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Visual perception and evaluation of child food packaging design by customers in northern Benin

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Introduction

Within food environments, visual design of food packaging constitutes a key element in determining the success or failure of a product on the shelf. As other extrinsic and sensory properties of food products, visual packaging attributes not only create hedonic value themselves but contribute to multisensory product experience and may influence peoples' perception of the products' intrinsic properties and price expectations (Spence 2016). Related to child food, an extra challenge is that packaging design needs to be appealing not only to children as consumers, but also to parents as customers. Design elements targeting children and parents include cartoon characters, premium offers, appeals to "fun", bright colours, unusual product names or flavour indications, and direct references to "kid" in the product or brand name (Elliott und Truman 2020). However, packaging needs not only to be appealing to target audiences, but also to stand out on the shelf as allocation of visual attention is essential for a product being considered as a potential purchase (Clement et al. 2013). Design features affecting the allocation of initial visual attention are, for example, visual salience, surface size, position and emotional elements (Orquin et al. 2018). These features may overrule a more rational, top-down driven search strategy (Franconeri et al. 2004), e.g., for healthy child food, and might lead to biased purchase decisions (Orquin et al. 2018). While multinational child food producers have this knowledge and deliberately use visual biases to attract and maintain parents' and children's attention through appealing packaging design (Swana und De Lange 2015), small-scale local producers may need support in designing attractive packaging to compete in the market. Despite these challenges, small scale producers might have an inherent advantage in the local context. Compared to multinational companies whose packaging designs have to appeal to a wide audience, local producers can adapt the packaging design to preferences of the local population and might gain competitive advantages this way.

The present study is one in a number of investigations aimed at empowering mother groups in northern Benin to successfully market their locally produced child food by co-developing appealing packaging designs. For this, perception of five different child food packaging of breakfast cereals as one of the leading food categories targeted at children globally (Swana und De Lange 2015) was investigated to learn from multinational and local producers and derive recommendations for packaging designs that may appeal to parents and children in northern Benin in a local context.

Data, Material and Methods

To investigate perceptions of packaging design, an approach inspired by the photovoice methodology (e.g., Lal et al. 2012) was chosen, which we termed "eye-tracking voice approach". In this approach, the participants' gaze behaviour was recorded with an eye-tracker while looking

at the object of interest (in our case child food packaging). Immediately after the eye-tracking, the gaze behaviour visualised by gaze plots was discussed with the respective participant and/or a group of participants to gain a deeper understanding of the underlying drivers of the gaze behaviour and the perception of the object, i.e. in our case the perception of the packaging design and its specific design elements.

The study was conducted in December 2022. Five different child food packaging designs of breakfast cereals were used as stimuli (see table 1) – three of multinational producers, one of a domestic producer and one created based on results of own preceding investigation (Cramer et al. 2022). The stimuli were shown to 15 female child food customers living in the surroundings of Parakou, northern Benin. The stimuli were always presented in the same order: 1. Beau Bebe (domestic producer); 2. Beldine (multinational producer); 3. Farine infantile (design based on own previous research); 4. Cerelac (multinational producer); 5. Phosphatine (multinational producer). Each stimulus was displayed to each participant on a computer screen for seven seconds. During this time, the participant's gaze behaviour was recorded by a remote eye-tracker (Tobii EyeX, 70 Hz) and the software Eyevido Lab. Immediately after watching the respective packaging, the participant was asked to rate the packaging design on a 5-star scale. Subsequently, the eye-tracking results were reflected on in the context of the packaging design by the researcher together with the respective participant and later with the group. The relevant statements from the interviews were documented separately for each participant and each packaging in a written summary.

The eye-tracking data of all participants were analysed qualitatively with heat maps and quantitatively by defining areas of interest (AOIs) for which fixation-related parameters were analysed. Fixations are eye movements in which the eye remains relatively still over a period of time at one point and visual information is received (Holmqvist et al. 2011). All quantitative data (packaging design ratings; eye-tracking data) were analysed using SPSS, version 27.

Results and Discussion

Participants' ratings of the packaging designs differed significantly (rmAnova; $p < 0.001$), with the three packaging designs of the multinational manufacturers receiving the highest ratings, while the domestic manufacturer's design and our own design received lower ratings (Table 1). This result suggests that the packaging designs of the multinational companies were more appealing to the participants than the design of the domestic manufacturer and the design based on our own previous research. However, brand effects cannot be excluded, especially in the case of Cerelac. In the reflection section, participants repeatedly stated that they were familiar with the product and/or had already used it.

Table 1: Stimuli (packaging designs) and the participants' ratings of attractiveness (5-star scale)

Product name	**Cerelac** multinational producer	**Phosphatine** multinational producer	**Bledine** Multinational producer	**BeauBebe** Domestic producer	**Farine infantile** Own design
Packaging design					
Rating Mean (SD)	4.73 (0.46)	4.47 (0.83)	4.13 (0.64)	3.73 (1.16)	3.00 (1.07)

The cumulative gaze behaviour of all 15 participants is visualised by the heat maps in figure 1. Fixation intensity is represented by red (high intensity), yellow, green and blue (low intensity) colouring of the observed areas. Areas without colouring indicate that participants did not fixate on those parts of the stimulus. The heat maps indicate that participants were interested in both picture and text elements. Fixations could be found on almost all product information and design features, such as product name, brand, product description, taste, food additives, ingredient visualisations or age recommendations, even if not every respondent looked at all the information/features. More detailed information can be obtained from the analysis of the quantitative data of the AOIs.

Figure 1: Heat maps for each packaging design visualising the cumulative gaze behaviour of all 15 participants

The product logo was visually visited by all participants (n = 15) on each packaging, except for the domestic product (n = 10), for which the time to first fixation (the time it takes a participant to take the first look at the AOI) was also the longest. This indicates that the characteristics of the logo of the domestic product (e.g. colour, shape of the logo) may not be optimal, and/or the positioning at the top of the packaging was inappropriate. The time to first fixation was shortest for the logo of Cerelac, and its colour (red) was also mentioned positively in the reflection part (Figure 2).

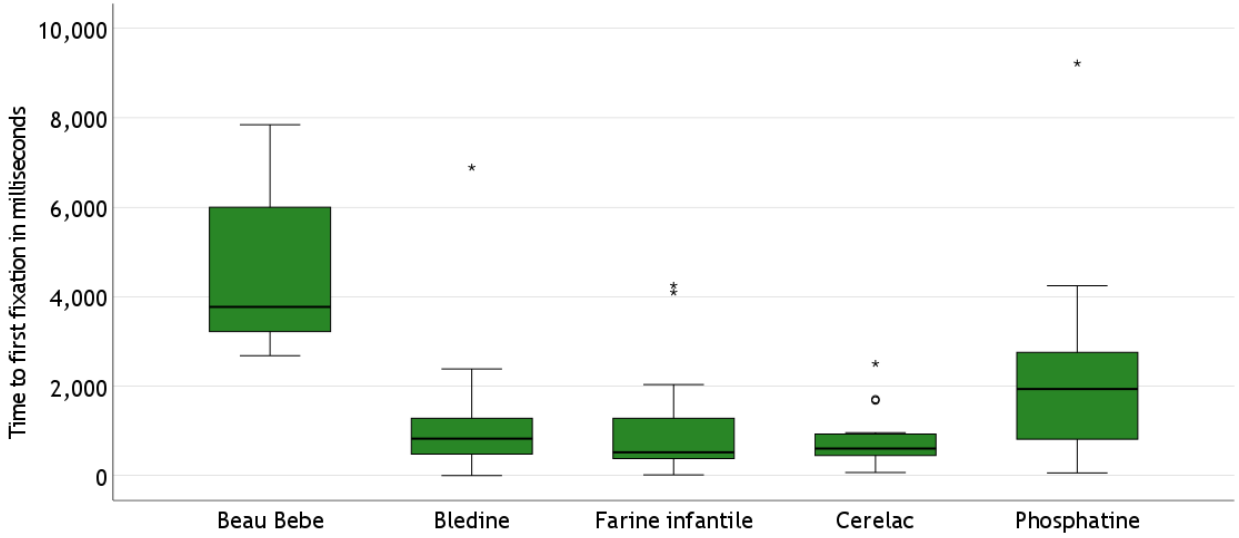

Figure 2: Time to first fixation (in milliseconds) to the product logo

Within each packaging, the mascot was visually visited by the majority of participants: Beau Bebe (baby) n = 11; Beldine (brown teddy) n = 9, Farine infantile (giraffe) n = 13, Cerelac (blue teddy) n = 13, Phosphatine (lion) n = 13. However, only 4 participants visually visited the mascots on all packagings. The time to first fixation (calculated from all participants who visited the respective AOI) was shortest for Cerelac, indicating that this mascot was highly salient, probably due to the

use of intense, contrasting colours of the background (yellow) and the inviting mascot (blue bear with a winking eye). In the reflection part of the study, this was the only mascot associated with fun. Together with the high rating of the Cerelac packaging this underlines results of Swana and De Lange (2015) who describe that multinational producers often attract potential customers and consumers of child food by using inviting cartoon characters, bright colours and design themes depicting fun.
With regard to the domestic packaging design, another interesting result emerged. When participants had visually perceived the food quality hallmark on the domestic packaging, their ratings tended (t-test; $p = 0.11$) to be higher (mean 4.33 ± 0.82, median = 4.5; $n = 6$) than those of participants who had not looked at it (mean 3.33 ± 1.22, median = 3; $n = 9$).

Conclusions and Outlook

The ratings of the attractiveness of the product designs combined with the eye-tracking data and the reflections indicate that omnipresent packaging designs of multinational manufacturers has profoundly shaped local customers' perceptions and preferences. In order for local mother groups not only to imitate the designs of multinationals, unique and characteristic design approaches are required to attract customers' attention by using inviting cartoon characters, bright colours and designs that convey fun. The mother groups should also pay attention to the appearance and position (in the middle of the packaging rather than at the top) of the product logo and could seek a food seal.

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