COM ENG MATH II Project

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Background

The concept of "returning to the monkey" has gained popularity as a humorous critique of modern life's stress and complexity. It reflects a longing for a simpler, primal existence, free from societal burdens. This experiment explores whether humans are subtly influenced by such imagery and whether visual cues can sway their preferences or beliefs.

To investigate, participants were randomly shown one of two pictures: one depicting a modern, civilized human experience, and the opposite. By analyzing the participants' reactions, this study aims to determine if visual context can influence perceptions, preferences, or a deeper psychological connection to their evolutionary roots.

What are we testing for?

This experiment is designed to measure participants' inclination toward embracing a "monkey-like" state versus maintaining a modern human perspective.

1. Visual Influence:
   Participants are randomly shown one of two images—one representing a modern human happy life and the other, a modern human unhappy life. This section tests how the visual context influences their initial thoughts and reactions.

2. Preference Assessment:
   Participants respond to questions or make choices based on the image they see. This section evaluates how much they resonate with the concept of "returning to the monkey" and whether the imagery shifts their preferences toward simplicity or modernity.

Setup

In this experiment, we analyze the **influence of visual imagery** on participants' inclinations toward adopting a "monkey-like" state versus maintaining a modern human perspective. We test whether different visual contexts—"happy modern life" versus "unhappy modern life"—can significantly sway preferences or beliefs.

Hypothesis

Null Hypothesis (H_0):

$$H_0 : \mu_A - \mu_B = 0$$

There is no difference in the mean inclination scores toward embracing a "monkey-like" state between participants shown the "happy life" image (μ_A) and those shown the "unhappy life" image (μ_B).

Alternative Hypothesis (H_A):

$$H_A : \mu_A - \mu_B < 0$$

Participants shown the "happy life" image (μ_A) have a lower mean inclination score toward embracing a "monkey-like" state compared to those shown the "unhappy life" image (μ_B).

To achieve this, we designed the A/B test under the following assumptions:

Assumptions

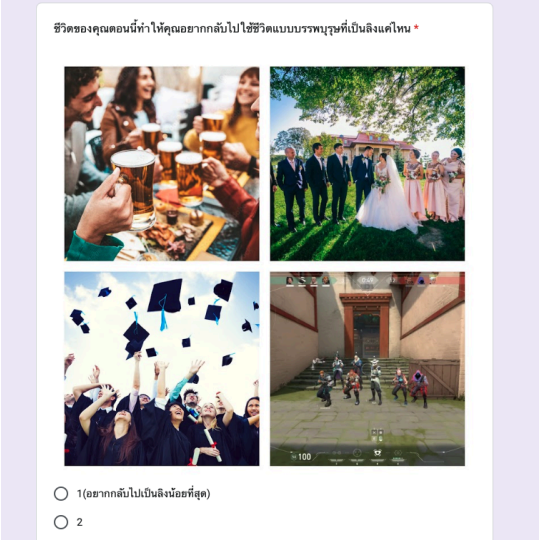
1. **Data Distribution**:
   Since we are measuring reactions and calculating averages across participant scores, we assume the data follows a **Normal Distribution** with a **Standard Deviation.**
2. **Hypotheses**:
   The **Alternate Hypothesis** is **one-sided**, as we are only interested in whether the images increase inclination toward "returning to a monkey."
   - Null Hypothesis (H_0): No significant difference between the groups. $\mu_A - \mu_B = 0$
   - Alternate Hypothesis (H_A): Participants' preferences are influenced by the image they are shown. $\mu_A - \mu_B < 0$
3. **Significance Level (α)**:
   We set the significance level at the standard α=0.05, corresponding to Z_α=1.645
4. **Minimum Detectable Effect (MDE)**:
   The MDE is set at 0.5, indicating we are testing for a subtle but meaningful preference shift based on the visual context. This ensures that the sample size remains manageable while detecting a practically significant difference.

5. **Statistical Power (β)**:
   The test is designed with a power of 80% (β=0.2), ensuring an adequate likelihood of detecting a true effect, with Z_{β}=0.842.
6. **Control/Variant Ratio**:
   The ratio of participants in the control group (happy modern life) to the variant group (unhappy modern life) is balanced at 50:50, simplifying the calculation (m=1).
7. **Data variance**
   Assuming variances of the two datasets (A and B) are equal. Use a pooled variance to calculate the test statistic. Pilot Study

Pilot Study

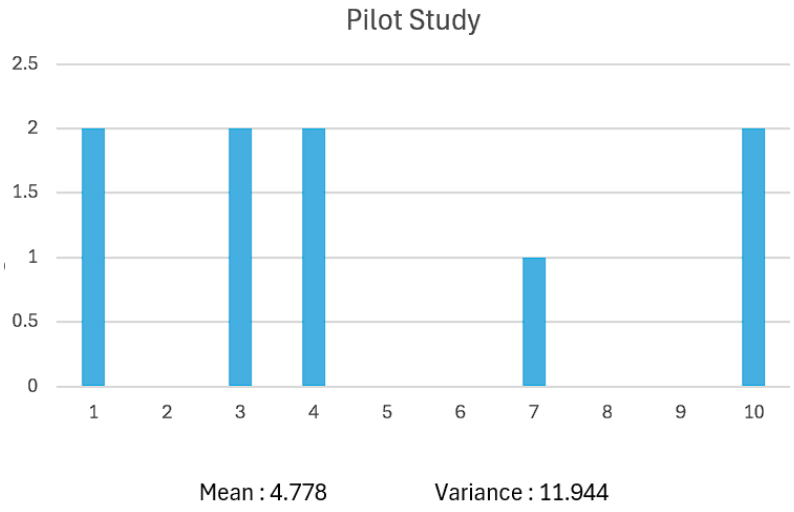
Setup

We created an anonymous poll (A variant) which is a form showing a happy life and allows participants to select the level of their desire to adopt a "monkey-like" life from 1-10 with 10 being the highest level of desire of adopting a "monkey-like" life.



Pilot form A variant.

Raw data



Mean, Variance, and Histogram representing distribution score from a pilot study

The result from the pilot study represents the base statistical information of the system which will be used to calculate the sample size.

Sample size estimation

Consider M = 1, α = 0.05, β = 0.2, MDE = 0.5,

$$N = \frac{m+1}{m}\left(\frac{(Z_{\alpha}+Z_{\beta})\sigma}{MDE}\right)^2$$

$$N = \frac{1+1}{1}\left(\frac{(1.645+0.842)\sigma}{0.5}\right)^2$$

$$N = 591$$

Sample size adjustment

Adjust new variables: M = 1, α = 0.1, β = 0.2, MDE = 2

$$N = \frac{m+1}{m}\left(\frac{(Z_{\alpha}+Z_{\beta})\sigma}{MDE}\right)^2$$

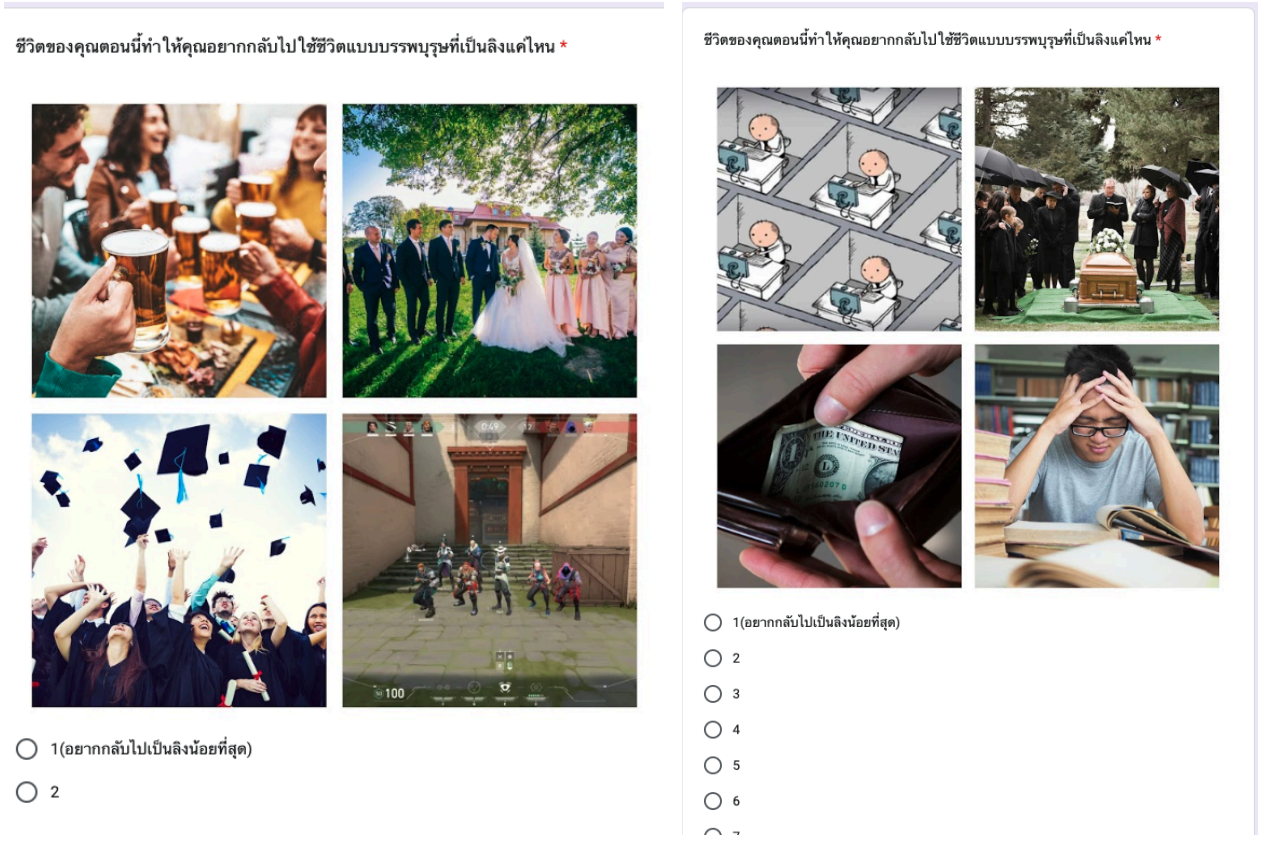
$$N = \frac{1+1}{1}\left(\frac{(1.282+0.842)\sigma}{2}\right)^2$$

$$N = 29$$

Experiment

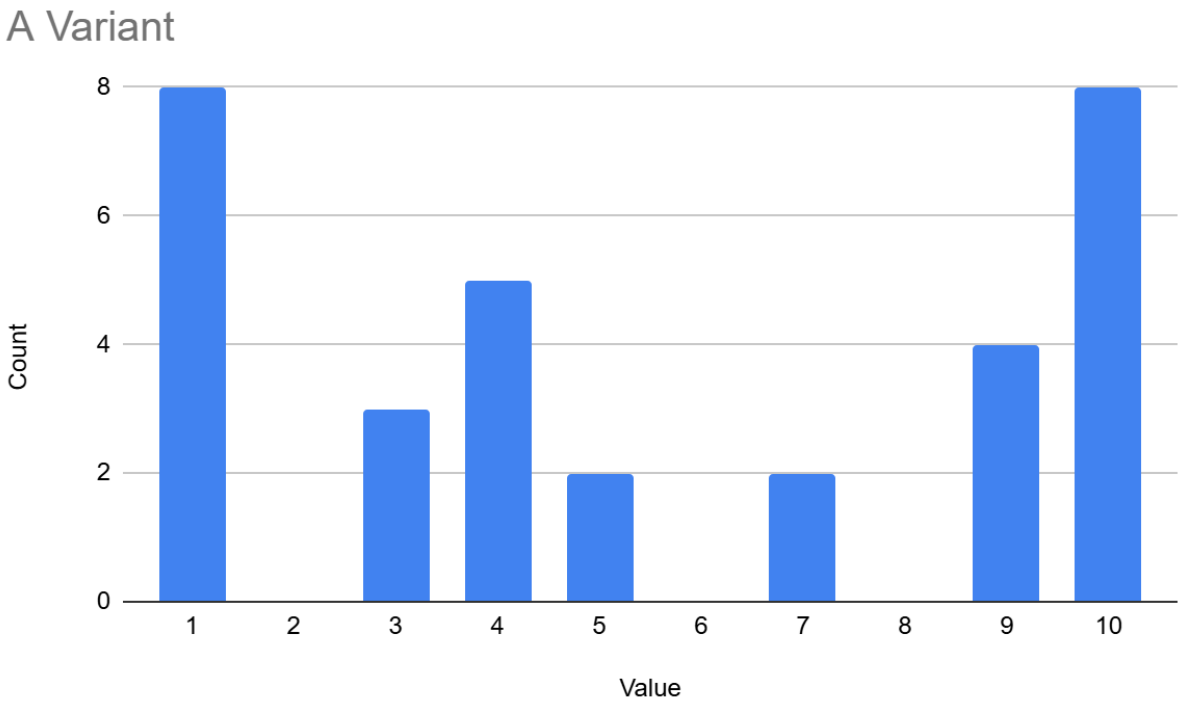
Setup

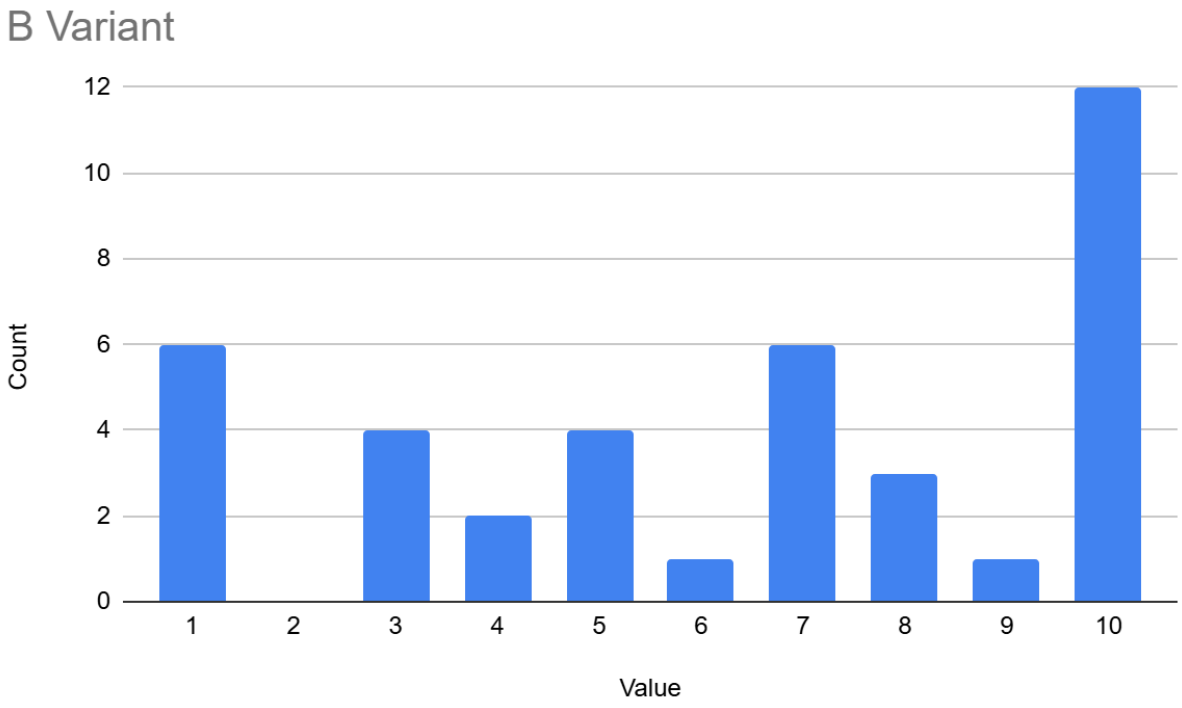
We designed two variants of the poll, A and B, and implemented a URL randomizer (Allocate Monster) to assign participants to one of the two variants randomly. Each participant could only access one variant, ensuring no overlap between the groups. The participants for this experiment were from a completely separate group from those who participated in the pilot study.



Poll variants A and B

Raw data


A Variant
Count
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
Value


B Variant
Count
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
Value

Statistic calculation

Where

- $s_x = 3.62771$: Sample standard deviation of group A
- $s_y = 3.29539$: Sample standard deviation of group B
- $\mu_0 = 0$: The hypothesized difference in population means
- $\bar{x} = 5.53125$: Sample mean of group x
- $\bar{y} = 6.33333$: Sample mean of group y
- $n = 32$: Sample size of group x
- $m = 39$: Sample size of group y

$$
\begin{aligned}
s_p^2 &= \frac{(n-1)s_x^2 + (m-1)s_y^2}{n+m-2} \\
&= \frac{(32-1)\cdot 3.62771^2 + (39-1)\cdot 3.29539^2}{32+39-2}\left(\frac{1}{32}+\frac{1}{39}\right) \\
&= 0.82257
\end{aligned}
$$

$$
\begin{aligned}
t &= \frac{\bar{x} - \bar{y} - \mu_0}{s_p} \\
&= \frac{5.53125 - 6.33333 - 0}{0.82257} \\
&= -0.9751
\end{aligned}
$$

$$
\begin{aligned}
df &= n + m - 2 \\
&= 32 + 39 - 2 \\
&= 69
\end{aligned}
$$

$$
\therefore \text{ p-value} = P(T \leq t) = P(T \leq -0.9751) = 0.1665
$$

Conclusion

According to the statistical calculation, the dataset has a p-value of 0.1665. With a significance level (α) set at 0.1 for a one-sided test, the p-value is greater than the significance level. Therefore, we **fail to reject** the null hypothesis.

Consequently, we **cannot conclude** that visual imagery influences participants' inclinations toward adopting a "monkey-like" state versus maintaining a modern human perspective.