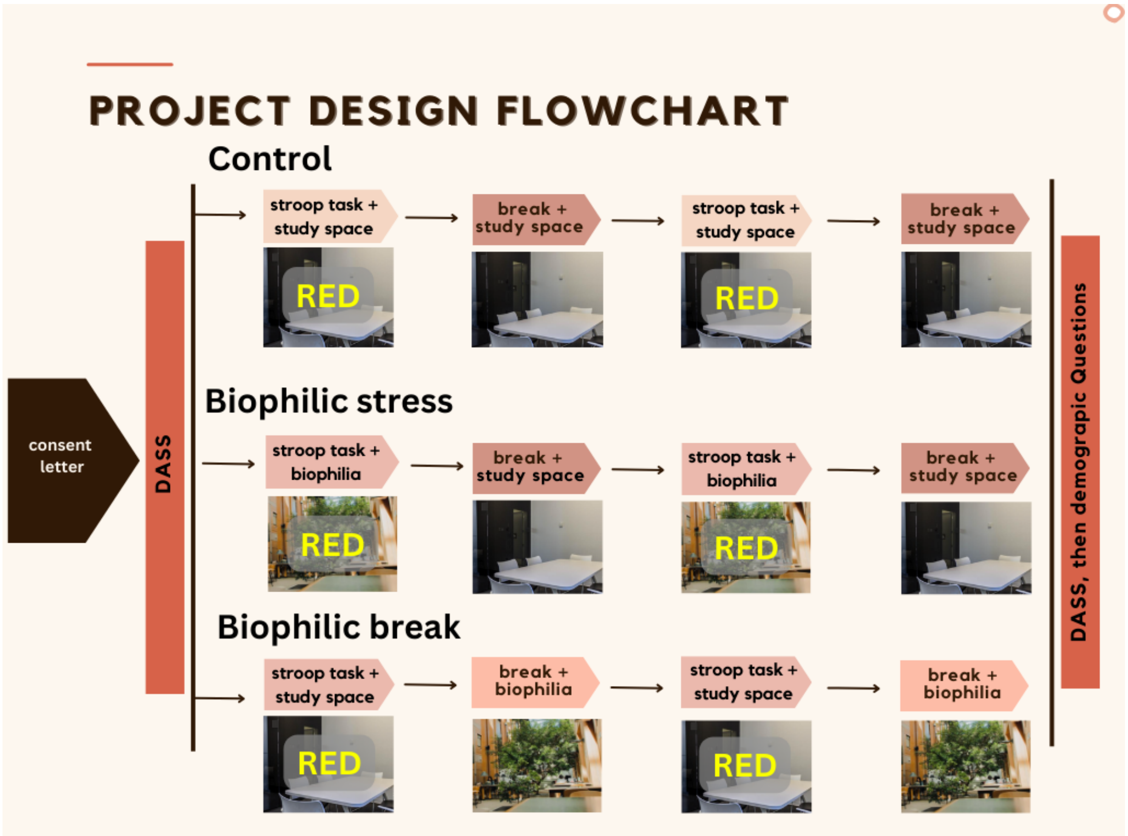
Descriptive Statistics

	Control Condition	Condition 2	Condition 3
Valid	56	54	55
Missing	0	0	0
Mean	96.429	96.914	93.788
Std. Deviation	13.517	9.020	19.109
Minimum	4.167	37.500	0.000
Maximum	100.000	100.000	100.000

Figure I.1 – A table showing participants' mean task performance (accuracy) on the Stroop trials and standard deviations for each condition. (Condition 2 – Biophilia only during break; Condition 3 – Biophilia only during task).

Appendix J

Project Design Flowchart



Appendix K

Promotional Media


PARTICIPATE IN RESEARCH!
Interested in stress and environments? Help us by completing this 5-min survey!
Description:
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.
UBC
tinyurl.com/2p8hppm4


How we feel when we see all your survey responses

Appendix L

Survey

THE UNIVERSITY OF BRITISH COLUMBIA

Consent Letter

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.

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 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.

- ○ I consent to participate in this study.
- ○ I do not consent to participate in this study.

Pre DASS Test

Please read each statement and select the responses that best describes how you felt in the **past 15 minutes**

	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)
I found it hard to wind down.	○	○	○	○
I tended to overreact to situations	○	○	○	○
I felt that I was using a lot of nervous energy	○	○	○	○
I found myself getting agitated	○	○	○	○
I found it difficult to relax	○	○	○	○
I was intolerant of anything that kept me from getting on with what I was doing	○	○	○	○
I felt that I was rather touchy	○	○	○	○

Intro Block

Hello!

In this study, you will be completing 3 sets of questions with 2 breaks in between

For each question below, please choose the multiple-choice answer that states **what color the word is** and **not what the word says**

For example, if you are presented with the picture below, **the correct multiple choice answer would be red** and **not** blue

BLUE

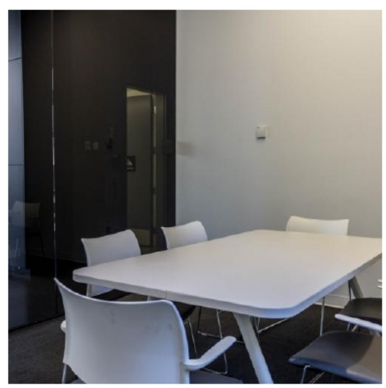
○ Blue

◉ Red

○ White

As soon as you click the arrow, the task will begin. Good luck!

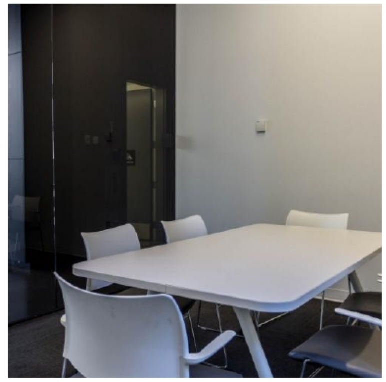
CONTROL PART 1



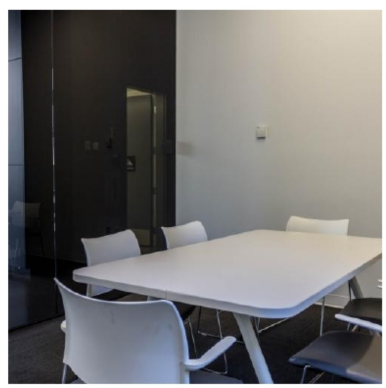
○ Yellow

○ Red

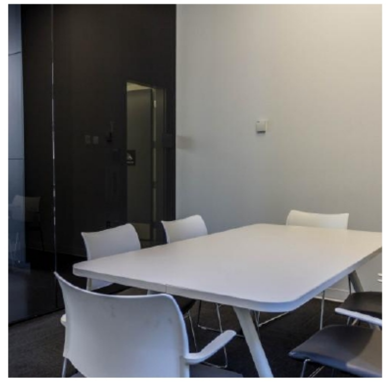
○ Orange



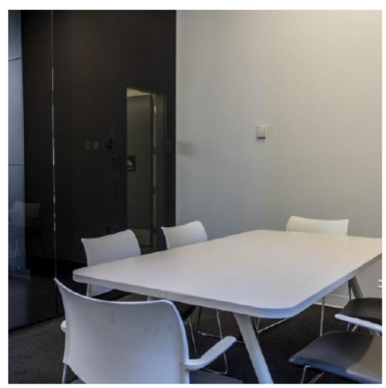
- White
- Blue
- Yellow



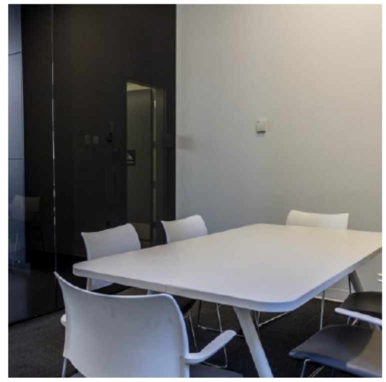
- Black
- Red
- Purple



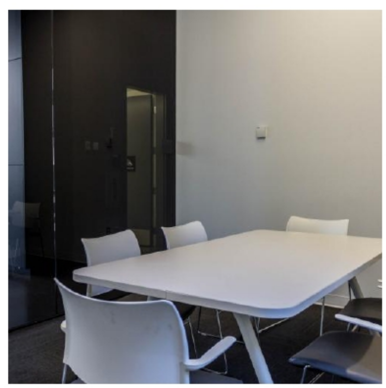
- Yellow
- Black
- White



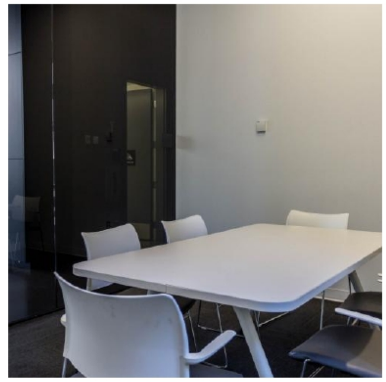
- Red
- Blue
- Pink



- Yellow
- Purple
- Black



- Purple
- Orange
- Green

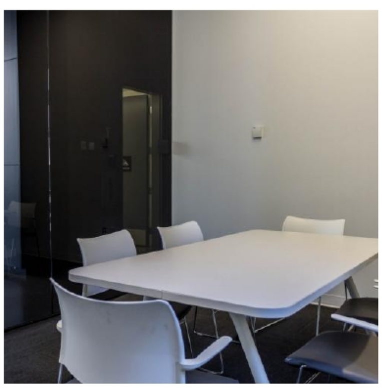


- ○ White
- ○ Grey
- ○ Brown

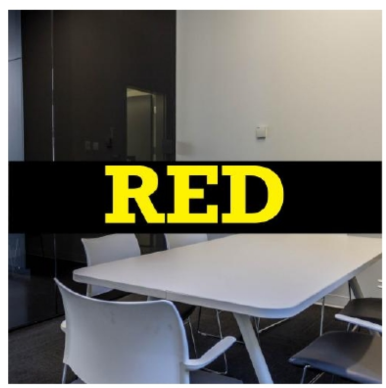
BREAK

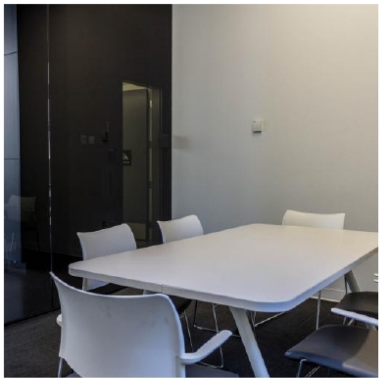
Enjoy this short break before your next set of questions.

Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.

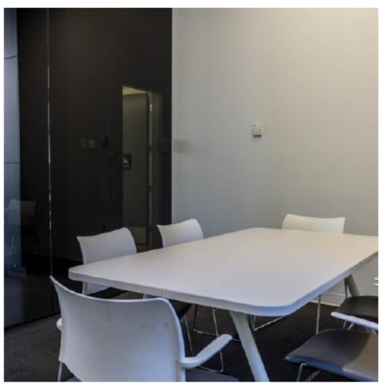


CONTROL PART 2

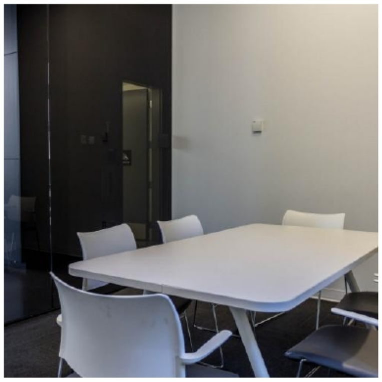




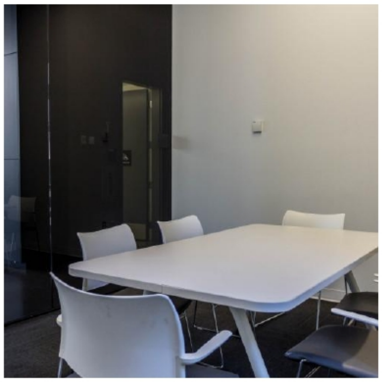
- Red
- Black
- Yellow



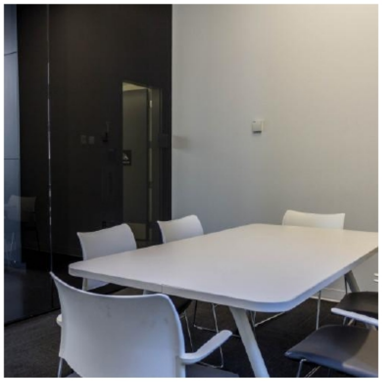
- Blue
- Yellow
- Pink



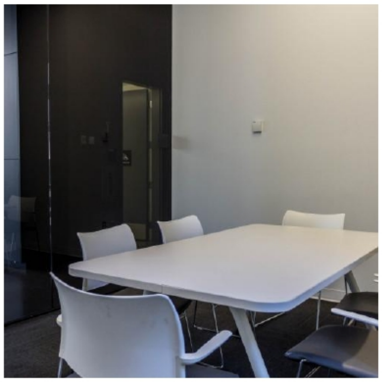
- Purple
- Orange
- Black



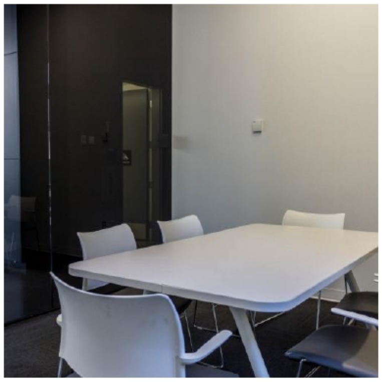
- White
- Pink
- Green



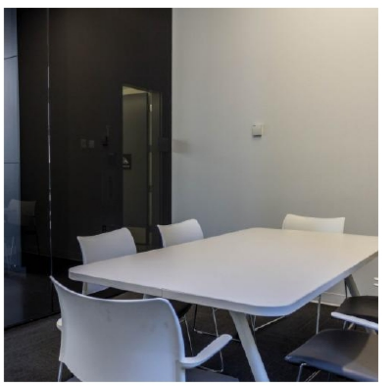
- Yellow
- Blue
- Pink



- Purple
- Blue
- White



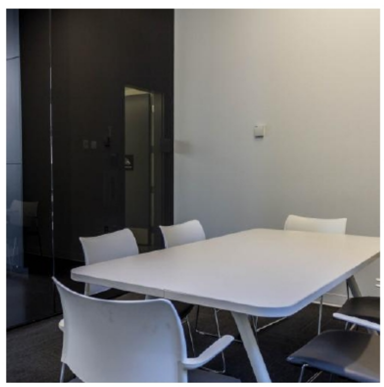
- Yellow
- Red
- Blue



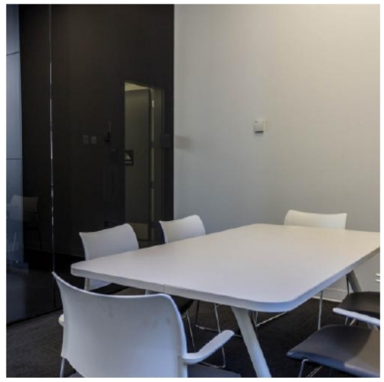
- Orange
- Green
- White

BREAK 2

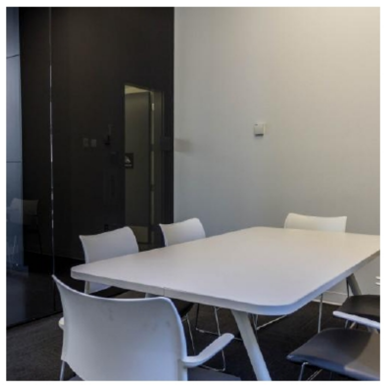
Enjoy this short break before your next set of questions. Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.



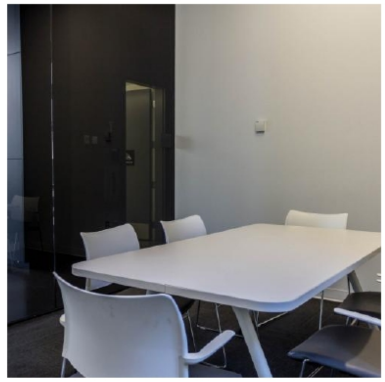
CONTROL PART 3



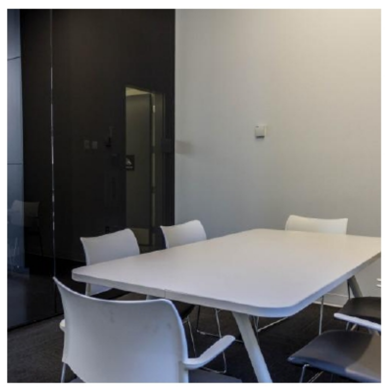
- Blue
- Red
- White



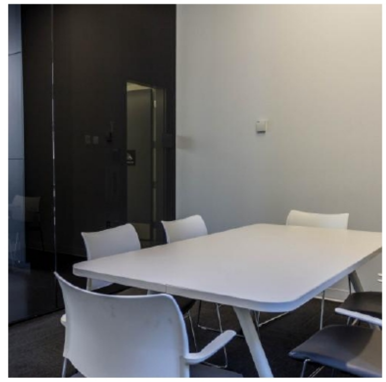
- Green
- Blue
- Yellow



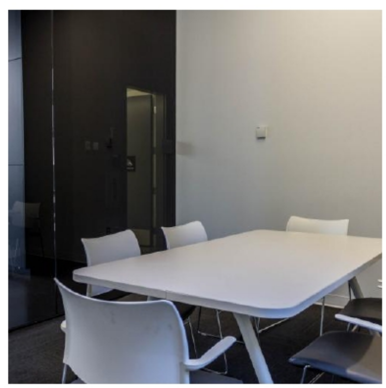
- Green
- White
- Red



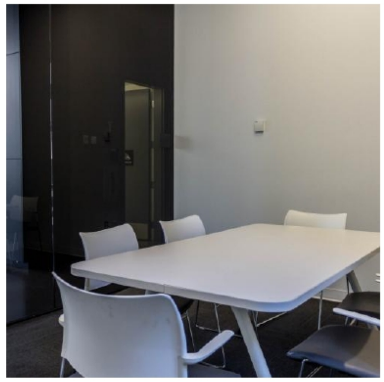
- Yellow
- Red
- Blue



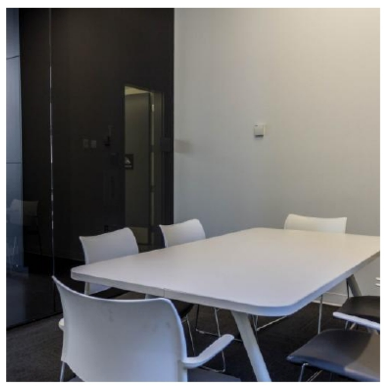
- Black
- White
- Brown



- Pink
- Yellow
- White

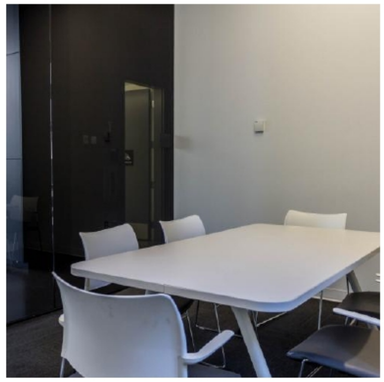


- Red
- Orange
- Blue

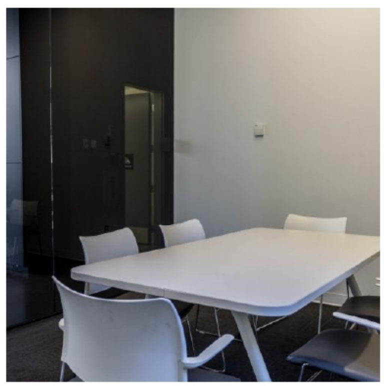


- Pink
- Yellow
- Brown

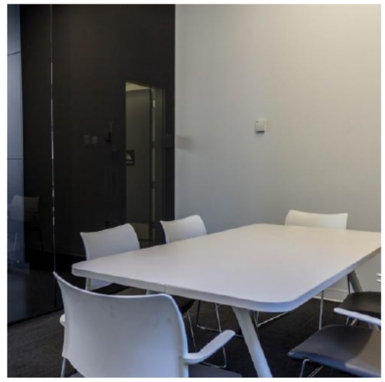
BIOPHILIA DURING BREAKS PART 1



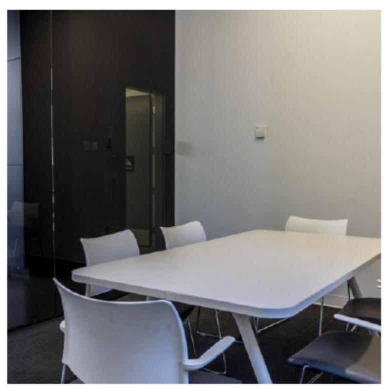
- Yellow
- Red
- Orange



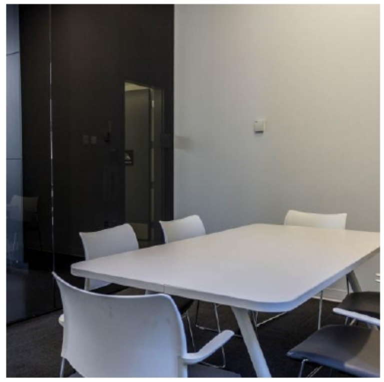
- White
- Blue
- Yellow



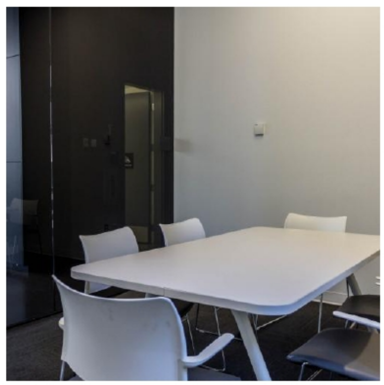
- Black
- Red
- Purple



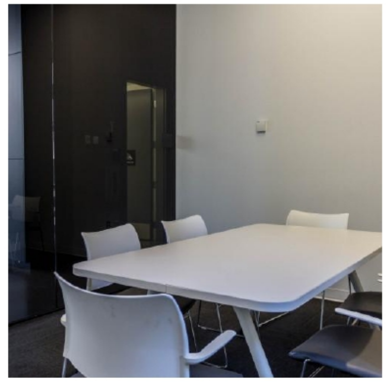
- Yellow
- Black
- White



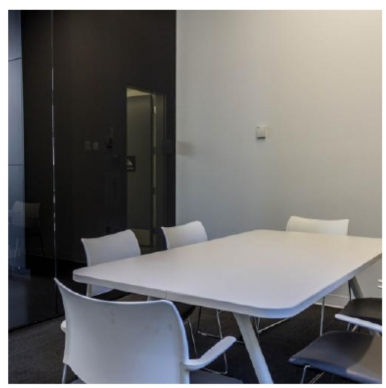
- Red
- Blue
- Pink



- Yellow
- Purple
- Black



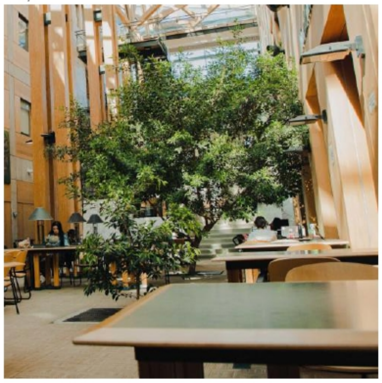
- Purple
- Orange
- Green



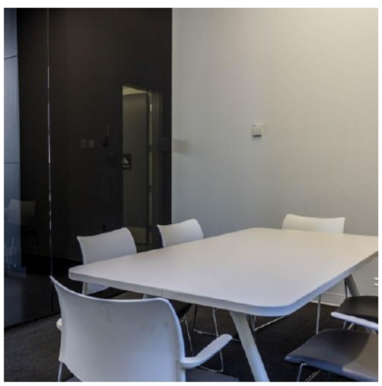
- White
- Grey
- Brown

BREAK

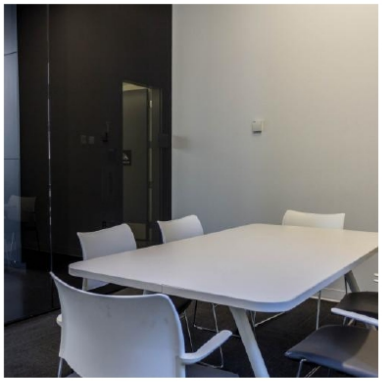
Enjoy this short break before your next set of questions. Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.



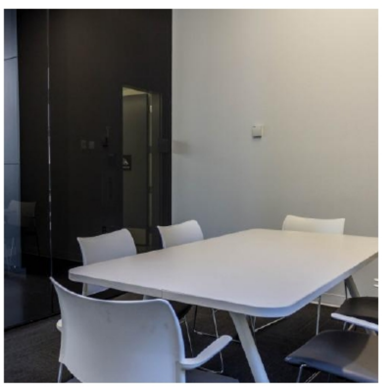
BIOPHILIA DURING BREAKS PART 2



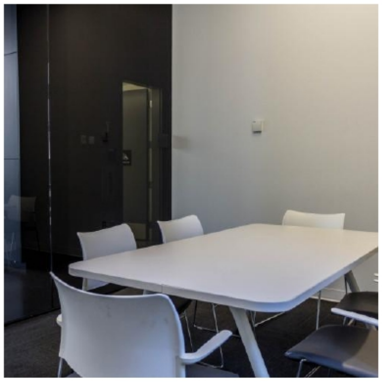
- ○ Red
- ○ Black
- ○ Yellow



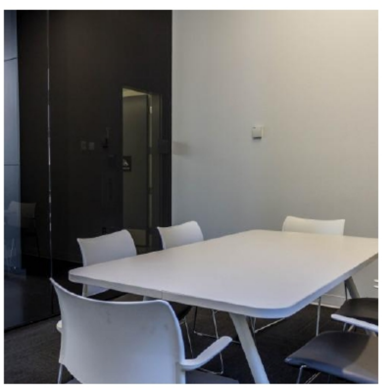
- Blue
- Yellow
- Pink



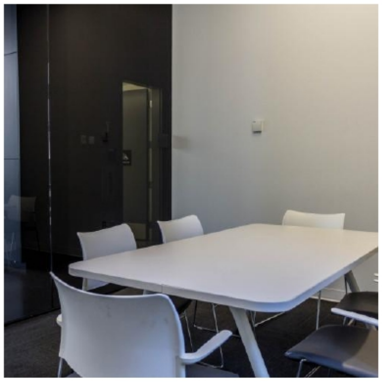
- Purple
- Orange
- Black



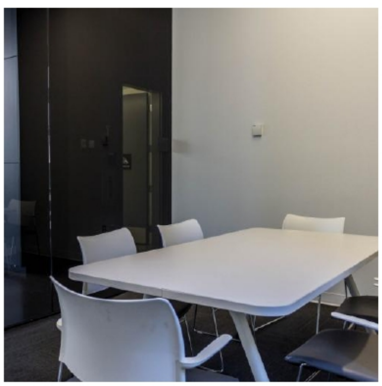
- White
- Pink
- Green



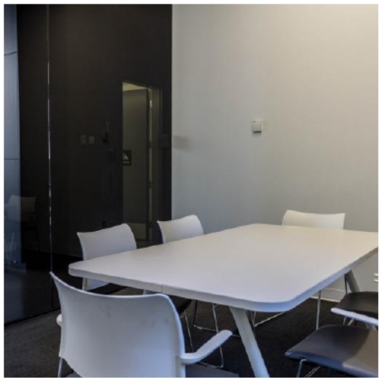
- Yellow
- Blue
- Pink



○ Purple
○ Blue
○ White



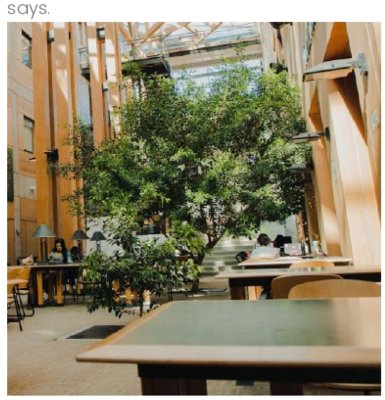
○ Yellow
○ Red
○ Blue



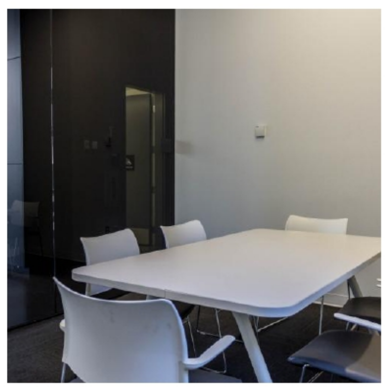
- ○ Orange
- ○ Green
- ○ White

BREAK 2

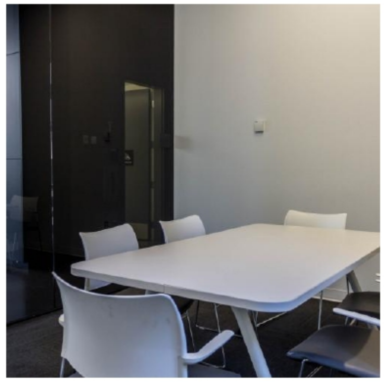
Enjoy this short break before your next set of questions. Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.



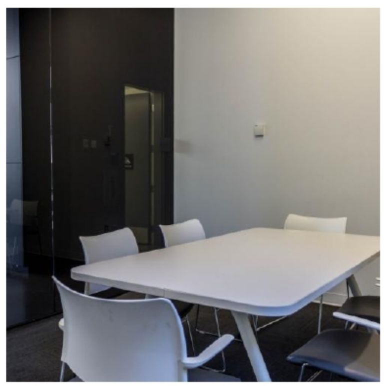
BIOPHILIA DURING BREAKS PART 3



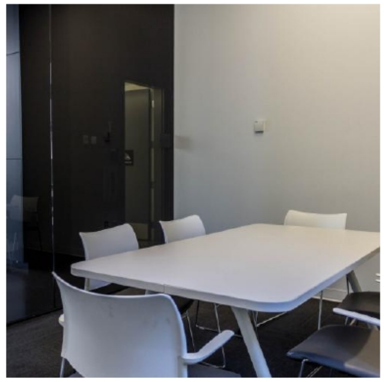
- ○ Blue
- ○ Red
- ○ White



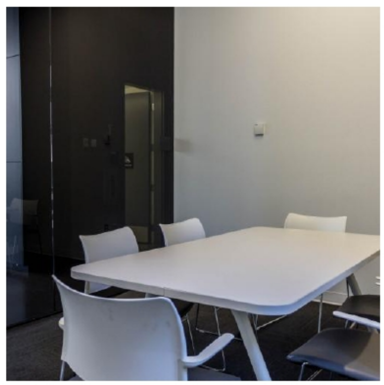
- Green
- Blue
- Yellow



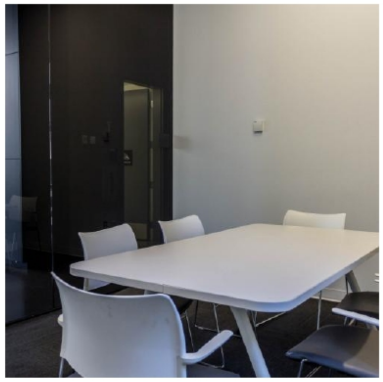
- Green
- White
- Red



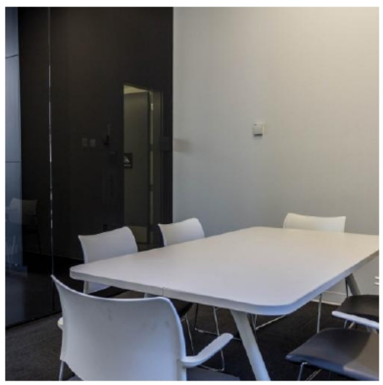
- ◯ Yellow
- ◯ Red
- ◯ Blue



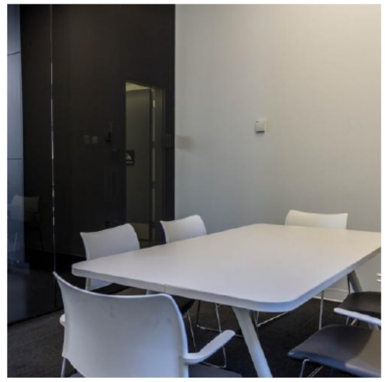
- ◯ Black
- ◯ White
- ◯ Brown



- Pink
- Yellow
- White

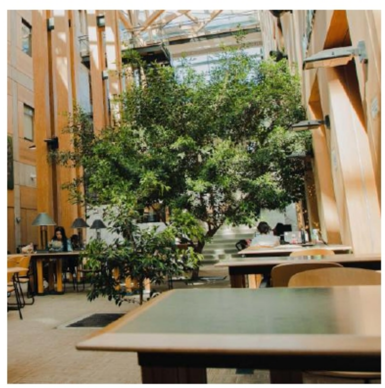


- Red
- Orange
- Blue

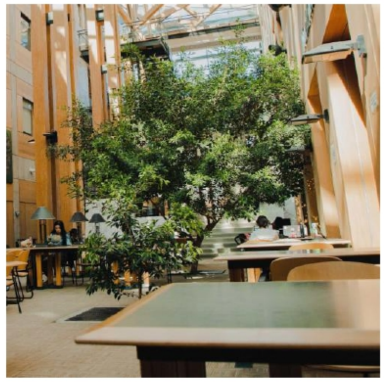


◯ Pink
◯ Yellow
◯ Brown

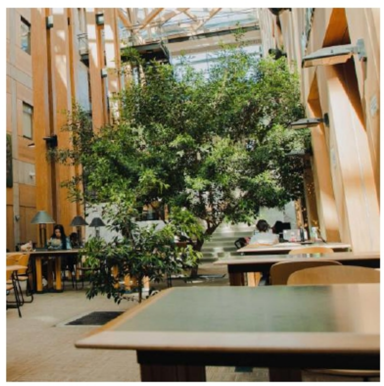
BIOPHILIA DURING STRESSORS PART 1



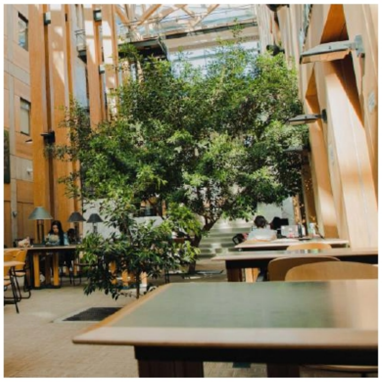
◯ Yellow
◯ Red
◯ Orange



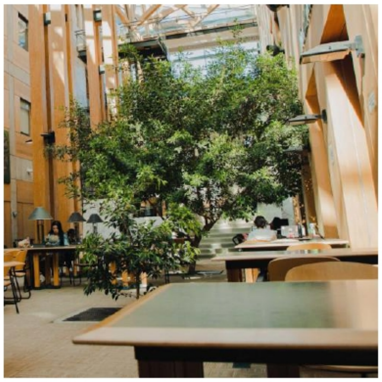
- White
- Blue
- Yellow



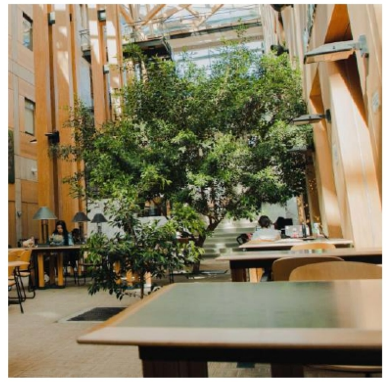
- Black
- Red
- Purple



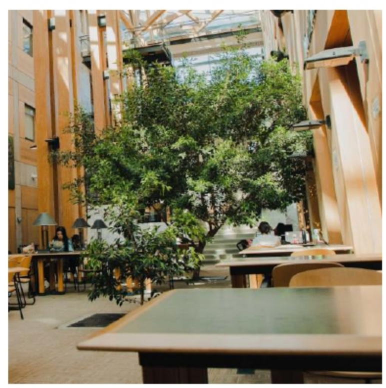
- Yellow
- Black
- White



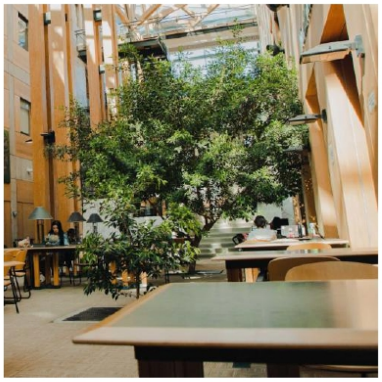
- Red
- Blue
- Pink



- Yellow
- Purple
- Black



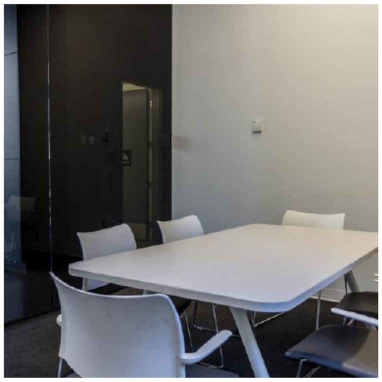
- Purple
- Orange
- Green



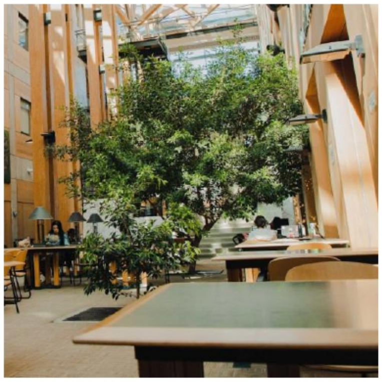
- White
- Grey
- Brown

BREAK

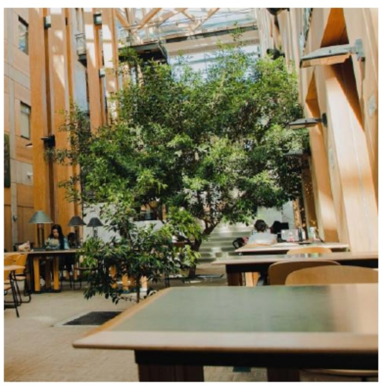
Enjoy this short break before your next set of questions. Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.



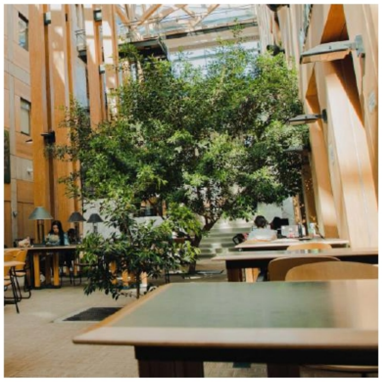
BIOPHILIA DURING STRESSORS PART 2



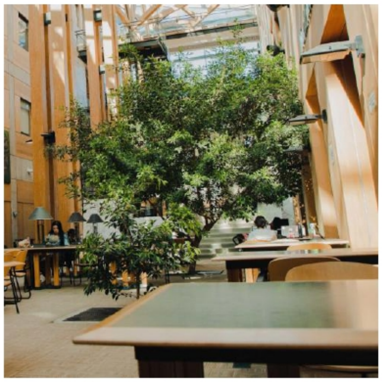
- Red
- Black
- Yellow



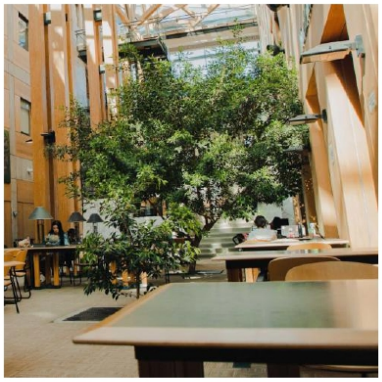
- Blue
- Yellow
- Pink



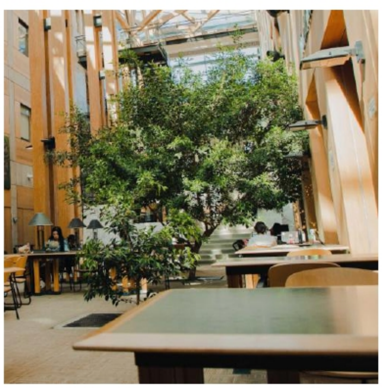
- Purple
- Orange
- Black



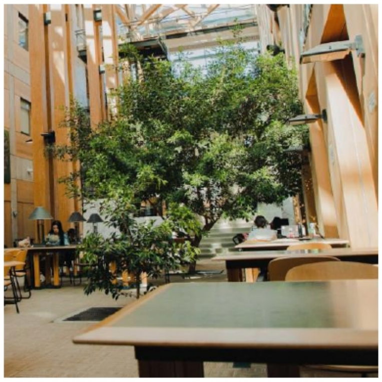
- White
- Pink
- Green



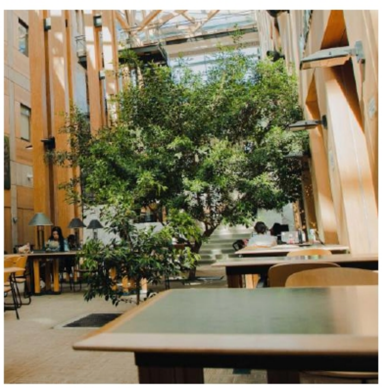
- Yellow
- Blue
- Pink



- Purple
- Blue
- White



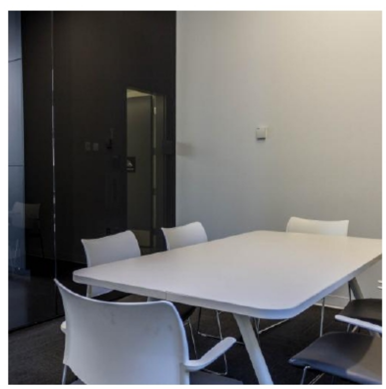
- ○ Yellow
- ○ Red
- ○ Blue



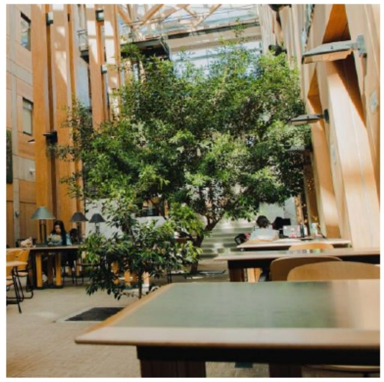
- ○ Orange
- ○ Green
- ○ White

BREAK 2

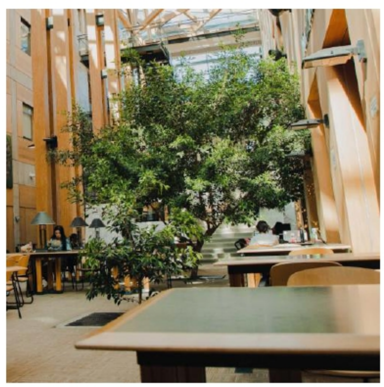
Enjoy this short break before your next set of questions. Once again, please choose the multiple-choice answer that states what color the word is and not what the word says.



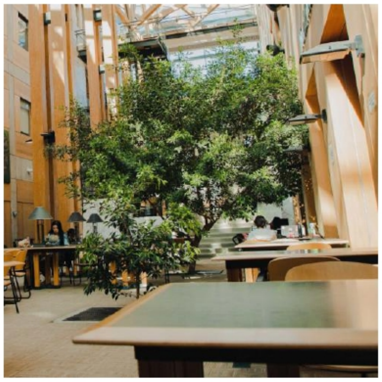
BIOPHILIA DURING STRESSORS PART 3



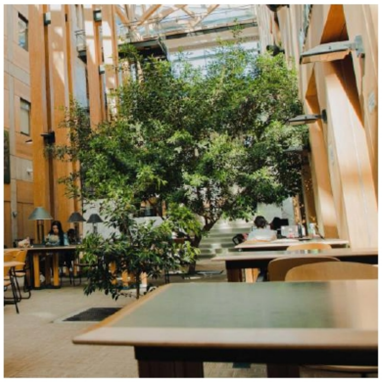
- ◯ Blue
- ◯ Red
- ◯ White



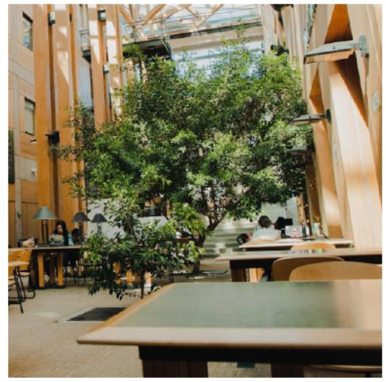
- ◯ Green
- ◯ Blue
- ◯ Yellow



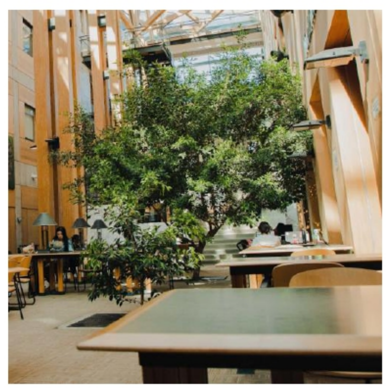
- Green
- White
- Red



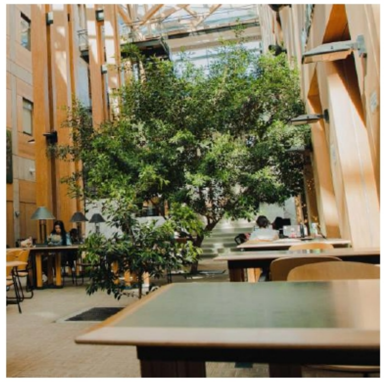
- Yellow
- Red
- Blue



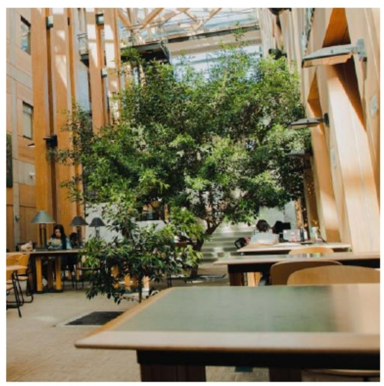
- Black
- White
- Brown



- Pink
- Yellow
- White



- Red
- Orange
- Blue



- Pink
- Yellow
- Brown

Post DASS Test

Please read each statement and select the responses that best describes how you feel **in this moment**

	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me to a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)
I found it hard to wind down	○	○	○	○
I tended to overreact to situations	○	○	○	○
I felt that I was using a lot of nervous energy	○	○	○	○
I found myself getting agitated	○	○	○	○
I found it difficult to relax	○	○	○	○
I was intolerant of anything that kept me from getting on with what I was doing	○	○	○	○
I felt that I was rather touchy	○	○	○	○

Demographics

Are you a student?

○ Yes, I'm a UBC student
○ Yes, but I'm not a UBC student
○ No, I'm not a student
○ Prefer not to answer

Which year are you in?

○ Undergraduate Year 1
○ Undergraduate Year 2
○ Undergraduate Year 3
○ Undergraduate Year 4
○ Undergraduate Year 5+
○ Graduate student
○ ________ Other
○ Prefer not to answer

What is your age in years? (please enter a number e.g., 21)

____

With which of the following do you identify? Please select all that apply

☐ Woman
☐ Man
☐ Non-binary
☐ Transgender
☐ ________ Other
☐ Prefer not to answer

What images did you see in this survey? Please select all that apply

☐ A barn
☐ A study space without plants
☐ A study space with plants
☐ An aquarium
☐ A cottage

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Team Member Contributions

Task	Team member
Original Research idea and design	Mark
Literature review	Amanda, Mark, Mathea, Rex, Rachel
Stressors/task	Mark
Measures	Rachel
Study Coordinators	Amanda & Rachel
Qualtrics construction	Rex, Rachel
Qualtrics final edits	Rex, Rachel, Mathea, Hasan
Qualtrics: Testing survey	Amanda, Hasan, Mark, Mathea, Rex, Rachel
Proposal: Project title	Amanda, Hasan, Mark, Mathea, Rex, Rachel
Proposal	Amanda, Mark, Mathea, Rex, Rachel
Proposal editing	Amanda, Mark, Mathea, Rex, Rachel
Power Analysis	Amanda & Rachel
Data cleaning/filtering	Rex, Mark, Rachel, Amanda
Data analysing/organising	Rex, Mark, Rachel, Amanda
Project design flowcharts	Mark, Amanda, Rachel
Powerpoint	Mathea
Participants, Demo info → charts/graphs	Hasan
Powerpoint implications	Mark & Mathea
Powerpoint polishing	Amanda, Mark, Mathea, Rex, Rachel
Members who presented	Amanda, Hasan, Mark, Mathea, Rex, Rachel
Final Paper	Amanda, Mark, Mathea, Rex, Rachel