

# **EMPIRICAL STUDY**

FOR

## **IMMERSIVE HUMAN DIGESTIVE TOUR VR APPLICATION**

### **Group-12**

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# 1. Purpose

The main purpose of this empirical study is to check the usability of the software for the project 'Human Digestive System VR Tour'. The main idea is to get conclusions about the relationship between interface elements and aesthetic score for a student using the software.

## 2. Research Hypotheses

- $H_0$ : The Aesthetic score (on a scale of 1-10) does not depend on the number of objects, object types, and the layout of objects an interface has.
- $H_1$ : The Aesthetic score (on a scale of 1-10) depends on the number of objects, object types, and the layout of objects an interface has.

## 3. Variable Determination

Dependent Variables:

- **Aesthetic Score:**
  - Scale: Interval [1-10]
  - Measures how aesthetic does a user find the software in terms of learning about the human digestive system

Independent Variables:

- **Number of Objects (N) :**
  - Value: Integer
  - It is the total number of objects an interface has that includes but is not limited to text boxes, buttons, drawers, options.
- **Type of Object (T) :**
  - Value: Text, Image, Icon
  - It is to specify whether the object is text, image, or icon
- **Layout of Objects (L) :**
  - Value: Asymmetric or symmetric
  - It is to signify whether the design is symmetric or asymmetric.

## 4. Experiment Design

**Type:** Between-Subject

**Tasks:**

1. Start the tour, choose touch and find about diseases in the mouth.
2. Find about the nutrients digested in the mouth
3. Find about connected organs to the mouth
4. Find about the connected glands to the mouth
5. See the working video of mouth
6. Go to next organ to mouth

**Participants (5):**

- Anant Bansal (P1)
- Aditya Kandekar (P2)
- Soham Khadilkar (P3)

- Harsh Vardhan Sharma (P4)
- Anmol Kawadkar (P5)

### **Interfaces presented:**

Following three different interfaces are presented to the participants -

- **Interface #1 ( $I_1$ ):**

<https://www.figma.com/proto/KtWbNMsRYI7KdyhJJFSjzT/Prototype?scaling=scale-down&page-id=0%3A1&node-id=3%3A4>

- N : 122
- T : Text, Image & Icon
- L : Symmetric

- **Interface #2 ( $I_2$ ):**

<https://www.figma.com/proto/RVppWTtbrgDBJU1yu0SHyJ/harsh-s-prototype?node-id=1%3A4&viewport=340%2C291%2C0.24658384919166565&scaling=scale-down&page-id=0%3A1>

- N : 81
- T : Text, Image & Icon
- L : Asymmetric

- **Interface #3 ( $I_3$ ):**

<https://www.figma.com/proto/IXUDpzXsW5kcOxgKA93m7F/Prototype-N?node-id=1%3A378&scaling=min-zoom&page-id=0%3A1>

- N : 94
- T : Text, Image & Icon
- L : Asymmetric

## 5. Data Collection

	$I_1$	$I_2$	$I_3$
<b>P1</b>	4	6	9
<b>P2</b>	2	8	10
<b>P3</b>	3	5	8
<b>P4</b>	6	8	10
<b>P5</b>	1	5	9

## 6. Data Analysis

Since our experiment design is a between-subject design with 3 factors, each having more than 2 levels, therefore we need to do the '**Kruskal-Wallis**' test.

(i) Null & Alternative Hypotheses -

- $H_0$ : The aesthetic score (on a scale of 1-10) does not depend on the number of objects, object types, and the layout of objects an interface has.
- $H_1$ : The aesthetic score (on a scale of 1-10) depends on the number of objects, object types, and the layout of objects an interface has.

(ii) Stating Alpha -

- $\alpha = 0.05$

(iii) Degree of Freedom -

- $df = k-1 = 3-1 = 2$

(iv) Stating Decision Rule -

- From chi-square table of Wallis test, for  $df = 2$  and  $\alpha = 0.05$ , we have
  - Critical Value of chi-square = 5.99
- If  $\chi^2 > 5.99$ , we reject the null hypotheses.

(v) Calculating Test Statistic -

$I_1$	$I_2$	$I_3$
4	6	9
2	8	10
3	5	7
6	8	10
1	5	9

Original Score	Rank
1	1
2	2
3	3
4	4
5	5
5	6
6	7
6	8
7	9
8	10
8	11
9	12
9	13
10	14
10	15

	I1	I2	I3
	4	7	12
	2	10	14
	3	5	9
	8	11	15
	1	6	13
T	18	39	63
n	5	5	5

$$H = \left[ \frac{12}{n(n+1)} \sum_{j=1}^c \frac{T_j^2}{n_j} \right] - 3(n+1)$$

$$H = 10.14$$

(vi) State Results -

Since  $H > 5.99$

- **Reject the null hypothesis**

$$H = 10.14 \text{ (2, } n = 15), p < 0.05$$



## 7. Conclusion

The aesthetic score (on a scale of 1-10) depends on the number of objects, object types, and the layout of objects an interface has.

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