IN-STORE DECISION TIME VERSUS PRODUCT CATEGORY

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Abstract - A retail store can have many effects on consumers that results gazing behavior. The purpose of this study was to examine the relationship between decision time and product category in consumers' gazing behavior using eye-tracking recordings. A mixed-gender, 20-year-old age sample was examined in a real shopping environment buying four food product categories considering the absolute and relative time of buying decisions. Results show that total fixation time and relative fixation time depends on the type of product. Identifying differences among consumers' fixation time may contribute to better in-store management.

Keywords - Gazing Behavior, Decision Time, Absolute and Relative Time

I. INTRODUCTION

Purchasing patterns can be derived from consumer routines but point of sale stimuli can change consumer's mind in shop. The gazing behavior observations in consumer research and measurement of the fixations of eyes when consumers receive a visual stimulus or view a product permit to define these stimuli. A number of different measures such as fixation duration, and fixation count, can be used to characterize the gazing behavior. By analyzing those measures, the gazing behavior of consumers and influencing factors can be described, and then relationships to other important behavioral aspects such as choice behavior can be determined. Using fixation time as a choice predictor it is also important to know if a person has a decisive or indecisive personality.

In the food sector, technique of measuring gazing behavior has mainly been applied in packaging research [1],[2], where respondents used to be asked to evaluate packaging. This technique is also applied to access visual stimuli of food products in order to evaluate the consumer perception of sensory properties such as color, expected tastiness, intensities [3] or consumer perception of quality factors [4]. Marketing studies show that purchases are related to customers' gaze position in front of store shelves strongly impact the buying act [5],[6]. Although a recent study found that the location of the first fixation had no positive correlation with consumers' choice [7]. Armel, Beaumel and Rangel [8] found that the relative time of fixation on an item during a decision process increases the probability of selection the item. The absolute and relative fixation time of individuals can be investigated using eye-tracking technology [9]. Eye-tracking strongly contributed to the study of factors which might influence choice and consumer behavior [10],[11], decision goal, and thinking style [12],[13]. Gofman, Moskowitz, Fyrbjork, Moskowitz and Mets [9] analyzed the effects of font size, colors and location of images capturing the gazing behavior of individuals. Bialkova and van Trijp [14] measured the attention to information displayed front-of pack. The attention bias of eye movement to food and non-food images was studied by Castellanos et al. [15].
The way we see the literature on consumers' gazing behavior using eye-tracking technology, there are a few publications involving the effects in the category of food products. In this paper our main objective is to investigate differences among absolute and relative fixation time durations in four different food categories. These outcomes may be useful for managers to define their merchandising strategies.

II. RESEARCH DESIGN AND SAMPLING

A Tobii Glasses Eye Tracker was used to measure and analyze the gazing behavior of the 91, 20-year-old recruited participants (66 female and 25 male – it demonstrates the female domination of FMCG consumers [16],[17]). Tobii Glasses Eye Tracker is a mobile eye tracking tool, which can be used in a real shopping environment. Calibration takes only fifteen seconds to ensure reliability and glasses-form makes it possible to get precise insight into how shoppers really shop. Data recording took three days in a middle-size sales area (450 m^2) of a department store. Subjects were asked for a shopping simulation in four product categories (milk, beer, sweets, soft drink). In order to randomize, choice sequence of product categories was not determined. Participants were not informed about product assortment and structure of the store in advance; purchase limit and the available time were not defined to simulate real life experience.
With the help of infrared markers we could define the area of analysis (AOA) - part of the shelf we were investigating and area of interest (AOI) – the group of products within AOA we defined for analysis. We measured absolute time of fixation (in seconds) – from perceiving the product to put it into the basket, and relative time of fixation (in percentage) –

dividing the time used for one specific product to the total time of purchasing the four categories.
Our main objective was to answer (1) how homogeneous the population is considering absolute and relative gazing time; (2) how gender and product category affect shopping time?

III. RESULTS

First step of the analysis was the examination of absolute and relative fixation time values correlation with product types. Afterwards we completed a principal component analysis.

Correlation between fixation times and product type

We measured the time period from noticing the product to put it into the basket in four different categories. Based on N=91 successful measures, we calculated the correlation of the total time values (Σ) and the time values spent on selection of each product types, which, in case of all four compared cases gives cca. ¾ value (as indicated in Table 1), though in case of milk, the value is above 3/4. Probability of error is marked with „p", which is insignificant in all four cases.

N = 91	milk - Σ	beer - Σ	soft drink – Σ	sweets - Σ
Correl.	0,811	0,750	0,74a 5	0,733
T	13,091	10,683	10,523	10,162
$t_{0,05}$	1,987			
P	1,2E-022	9,7E-018	2,1E-017	1,2E-016

Table 1: Correlation of total time values and time values spent on selection product types and chance of fault.

We calculated mean, standard deviation and homogeneity of time periods for all the four product categories. We analyzed decision times of a specific subject in all categories by considering total samples and genders. The average time of shopping in seconds by product categories is indicated in Table 2, where average time is considered as absolute time. Based on the total sample the average time of shopping in absolute time indicates consistent deviation. Results show that, based on the absolute average times, milk and beer categories have the most significant difference (16.10 sec vs. 12.32 sec) which is even greater in case of males (16.92 sec vs. 10.64 sec). In case of females the difference shows the same trend but the value is lower. The results also point out the question: are males more uncertain when shopping milk and are more certain in the case of beer?

Abs. time (sec)	n	milk	beer	soft drink	sweets
Av. Time	Sum = 91	16,10	12,32	14,40	13,44
Dev.	Sum = 91	12,79	10,89	11,51	10,15
Av. Time	Fem = 66	15,79	12,95	14,39	13,36
Dev.	Fem – 66	13,94	11,14	12,38	10,53
Av. Time	Male = 25	16,92	10,64	14,40	13,64
Dev.	Male = 25	9,30	10,25	9,02	9,28

Table 2: Average time and deviation considering absolute time

The answer can be found in Table 3, where we examined the average time of shopping considering relative time and represented the time in percentage divided among product categories.

Relat. Time(%)	n	milk	beer	soft drink	sweets
Av.time	Sum = 91	0,29	0,21	0,25	0,24
Dev.	Sum = 91	0,11	0,11	0,11	0,10
Av.time	Fem = 66	0,28	0,23	0,25	0,24
Dev.	Fem = 66	0,11	0,11	0,11	0,10
Av.time	Male = 25	0,33	0,17	0,26	0,24
Dev.	Male = 25	0,13	0,08	0,11	0,10

Table 3: Average time and deviation considering relative time

The result is similar but the difference is even more decisive; the difference between milk and beer is nearly the double (0.33 vs. 0.17) where lower deviation indicates definite behavior and higher deviation shows uncertainty, except for one case where deviation of males' time values is 0.13 vs. 0.08. According to these results, we can declare that males are more uncertain when shopping milk than buying beer.

Principal Component Analysis (PCA)

During our examination the subjects had to choose in four product categories. We examined whether the categories show significant difference compared to each other and based on gender. In the case of recording absolute time, PCA is successful since the first two main directions include 76% of total information. The PC1 and PC2 coordinates are shown in Table 4, while Figure 1, where PC1 gives the horizontal axis and PC2 means the vertical axis, demonstrates that the upper two points (beer and soft drink) are close to each other in contrast with the other two points (milk and sweets) which show counter pairs.

	58% PC1	18% PC2	13%	11%
λ	**2,313**	**0,738**	**0,526**	**0,422**
milk	0,528	-0,368	-0,264	0,718
beer	0,495	0,481	-0,633	-0,350
soft drink	0,484	0,521	0,684	0,162
sweets	0,492	-0,601	0,247	-0,579

Table 4: PCA considering absolute time

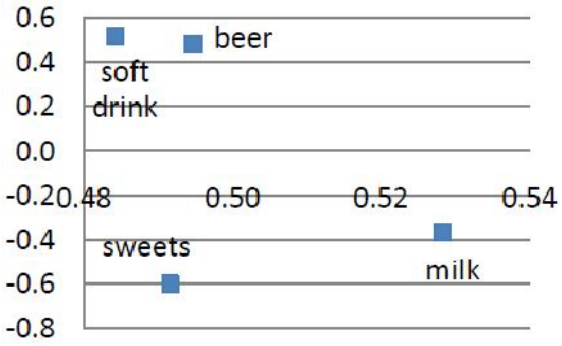


Figure 1: Absolute time, PC1-2

As a statistic proof: Bartlett test c2 = – {n – 1 – (2m + 5)/6}×ln|R| = 85,05; meaning at 5% level (p – value = 3,2 ×10-16 < 0,05) the Bartlett test is significant. The Kaiser-Meyer-Olkin value = 0,729; KMO ≥ 0,7 is acceptable for analysis.

CONCLUSION

Examining standard deviation in our research, we experienced (1) significant difference considering relative gazing time. We also found that (2) males showed higher difference in shopping certain/uncertain scores by each product categories. During the analysis all data indicated strong significant relationship; while in the case of absolute times the role of individual is more important than the category itself; the relative times demonstrate more definite occurrence of product categories in shopper's decision process. However, by considering the method of research, we should not neglect the distorting effect that comes from the task-based character of the research. As a summary we may declare: merchandising directors should pay attention to differences between individuals and products when designing shelves.

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