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Visual attention and choice behavior in multi-alternative choice situations of food products differing in caloric density during hungry and sated condition

An Eye-Tracking Study

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Aim

This study investigates the correlation between gazing behavior and choice decisions in multialternative forced choice situations with food products differing in caloric density, during hungry and sated condition. The aim was to examine how:

a) gazing behaviour and choice behaviour is correlated and,

b) gazing and choice behaviour differ in hungry and sated condition.

Material

For each choice task pictures of two high and two low caloric alternatives, but similar in familiarity and liking, were presented as stimuli. The high caloric alternatives had at least 20% more calories than the low caloric ones. In total eight pictures with four objects each were tested. Showing different meal occasions starting with breakfast, followed by side dishes, main courses, desserts and snacks, the choice sets tried to represent an approximate daily consumption.

Figure 1: Samples of the presented stimuli on the screen

Method

To measure gazing behavior a Tobii® X2-60 and a Tobii® T60 eye-tracker were used. Four different testing sets with randomized positions of the food products were utilized. In total 117 results of students (89 female, 28 male) aged between 19 and 32 were analysed. Self-reports were used to assess satiety in the beginning of the test. Those participants, who could not be classified neither as hungry nor as sated, have been taken out of the final evaluation. Finally, the recordings of 41 hungry and 42 sated participants were analyzed.

Study design: Eye-Tracking

The testing procedure included the same task for all eight pictures presented on the screen of the eye-tracker:

- Participants had to choose one out of the four simultaneously presented products.
- As soon as they had decided, they were instructed to make a mouse click (the cursor was invisible).
- Directly afterwards they had to state their choice by clicking on the chosen alternative (visible cursor).

Eye-Tracking Analyses

Using Tobii® Studio Version 3.2.2.130, the products were selected as area of interest (AOI) and the parameters of interest included:

- fixation duration and fixation counts,
- visit duration and counts,
- decision time.

Statistical Analyses

Repeated Measures ANOVAs and Greenhouse-Geisser-correction were used for data analyses.

Results

Although special care was taken to select equally appealing products the choice was not completely balanced for all choice sets.

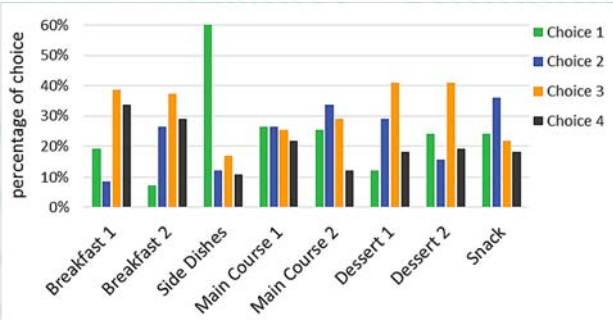

Figure 2: Frequency of choice of all 8 pictures with 4 alternatives each

Relationship between hunger state and decision time

The results depicted in Fig.3 show that hungry participants needed in seven out of eight choice situations slightly more time to decide on a food product, than participants in sated condition. On average, it takes hungry Participants 6,37 seconds to choose, while sated ones need 6,21 seconds. Nevertheless, these differences are not significant (p>0,05).

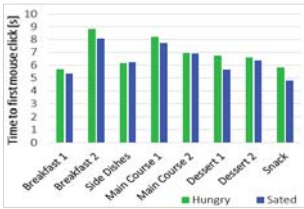

Figure 3: Means of time to decide on a food product per stimulus of participants distinguishing between feeling of satiety

Relationship between hunger state and caloric density of choice

Our findings (Fig.4) indicate that hunger state does not have an effect on the food choice in respect to the caloric density of the food products.

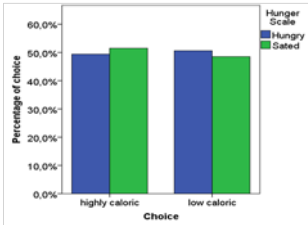

Figure 4: Overview of choice on highly caloric and low caloric food products of all stimuli of participants distinguishing between feeling of satiety

Relationship between gazing behaviour and self reported hunger

The results show that hungry participants gaze longer at the food products on average before they decide than participants of sated condition. The detailed view displays that hungry participants have a longer gazing time on 23 out of 32 food choices. Nonetheless, no significant relationship (p<0,05) between gazing behaviour and feeling of hunger was found.

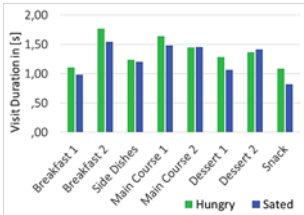

Figure 5: Means of visit time per stimulus of participants distinguishing between feeling of satiety.

Relationship between gazing behaviour and choice

The results (Fig. 6 and 7) show a strong correlation (p<0,05) between choice and gazing behavior, in forms of longer total visit duration and more fixation counts on the chosen alternative. These results were consistent across the tested product groups and independent from hunger state of the participants.

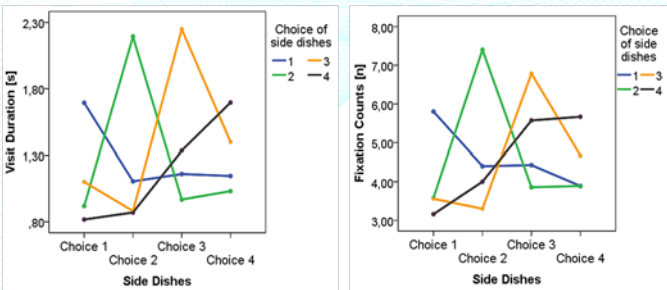

Figure 6 and 7: Correlation of between choice and gazing behaviour. Example: Side dishes

Conclusions

a) This study supports previous findings, showing that gazing behaviour is closely correlated with food choice. The chosen products attracted more visual attention in form of longer total visit duration and more fixation and visit counts than the other alternatives.

b) Hunger state did not have an effect on the food choice in respect to the caloric density of the food products.

c) The results showed that food choice (between alternatives deferring in caloric value) and gazing behaviour are similar in hungry and sated conditions, indicating that food choice is more driven by personal preferences than by degree of satiation.