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# Promoting Sustainable Health Choices through Menu Labelling: An Eye-Tracking Study Aligned With Sdg-3

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**ABSTRACT**
Non-communicable diseases (NCDs) and obesity are becoming global health problem and are surging due to unhealthy fast food. Sustainable healthy diet and menu labeling can be a solution for the diners to take a well-informed decision and can contribute in leading the world towards sustainable developmental goal-3. The main objective of this research is to track the attention span of respondents through heat map and investigate the most preferred format of menu labeling using eye tracking technique. Experimental research has been conducted using eye- trackers with ninety-three (N=93) respondents with three different menu card conditions. Heat maps were analyzed and compared for all menu board formats with and without calorie information. Further, all three formats were analyzed and significant difference was found in all menu board formats. Physical activity-based format was the most preferred format over the numeric calorie format and no calorie format. This study helps marketers to identify elements with higher attention span, lesser level of interest, cognitive load contributors, and clutter making elements. Thus, study contributes in identifying customer friendly menu labeling options that helps in promoting healthy choices for the customers.

**Keywords:** Sustainability, Menu labeling, Heat map, Eye tracking, Calories, SDG

## 1. INTRODUCTION

Non-communicable diseases (NCDs) and obesity have become more commonplace worldwide in recent years. As per the World Health Organization (WHO), non-communicable diseases (NCDs) including diabetes, cardiovascular illnesses, and cancer account for 70% of global fatalities, with obesity playing a significant role in their progression (WHO, 2020). The availability, accessibility, and information around food make up the food environment, which is one of the primary determinants of dietary choices (Scarsi et al., 2023; Jia et al., 2023) and, eventually, health consequences. Individual differences such as age, gender, level of exercise, and type of disease decides requirement of nutritional level which becomes a constraint in defining a healthy diet at an international level (Willett et al., 2019; Ares et al., 2024). According to 2017 Indian Council of Medical Research (ICMR) report, India became a hub of NCDs and these diseases are bringing many shifts in dietary habits. Due to the dramatic shifts in the health and nutrition, India has been carrying a double burden of under nutrition and obesity (Rao et al., 2019).

Studies show that people's dietary choices have altered dramatically over time, with differing consequences for various age groups. In recent times, eating out has become increasingly common. The fast-paced lifestyles and changing dietary preferences of Indians are driving growth in the quick service restaurant (QSR) industry (Badal, 2024). The QSR market is expected to increase at a 4.9% CAGR over the course of the forecast period, with a worldwide market value estimated at USD 173.72 billion in 2021 (van Erpecum et al., 2023). The primary drivers of the QSR industry's global growth are customers' changing dietary preferences and changing lifestyles. According to Polaris Market Research Analysis (June 2022) that by 2030, QSR's sales would amount to USD 264.89 billion. However, significant health problems would also be being brought on by this rapid increase. Changing one's eating habits might have serious consequences for one's health. Several degenerative

diseases, including diabetes and hypertension, are more common among younger people.

Making one's health a priority becomes something we cannot ignore in a world that is changing quickly, where technological advancements are navigating every aspect of life, urbanization is taking new forms and leading to varied lifestyles, and environmental challenges are glaring (Hoque and Akter, 2024). This would especially true if our goal as a country and a community would have a sustainable future. Sustainable health promotes nutritionally adequate, protective diet that is safe and healthy (Machado et al., 2023). The third Sustainable Development Goal (SDG) aims to ensure healthy lives and improve the well-being of all people, regardless of age. A person's health and well-being are critical from the beginning of their lives. SDG 3 establishes essential goals for improving a country's overall health in order to reduce unnecessary suffering from preventable illnesses and premature death.

To deal with obesity and NCDs, listing down calories on menu or food package has been suggested as a viable practice. Calorie or menu labeling help the customers with the required information to enable them to select the food wisely and restrict them from intake of excessive calories. Calorie labeling empower consumers to enhance the diet quality, reduce the calorie intake (Jia et al., 2023). As a result, it encourages retailors and restaurant owners to revise and reformulate the food items to comply with the changes (Bleich et al., 2017). According to Muth et al., (2019) for the customers who regularly goes for dined out, calorie labeling must be followed. In this regard, the Food Safety and Standards Authority of India (FSSAI) released guidelines for the restaurant chains and online food portals in January 2022. Calorie labeling can help reduce information imbalance between restaurant chains and customers and encourage consumers to make informed eating decisions. Nevertheless, if consumers ignore these calorie and nutritional labels, their effectiveness would be limited. Decisions made by customers, whether in-person or online, were significantly influenced by their attention (Lee and Wei, 2024). Throughout a whole shopping trip, the visual inspection assists in monitoring the consumers' attention patterns as they explore different options (Beser et al., 2022). The method for observing, documenting, and measuring significant eye movements and the locations is called eye tracking (Hwang and Lee, 2018). Eye trackers were used to measure the focus of vision and monitor its trajectory, which would not be achievable with conventional research methods (Bergstrom and Schall, 2014). In consumer-centric visual attention research studies, eye-tracking experimental methods were generally preferred.

**The main objectives of this research study are:**

1) To study role of heat maps and its interpretation to measure customers' attention spans using eye-trackers.
2) To examine the impact of different formats of calorie labeling (numeric and physical exercise format) on consumer's visual attention.
3) To explore the most preferred format of menu card design.

The paper is organized as follows. Hereafter, second section provides the elaborate discussion on research method including the experimental setup, its preparation and procedure. In third section, research results were analyzed along with the discussion on the practicality of heat maps in assessing customers' attention levels. Finally, the research was concluded with implications of heat map on designing menu card labelling in promoting sustainable health choices.

## 2. MATERIALS AND METHODS

### Eye-tracking Technique

Eye-tracking devices were often employed in studies to look at how people interact with visual stimuli such as advertisements, websites, and other user interfaces (Kim and Lee, 2021). Applications for it may be found in many fields such as marketing, psychology, neurology, human-computer interaction, and usability evaluation (Zhu and Lv, 2023). The fundamental idea behind eye tracking was to track and record the position and movement of the eyes using sensors or cameras. One method for analyzing and assessing eye tracking data was to employ visualization approaches; these may be divided into two categories: area of interest (AOI) based visualization and point based visualization (Blascheck et al., 2017).

In eye-tracking investigations, heat maps were considered as an important and well-known analytical tool and AOI-based visualization technique. Because they can visually represent the areas of a stimulus or interface that receive the greatest visual attention, which in turn reflects the distribution and intensity of visual attention (Lee and Wei, 2024). Researchers used heatmaps to pinpoint places which were ignored (cold spots) or were highly enticing (hotspots) (Feng et al., 2024). Studying user behaviour and improving designs to highlight important details may benefit greatly from this knowledge. Academicians and researchers were interested in heat maps, which were two-dimensional graphical representations of data in which the values of a variable were depicted as colour bombs (Bojko,2009). An eye tracking heat map would be created by gathering data on the frequency with which visitors look at particular things, as well as the length and duration of their fixations.

### 2.1 Participants Prerequisites

Experimental method was used in the study employing an eye tracking approach. The current study was conducted with 93 participants. Prerequisites were met to recruit volunteers, including:

a. must have normal vision and no colorblindness.

b. must fall under the 18 to 25 age range.

c. must have made a meal purchase at a quick service restaurant within the last three months.

The reason behind considering the participants from the age group of 18 to 25 years as they were known to be frequent visitors at QSR restaurants (Harrington et al., 2012; Schwebler et al., 2020).

### 2.2 Eye Trackers

For this investigation, Tobii Pro Studio Software and the Tobii Pro X2 30 Package Eye Tracker of i-motion company were utilized. A static version of the software was attached to the computer display. The Heat map of each individual participant who looks at the computer screen are recorded by the Tobii Pro eye-tracker. Heat map data, fixation count, and fixation duration are seen to be more informative.

### 2.3 Procedure

The study was carried out in the Symbiosis International University consumer behavior lab. Participants were asked to sit in front of the computer while keeping a 60-centimeter gap between themselves and the monitor screen, which was linked to an eye tracker. The participants received a brief explanation of how eye trackers operate, and a calibration procedure was conducted to verify that each person's gaze was normal at the end. In the lab setting, respondents were randomized to one of three circumstances, each with a different type of labels. The test design included the following conditions: 1) A menu with the calories in numeric format 2) A menu with calories in the color scheme of a traffic signal, and 3) A menu with physical activity to burn calories.

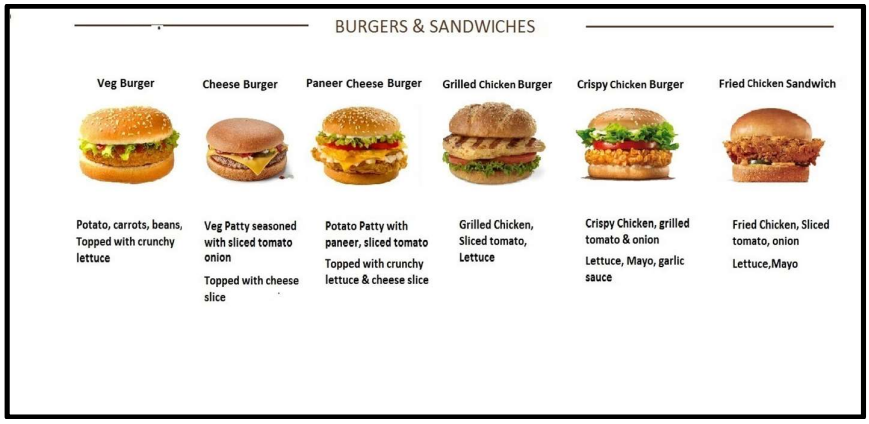
### 2.5 Design of the Study

This study employed three different randomized experiments with different conditions and different visual cues (menu with description, photos, number of reviews and start ratings, brand, promotional offers, and calories) to analyze heat maps and attention variables such as fixation count and fixation duration. In a lab setting, respondents were randomized to one of three circumstances, each with a different type of label. The test design included the following conditions:

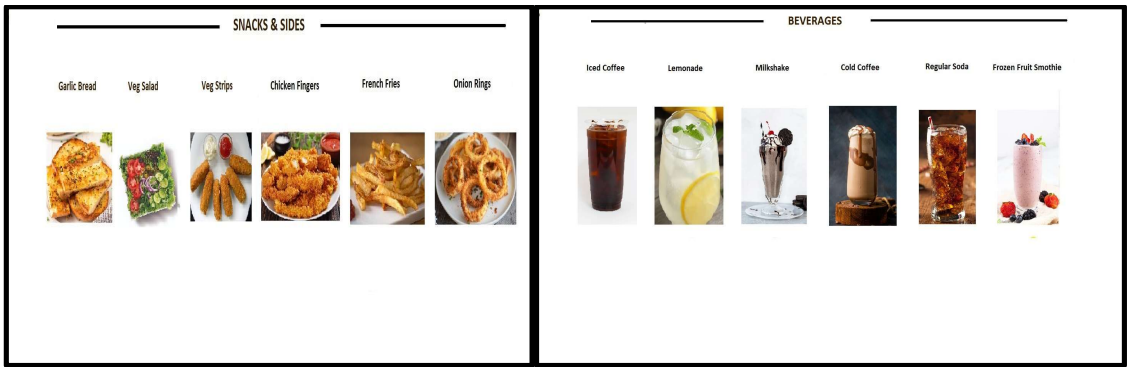
**a.** A menu without calories (Figure 1a, 1b, 1c)

**b.** A menu with calories in the numeric format (Figure 2a, 2b, 2c)

**c.** A menu with physical activity to burn calories (Figure 3a, 3b, 3c)

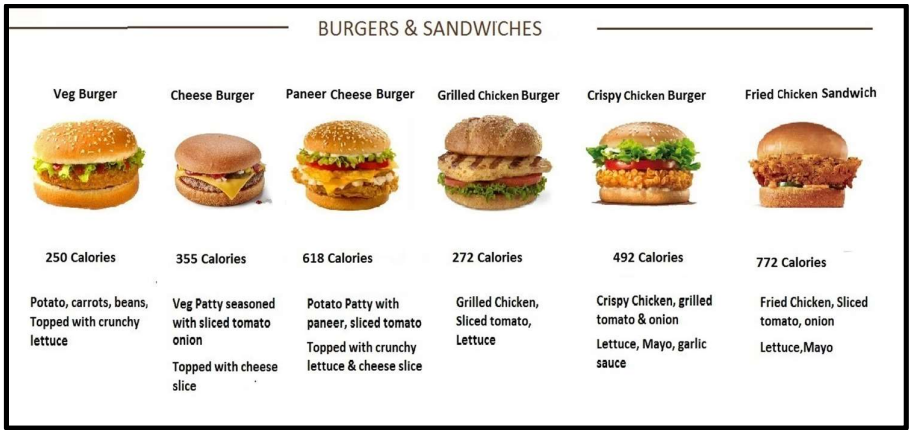



(a)

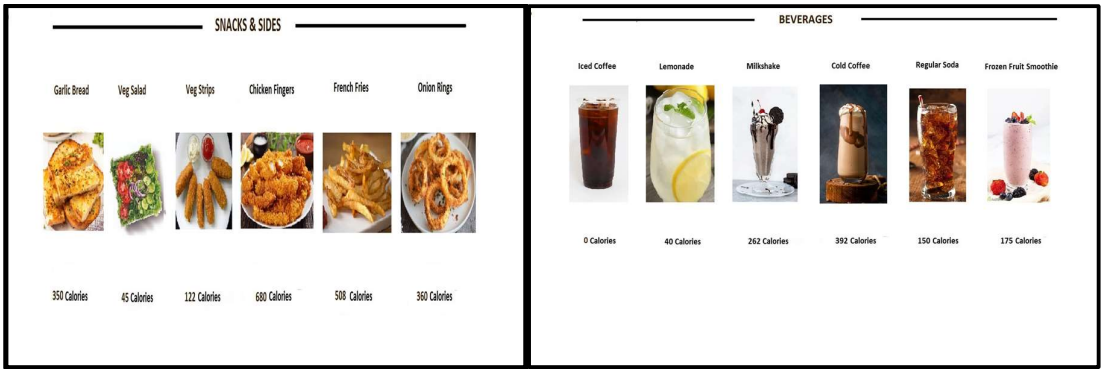



(b) (c)

**Figure 1:** Menu without calorie information (Control Group)

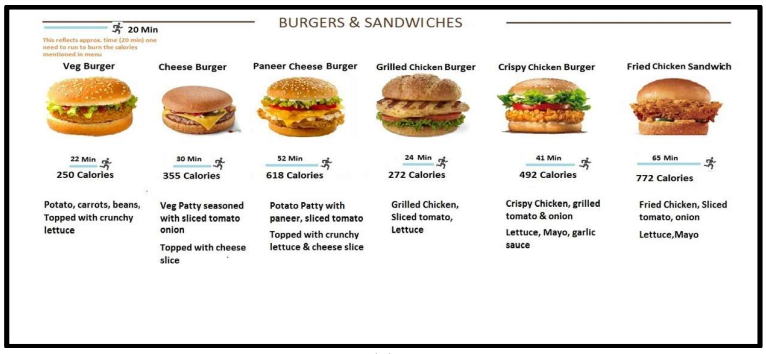



(a)

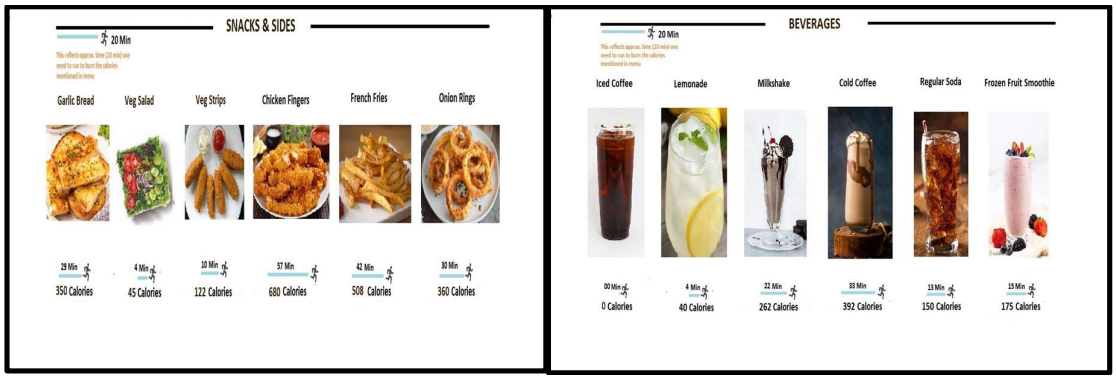



(b) (c)

**Figure 2:** Menu with calorie information in numeric format (Experimental Group)




(a)




(b) (c)

**Figure 3:** Menu with calorie information in physical activity format (Experimental Group)

### 2.6 Ethical committee approval

The research study has an independent ethics committee approval for conducting experiment using eye tracking device.

## 3. RESULTS AND DISCUSSIONS

### 3.1 Demographics Characteristics

Table 1 describes the demographic characteristics of the participants. Out of 93 respondents, 52.69% respondents were male and 47.31% were female. However, as 18-25 age group was considered for this study, majority 58.06% of the respondents were from 18-21 age group whereas, remaining 41.94% were from 22-25 age group. Maximum numbers of respondents were from a group of graduate level which was counted at 49.47% followed by undergraduate respondents (35.48%) and post-graduate respondents (15.05%).

**Table 1:** Demographics characteristics of participants

| Particulars | No. of Respondents | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 49 | 52.69% |
| Female | 44 | 47.31% |
| **Total** | **93** | **100%** |
| **Age** | | |
| 18-21 Years | 54 | 58.06% |
| 22-25 Years | 39 | 41.94% |
| **Total** | **93** | **100%** |
| **Education** | | |
| Under Graduate | 33 | 35.48% |
| Graduate | 46 | 49.47% |
| Post-Graduation | 14 | 15.05% |
| **Total** | **93** | **100%** |

### 3.2 Area of Interest

For every condition of an experiment, area of interest (AOI) was selected prior to start of experiment. The grouping was done, firstly with menu name description for control group, secondly with menu name description with calories in numeric format for experimental group 1, and thirdly menu name description with calories in physical activity format for experimental group 2 as exhibited in Table 2.

**Table 2:** Area of Interest (AOI) Selected for Different Conditions

| Group | Area of Interest (AOI) |
|---|---|
| Control Group | Menu description |
| Experimental Group 1 | Menu description, Calories in numeric format |
| Experimental Group 2 | Menu description, Calories in physical activity format |

The most and least attention-grabbing portions and features were gathered and visualized using eye tracking

heat maps. While yellow colour showed a moderate visual span and green colour the least attention-grabbing area, red colour indicated a higher concentration span. Figure 4 indicates heat maps for menu board (Burger and Sandwich) without calorie information however, figure 5 showcase heat map for menu board (Burger and Sandwich) with calorie information. Figure 5 clearly indicate concentration of higher attention span on the calorie information as compared to figure 4 which has more attention on either menu name or description of menu. It exhibits the attention-grabbing capability of calorie mention on menu card.

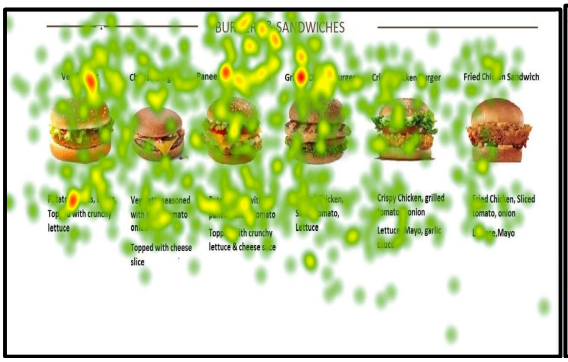


**Figure 4:** A heat map of menu board (Burger sandwich) without calorie information

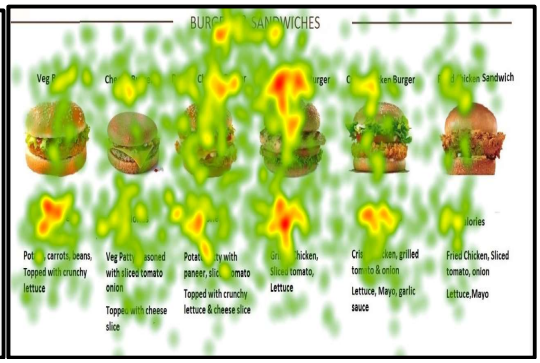


**Figure 5:** A heat map of menu board (Burger and and Sandwich) with calorie labeling

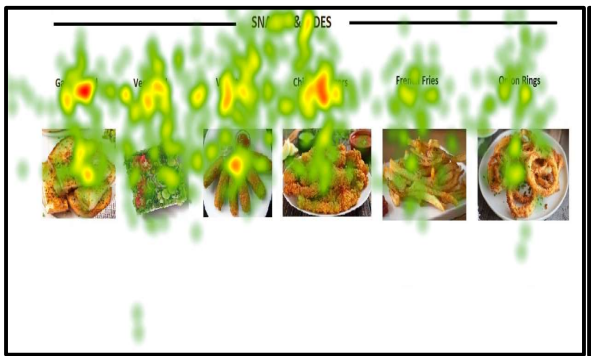


**Figure 6:** A heat map of menu board (Snacks sides) without calorie information

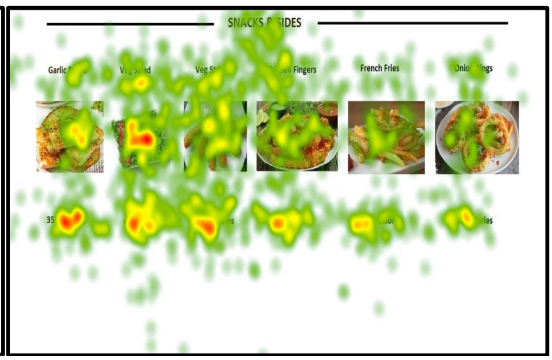


**Figure 7:** A heat map of menu board (Snacks and and sides) with calorie labeling

Figure 6 and 7 highlighted heat maps of menu boards of snacks and side category without calorie information and with calorie information. Concentration of attention span on calorie information was clearly visible as exhibited in figure 7 whereas figure 6 highlighted more focus on menu names in absence of calorie information. It indicates the power of calorie mention which has got high attention and engagement level.

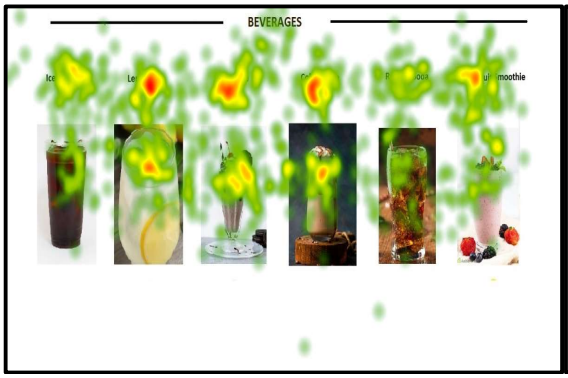


**Figure 8:** A heat map of menu board without calorie information

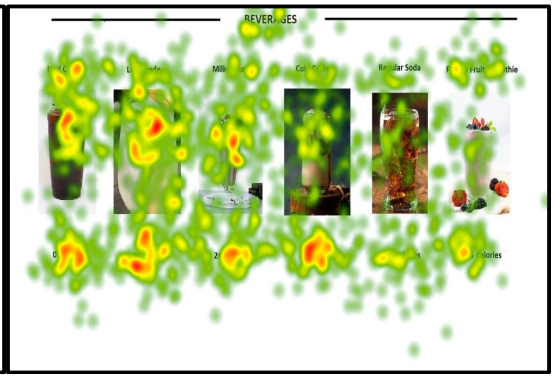


**Figure 9:** A heat map of menu board (Beverages) (Beverages) with calorie labeling

Figure 8 and 9 highlighted heat maps of menu boards of beverage category without calorie information and with calorie information. Like earlier two categories of menu card, concentration of attention span was found on calorie information which indicates major concentration on calorie content of food.

Further, one-way ANOVA was used to measure differences in time spent by respondents across different

formats of menu card (no calorie, numeric calorie, physical activity based). Three groups were formed of respondents as follows:

**Group1:** no calorie format,

**Group 2:** Numeric calorie format,

**Group 3:** Physical activity-based format.

Significant differences were found across three different formats of menu cards in the first category of burger/sandwich [ F(2,87) = 7.423, P= 0.001] as exhibited in Table 3. Physical activity-based format was found with higher mean through Tukey's post-hoc analysis than the numeric calorie format [0.0846, 95% CI (0.0269, 0.1423); p = 0.002] and no calorie inclusion condition [0.0762, 95% CI (0.0186, 0.1339); p = 0.006].

**Table 3:** One way ANOVA results

| Menu Category | Calorie Formats | Descriptive statistics | | Test of Homogeneity of Variance | | ANOVA | | |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Levene's Statistic | Sig. | F | Welch Statistics | Sig. |
| Burger | Numeric | .2320 | .0877 | 2.700 | 0.073 | 7.423 | NA | 0.001 |
| | No Calorie | .2237 | .0658 | | | | | |
| | Physical Exercise | .3082 | .1196 | | | | | |
| Snack/Side | Numeric | .2063 | .0487 | 5.034 | 0.009 | NA | 19.923 | 0.000 |
| | No Calorie | .1707 | .0604 | | | | | |
| | Physical Exercise | .2957 | .0894 | | | | | |
| Beverage | Numeric | .2093 | .0595 | 3.410 | 0.038 | NA | 5.043 | 0.01 |
| | No Calorie | .1950 | .0694 | | | | | |
| | Physical Exercise | .2817 | .1320 | | | | | |

Fixation times for the snacks/sides category was significantly different across the three formats tested (Welch statistics= 19.923, P= 0.000). Since the Levene's statistics is significant, Dunnett's T3 Test was used to investigate post hoc comparisons. The no calorie format (M= 0.1707, SD= 0.060) condition [0.1250, 95% CI (-0.1736, -0.0764); p = 0.000] and the numeric (M=0.2063, SD= 0.049) condition [0.0893, 95% CI (-0.1354, -0.0433); P= 0.000] were both lower than the physical activity-based condition (M=0.296, SD= 0.089).

The study for the beverage category reveled significant differences among the three formats tested (Welch statistics= 5.043, P= 0.010). The results of the Dunnett's T3 post-hoc test showed that the condition based on physical activity (M=0.2817, SD=0.1320) was greater than the numeric (M=0.2093, SD=0.0595) condition [0.0723, 95% CI (-0.1381, -0.0066): p = 0.027] and no calorie format (M=0.1950, SD= 0.0694) condition [0.0867, 95% CI (-0.1542, -0.0192); p = 0.008].

Further, the participants answered questions about their preferred format. Of the respondents, 54.84% choose the format based on physical activity as their first choice, whereas 35.48% preferred menu card with numeric format of calorie information and 9.68% voted for menu card without any calorie information. A chi-squared test was conducted to see whether participant preferences differed between the three different menu board scenarios. The chi-square test result was significant [$\chi 2$ (4) = 15.50; p = 0.002] indicating that participants preferred the label based on physical activity over the numeric format of calorie information and menu card format without any calorie information.

## 4. CONCLUSION

To enable diners or consumers to take informed decision, different formats of menu boards were designed and analyzed with the help of eye-trackers. The function of heat maps in analyzing attention span of customers in the 18 to 25 age range was checked. Through experimentation, a total of three distinct circumstances were

examined as visual clues. Most concentration-seeking locations were found when heat maps in presence and absence of calorie information were examined. Next, among the three formats—no calorie menu card format, numeric format of the menu card, and labeled in accordance with physical activity, physical activity-based menu format was identified as the most preferred and with maximum attention span as compared to other two formats. The research study concludes stating that the study contributes in identifying customer friendly menu labeling options that helps in promoting healthy choices for the customers. This ultimately enables customers to take informed decisions and finally play a part in achieving sustainable development goal 3.

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**REFERENCES**

Ares, G., De Rosso, S., Mueller, C., Philippe, K., Pickard, A., Nicklaus, S., ... & Varela, P. (2024). Development of food literacy in children and adolescents: Implications for the design of strategies to promote healthier and more sustainable diets. *Nutrition Reviews*, *82*(4), 536-552.

Bergstrom, J. R., & Schall, A. (Eds.). (2014). *Eye tracking in user experience design*. Elsevier.

Blascheck, T., Kurzhals, K., Raschke, M., Burch, M., Weiskopf, D., & Ertl, T. (2017, December). Visualization of eye tracking data: A taxonomy and survey. In *Computer Graphics Forum* (Vol. 36, No. 8, pp. 260-284).

Badal, A. A. (2024). Flipping burgers and financials: QSRs COVID-19 Journey. *International Journal of Science and Research Archive*, *11*(1), 1586-1597.

Bleich, S. N., Economos, C. D., Spiker, M. L., Vercammen, K. A., VanEpps, E. M., Block, J. P., ... & Roberto, C. A. (2017). A systematic review of calorie labeling and modified calorie labeling interventions: impact on consumer and restaurant behavior. *Obesity*, *25*(12), 2018-2044.

Bojko, A. (2009). Informative or misleading? Heatmaps deconstructed. In *Human-Computer Interaction. New Trends: 13th International Conference, HCI International 2009, San Diego, CA, USA, July 19-24, 2009, Proceedings, Part I 13* (pp. 30-39). Springer Berlin Heidelberg.

Feng, J., Zhao, B., & Shaw, S. L. (2024). The study of emotion in GIScience: status and prospects. *Cartography and Geographic Information Science*, 1-16.

Hoque, F., & Akter, A. (2024). Eating Choices and Planet's Sustainability; How Far Consumers Are Willing to Pay for Sustainable Food Consumption in Middle-Income Countries?. *Iranian Economic Review*.

Indian Council of Medical Research, Public Health Foundation of India, and Institute for Health Metrics and Evaluation. India: Health of the Nation's States - The India State-level Disease Burden Initiative. New Delhi, India: ICMR, PHFI, and IHME; 2017.

Jia, J., Van Horn, L., Linder, J. A., Ackermann, R. T., Kandula, N. R., & O'Brien, M. J. (2023). Menu calorie label use and diet quality: a cross-sectional study. *American Journal of Preventive Medicine*, *65*(6), 1069-1077.

Kim, N., & Lee, H. (2021). Assessing consumer attention and arousal using eye-tracking technology in virtual retail environment. *Frontiers in Psychology*, *12*, 665658.

Lee, Y. M., & Wei, C. (2024). Consumer visual attention to food allergen information on restaurant menus: an eye-tracking study. *British Food Journal*.

Machado, P., McNaughton, S. A., Livingstone, K. M., Hadjikakou, M., Russell, C., Wingrove, K., ... & Lawrence, M. (2023). Measuring adherence to sustainable healthy diets: a scoping review of dietary metrics. *Advances in Nutrition*, *14*(1), 147-160.

Muth, M. K., Karns, S. A., Mancino, L., & Todd, J. E. (2019). How much can product reformulation improve diet quality in households with children and adolescents?. *Nutrients*, *11*(3), 618.

Rao, N., Gazdar, H., Chanchani, D., & Ibrahim, M. (2019). Women's agricultural work and nutrition in South Asia: from pathways to a cross-disciplinary, grounded analytical framework. *Food Policy*, *82*, 50-62.

Scarsi, N., Pezzullo, A. M., Savoia, C., Raspolini, G. M., Pastorino, R., & Boccia, S. (2023). Correlates of adherence to a posteriori derived dietary patterns of an Italian sample of adults. *European Journal of Public Health*, *33*(Supplement_2), ckad160-1099.

van Erpecum, C. P. L., van Zon, S. K., Xie, T., Snieder, H., Bültmann, U., & Smidt, N. (2023). Fast-food environments and BMI changes in the Dutch adult general population: the Lifelines cohort. *Obesity*, *31*(8), 2159-2170.

WHO, M. (2020). Healthy diet.

WHO, Noncommunicable diseases progress monitor 2020. Geneva: World Health Organization; 2020.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., ... & Murray, C. J. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The lancet*, *393*(10170), 447-492.

Zhu, L., & Lv, J. (2023). Review of studies on user research based on EEG and eye tracking. *Applied Sciences*, *13*(11), 6502