Tropentag 2023
September 20-22, 2023
Conference on International Research on Food Security, Natural Resource Management and Rural Development
organised by the Leibniz Centre for Agricultural Landscape Research (ZALF), Germany in cooperation with Humboldt-Universität zu Berlin, Germany

Evaluation of the attractiveness of four variations of infant food packaging label using eye-tracking

Ina Cramer[a*], Iris Schröter[a], Diba Tabi Roba[b], Hussein Wario[b] and Marcus Mergenthaler[a]

a South Westphalia University of Applied Science, Faculty of Agricultural Economics, Lübecker Ring 2, 59494 Soest, Germany; cramer.ina@fh-swf.de
b Center for Research and Development ind Drylands, Marsabit, Kenya

Introduction

Child malnutrition is a prevalent problem in arid areas of Africa, hindering development, resulting in irreversible health issues (Adebisi et al., 2019), and perpetuating poverty (Bagriansky, Champa, Pak, Whitney, & Laillou, 2014). Malnutrition is worsened by different drivers, including non-income-related care practices and food environments which do not support healthy food choices (Herforth & Ahmed, 2015).

Meanwhile, peri-urban zones are currently experiencing a food transition with an increase in commercially accessible pre-packaged food items for children (Debela, Demmler, Klasen, & Qaim, 2020). However, these products frequently fail to address food and nutrition security. They escalate worries about food safety and quality as supply chains become more intricate (Reardon et al., 2021). Local women's groups, who create nourishing and reasonably priced infant food using traditional recipes, are unable to enter the formal market due to inadequate packaging (Quaye & Mensah, 2019).

The primary aim of this study is to determine Kenyan parents' packaging preferences for children's food. Understanding these preferences could aid in the battle against malnutrition through the creation of packaging designs that align with consumer choices, the promotion of healthier food consumption among infants, and potentially boost the local economy by increasing the consumption of locally produced foods, creating jobs and reducing poverty.

Data, Material and Methods

The involvement of a community-based women's group from Marsabit, nothern Kenya, specializing in porridge production, facilitated the development of four distinct designs for packaging infant porridge. The designs exhibit a range of characteristics, including colour, background motifs, logos, endearing fauna, KEBS certification symbols, and nutritional information. These attributes and their respective levels were derived from previous own investigations (Cramer, Schröter, Roba, Wario, & Mergenthaler, 2022). All four designs are identical with two exceptions: They have either a red or a yellow background and display either a zebra or a lion, resulting in the following combinations: ‘Red Lion’, ‘Yellow Lion’, ‘Red Zebra’ and ‘Yellow Zebra’ (refer to Table 1).

In January 2023, a market scenario was simulated to assess the attractiveness of the four different packaging designs and determine the most attractive option. Tables were set up to display porridge packages, and 87 participants were instructed to choose and purchase a package of porridge which was priced KSh 150 per package. The eye movements of 81 participants were recorded using eye-tracking glasses. 84 women and three men, aged between 18 and 80 (mean 39 ± 14 years), participated in the study. 71 were from Marsabit town, two were from the outskirts, and 14 were from the rural areas of

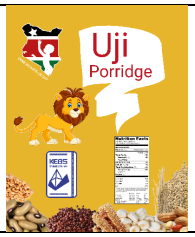
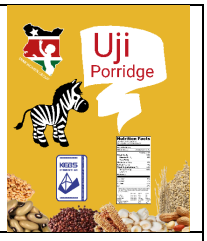
Marsabit County. Each participant received an expense allowance. Participants were interviewed to elicit their preferences and concerns regarding the packaging, their willingness to purchase it, the price they were willing to pay, their purchasing behaviour regarding children's food, and their income status. Responses were captured via an online form.

Results

Attractiveness of the four different packaging designs

The study showed that 'Red Zebra' was the preferred packaging option, followed by 'Red Lion', 'Yellow Lion' and 'Yellow Zebra'. Colour preferences leaned towards red and lion imagery was slightly preferred over zebra. When participants were asked to rate the design they had chosen on a Likert scale of 1 to 7, with 1 being the least attractive and 7 being the most attractive, 'Yellow Lion' scored the highest. Interest in seeing the product on the market was highest for 'Yellow Lion'. Those who chose 'Yellow Lion' were willing to pay the most, followed by 'Red Lion', 'Yellow Zebra' and 'Red Zebra' (see Table 1).

Table 1: Rating of packaging designs

				
Amount of participants who had chosen particular design	23 (26%)	31 (36%)	22 (25%)	11 (13%)
Rating of design's attractiveness (1-7)	6.32 (± 0.97)	6.39 (± 0.97)	6.45 (± 0.72)	5.91 (± 0.9)
Rating of interest in product on market (1-5)	4.50 (± 0.72)	4.48 (± 0.88)	4.77 (± 0.42)	4.55 (± 0.5)
Max amount of KSh participants would be prepared to pay	137 (± 42)	118 (± 43)	140 (± 60)	121 (± 41)

Packaging design attributes mentioned by participants

Participants were asked to share their thoughts on their selected packaging. Those who chose lion-themed designs commonly mentioned color, with fewer comments from those who chose zebra designs. Red was associated with attractiveness, danger, and visibility, while yellow was considered bright and cool. The zebra was admired for its beauty and energy, while the lion was seen as strong and brave (refer to Table 2).

Table 2: Participants' answers to the question of what they like about the packaging chosen

Attribute	**‚Red Lion'**	**‚Red Zebra'**	**‚Yellow Lion'**	**‚Yellow Zebra'**
colour	77% attractive, dangerous	63% blood, bright, striking, visibility	86% bright	59% cool
animal	64% king of the jungle, strong, energy, brave	84% colour, beautiful, energy, stripes, more attractive than lion	55% strong, king of the jungle, dangerous, brave, tough, better than zebra, 'did not notice'	100% colour, impressive, 'did not consider zebra vs lion'
ingredients	59% variety	41% variety	41% variety	58% variety
other attributes	10% logo: Kenyan flag; 5% KEBS mark; 5% composition of design	3% logo; 3% combination of colours	-	8% nutritional information

When asked what they did not like, respondents tended to mention technical issues: They reported that the packaging material lacked durability, felt that the packaging should be sealed or requested an expiry date. Two participants did not like the lion - but had chosen it.

Choice of packaging in relation to frequency of buying food for children

When questioned about their child's food purchases, the majority of participants stated that they made these on a weekly basis, while some did so less regularly. An analysis of design preferences revealed that lion designs were correlated with more frequent purchases, while zebra designs were associated with less frequent buying (see Table 3).

Table 3: Frequency with which participants buy food for their children

	All participants	‚Red Lion'	‚Red Zebra'	‚Yellow Lion'	‚Yellow Zebra'
once weekly or >	71%	74%	68%	82%	55%
< once weekly	23%	26%	23%	9%	45%
< once monthly	6%	0%	10%	9%	0%

Qualitative eye-tracking results

Figure 1 displays heat maps which show the combined gaze patterns of all 81 participants. Red represents high fixation intensity, while yellow and blue show lower and lowest intensity, respectively. Colourless areas indicate no fixation.

The heat maps reveal interest from participants in both visual and textual elements, with a specific focus on the lion images. Both the KEBS mark and the nutritional information were fixated more frequently on the packagings displaying the lion than on those showing the zebra, regardless of the packaging colour.

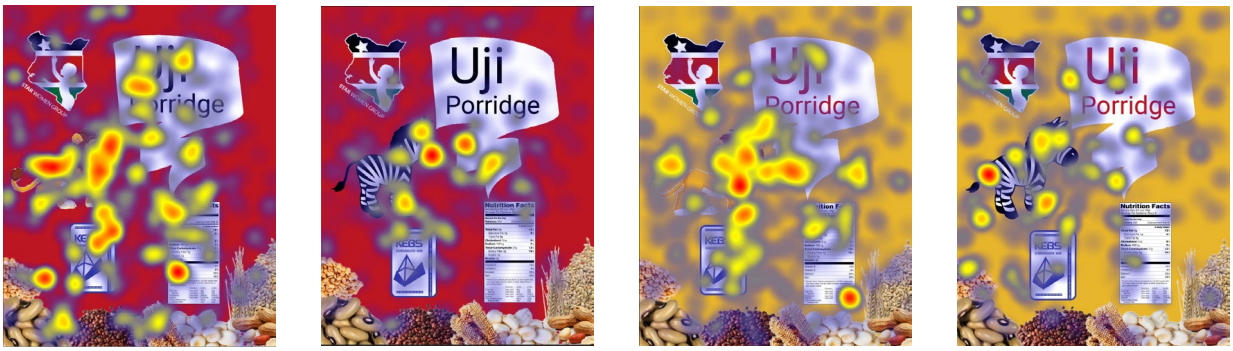


Figure 1: Heat maps of the four packaging design variants

Discussion

Participants exhibited a clear preference for the red child food packaging design, but did not show a strong preference for either the lion or zebra image. However, when these design elements were combined, the 'Red Zebra' design gained a clear preference among respondents. The study's findings are inconclusive as participants' cumulative gaze patterns suggest that the 'Red Zebra' variant was less interesting than others, particularly those featuring the lion. The lion's symbolism of danger and strength may create an eerie fascination, making it more captivating than the gentle zebra. Nevertheless, the latter may still be preferable as it poses no threat.

When asked how participants rated their chosen design, 'Yellow Lion' emerged as the most visually appealing design, garnering high interest in the product as well as the highest willingness to pay among consumers which might reflect the perceived value associated with this specific design.

Participants associated colors with attributes such as attractiveness, danger, brightness, and coolness. Furthermore, the imagery of animals, particularly the lion and zebra, was linked to qualities such as strength, energy, and impressiveness.

When broken down by type of packaging, those who had chosen a packaging displaying a lion reported buying children's food more often than the average, while those who had chosen the zebra reported doing so less often. These differences in respondents' purchasing behaviour could indicate economic differences between these two groups and could suggest that those respondents who chose the lion belonged to a more economically affluent group than those who chose the zebra. If this is the case, it could mean that the group living in better economic circumstances are aware of their economic strength and therefore associate themselves with the strong lion, while the economically weaker group feel more associated with the less powerful flight animal zebra. This difference in buying behaviour highlights the need to understand cultural and symbolic associations with colours and animals to guide the development of effective packaging, tailored marketing and distribution strategies to specific consumer segments.

Conclusions and Outlook

The evident inclination towards the 'Red Zebra' design, the attractiveness of the 'Yellow Lion' and the interest of participants in the lion image insinuate that design elements significantly influence consumer choices. However, examining the specific cultural associations and emotional connections that underlie these preferences justifies further investigation. Our results and especially ambiguities of this study should be cross-validated with stakeholders from the respective communities in Marsabit. Culture, symbolism, and the emotional impact of design elements remain promising areas for exploration.
Additionally, investigating how these design choices affect concrete consumption and nutritional results is another topic for further research. Although the impact on both child nutrition and the local economy seems positive, it is necessary to conduct ethnographically inspired participatory interviews and observations with members of different socio-cultural groups to assess the actual effects of aligning packaging with consumer behaviour within the household and at individual level. The comprehension of these subtleties is crucial in creating more efficient methods to combat child malnutrition and stimulate economic growth in arid zones.

References

Adebisi, Y. A., Ibrahim, K., Lucero-Prisno, D. E., Ekpenyong, A., Micheal, A. I., Chinemelum, I. G., & Sina-Odunsi, A. B. (2019). Prevalence and Socio-economic Impacts of Malnutrition Among Children in Uganda. *Nutrition and Metabolic Insights*, *12*, 1178638819887398. https://doi.org/10.1177/1178638819887398

Bagriansky, J., Champa, N., Pak, K., Whitney, S., & Laillou, A. (2014). The economic consequences of malnutrition in Cambodia, more than 400 million US dollar lost annually. *Asia Pacific Journal of Clinical Nutrition*, *23*(4), 524–531. https://doi.org/10.6133/apjcn.2014.23.4.08

Cramer, I., Schröter, I., Roba, D., Wario, H. T., & Mergenthaler, M. (2022). The Influence of Child Food Packaging Design on Perceptions of Kenyan Consumers: Conjoint Analysis Combined with Eye Tracking. Advance online publication. https://doi.org/10.18461/PFSD.2022.2215

Debela, B. L., Demmler, K. M., Klasen, S., & Qaim, M. (2020). Supermarket food purchases and child nutrition in Kenya. *Global Food Security*, *25*, 100341. https://doi.org/10.1016/j.gfs.2019.100341

Herforth, A., & Ahmed, S. (2015). The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. *Food Security*, *7*(3), 505–520. https://doi.org/10.1007/s12571-015-0455-8

Quaye, D., & Mensah, I. (2019). Marketing innovation and sustainable competitive advantage of manufacturing SMEs in Ghana. *Management Decision*, *57*(7), 1535–1553. https://doi.org/10.1108/MD-08-2017-0784

Reardon, T., Tschirley, D., Liverpool-Tasie, L. S. O., Awokuse, T., Fanzo, J., Minten, B., . . . Popkin, B. M. (2021). The Processed food revolution in African food systems and the Double Burden of Malnutrition. *Global Food Security*, *28.* https://doi.org/10.1016/j.gfs.2020.100466