The role of emotions in fast food choices of young adults

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Abstract:

One of the reasons of higher calorie intake in younger adults is the consumption of food away from home. Emotions have been identified as an important factor influencing food consumption in this age group. A survey and an experiment have been developed to test if there exists the effect of emotions on the amount of calories ordered on an order terminal of a fast food restaurant. Results demonstrate that for the whole sample, none of the factors indicating emotions is significant. For underweight individuals, negative emotions led to an increase in calories ordered. For overweight participants, negative emotions led to a decrease in calories ordered. For the participants in the normal weight group, neither positive nor negative emotions played a significant role in the choice of food options. For overweight individuals order assistant and highlighting choices were most effective method of on-screen communications. We conclude that emotions play an important role in fast food choices of young adults, which is moderated by BMI in a way that negative emotions lead to an increase in calories ordered by underweight participants, while this is the opposite for overweight participants.

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We conclude that emotions play an important role in fast food choices of young adults, which is moderated by BMI in a way that negative emotions lead to an increase in calories ordered by underweight participants, while this is the opposite for overweight participants.

Keywords: obesity, food choices, emotions, BMI, young adults

1   Introduction

The increase of obesity rates in Germany in younger adults (Mensink et al., 2013) creates public concern. One of the underlying reasons is higher calorie intake in this age group caused by the consumption of food away from home (Nielsen, Siega-Riz & Popkin, 2002). This in turn, might be driven by a so-called "obesogenic culture" of eating among younger people (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). In this regard, emotions have been identified as an important factor influencing food consumption (Köster & Mojet, 2015). For example, negative emotions were linked to higher self-rated motivations to eat. This was not the case when being in a state of relaxation, joy or being unemotional (Macht & Simons, 2000). Emotions were also found to be closely linked to body mass index (BMI). Barthomeuf, Droit-Volet, & Rousset (2009) report that pictures of food evoking positive emotions differed only slightly between the groups of people with different BMI. However, negative emotions were experienced more often by obese participants as compared to overweight and normal weight individuals. On the other hand, positive emotions were found to be related to higher calorie consumption and snack intake (Evers, Adriaanse, de Ridder, & de Witt Huberts, 2013).

Regulating emotions is more difficult for young adults compared to older adults (Scheibe & Blanchard-Fields, 2009). Lazarevich, et al. (2016) found that emotional regulation is a mediator between BMI and depressive symptoms for young adults. Against this background, we investigate if BMI mediates the effect that emotions have on the calorie level of the ordered food. Self-control is included in the analysis as a proxy for the ability to regulate one's emotions.

Since food away from home consumption was identified as major cause for increased calorie intake, our experimental setting uses the example of a fast food restaurant order terminal. We test three experimental conditions to analyze if the calorie intake could be lowered while ordering. Those conditions are: i) a calorie display that informs the user about the amount of calories that are currently in the shopping basket by giving a number and a signal in traffic light colors; ii) an order assistant that gives this information by changing its facial expression and iii) a green background that highlights less caloric food items.

This paper contributes to the literature by examining the effect of emotions on the amount of calories ordered on an order terminal of a fast food restaurant exclusively for the population of young adults. The remainder of the paper is as follows. The next section presents data and methods. Then, we present the results of data analysis. The last section discusses the results of the study and concludes.

2   Data and methods

Participants

Participants of the study were 401 students from a German university who received an incentive of 10 Euros. Subjects were between 17 and 26 years old with mean age of 19.5 years. Fifty percent of participants were female. They consumed fast food at least one a month with an average consumption frequency of 5 times per week.

Experiment

The experiment consisted of a pre-experiment questionnaire, a food order on a tablet screen that mimicked the fast food order terminal, and post-experiment questionnaire.

The pre-experiment questionnaire asked participants to indicate their emotional state before the experiment and their level of feeling hungry. Respondents also provided socio-demographic information, and information regarding their fast food consumption. Participants were then given

a computer tablet with an interface similar to the one at a popular fast food restaurant in Germany. The first screen provided the opportunity to enter a calorie goal for the upcoming order with the default setting of 700 calories. 26% of participants changed the calorie goal while 74% remained with the default of 700 calories. Afterwards, participants saw the order screen (see Figure 1 for an example).
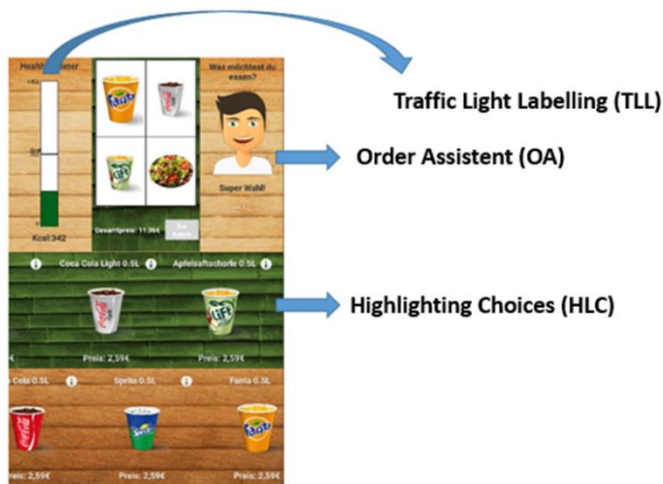

Figure 1. An example of ordering screen

Participants were randomly assigned to one of three experimental conditions, which included the presence on the screen (in combination with each other or separately) of an order assistant (OA), traffic light labeling (TLL), and highlighting choices (HLC) (Fig. 1). The order assistant on the upper right screen aimed to influence the user by changing its facial expression depending on the current amount of calories in the shopping basket in the screen center. The feedback given by the order assistant had five stages: neutral, friendly, critical, sad and shocked, all of these are accompanied by a respective message right below the assistant's face. Traffic light labeling is presented as a bar in the left upper corner of the screen, which changes the color depending on calories in the shopping basket from green to red. This is combined with a display of the number of calories below the graphical display. Highlighting choices occurs in the lower part of the screen, where the dishes to be selected by participants are organized in two sections: the upper (green) line contains 10 dishes with relatively little calories like small burgers, small fries, salads and diet drinks. The lower (brown) section contains food items and drinks with more calories.

After completing the order on the screen, participants received the post-experiment questionnaire, which contained questions regarding their body mass index (BMI), self-control and emotions.

Measures of emotions, hunger, self-control and BMI

Emotional levels of participants were measured with the German version (Breyer & Bluemke, 2016) of the PANAS scale (Watson, Clark, & Tellegen, 1988). The PANAS scale consists of 20 questions regarding specific emotions where the first ten questions refer to positive affect and the next ten to negative affect. Each emotion is rated on a 5-point Likert scale: 1 – very slightly or not at all; 2 – a little; 3 – moderately; 4 – quite a bit; 5 – extremely (Watson et al., 1988). Participants completed the set of questions before and after ordering the food to test whether the order affected their mood (e.g., by feeling guilty of having ordered too much).

Self-control was measured using the German version (Bertrams & Dickhäuser, 2009) of the self-control scale developed by Tangney, Baumeister, & Boone (2004). The short version of the scale used in the questionnaire contains 13 questions. Participants answered them using a 5-point Likert scale ranging from 1 – not at all to 5 – very much. We created a score of self-control for each participant by summing up the answers for all 13 questions and dividing the sum by 13. A higher score indicates a higher level of self-control.

Hunger was measured with the question: "How hungry are you at the moment?" Again, a 5-point scale was used including not at all, a little, moderate, relatively, and very hungry.
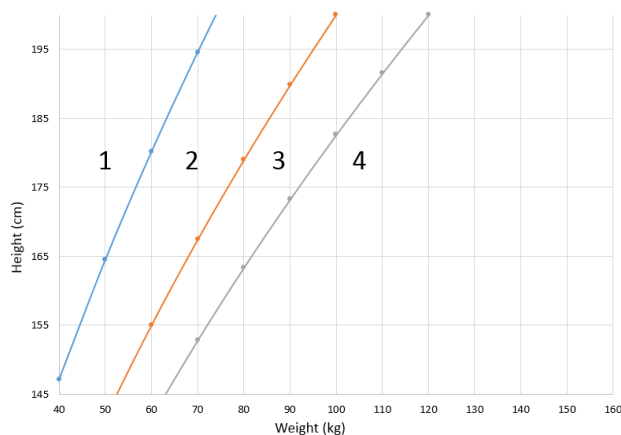

Figure 2. Graph used in the questionnaire for measuring BMI.

BMI was measured using the methodology suggested by National Heart, Lung, and Blood Institute[1], where four categories displayed in Figure 2 correspond to the following levels: 1 – underweight, 2 – normal weight, 3 – overweight, and 4 – obese.

3   Results

To start, we report the emotional levels of participants measured before and after the experiment (Figure 3).
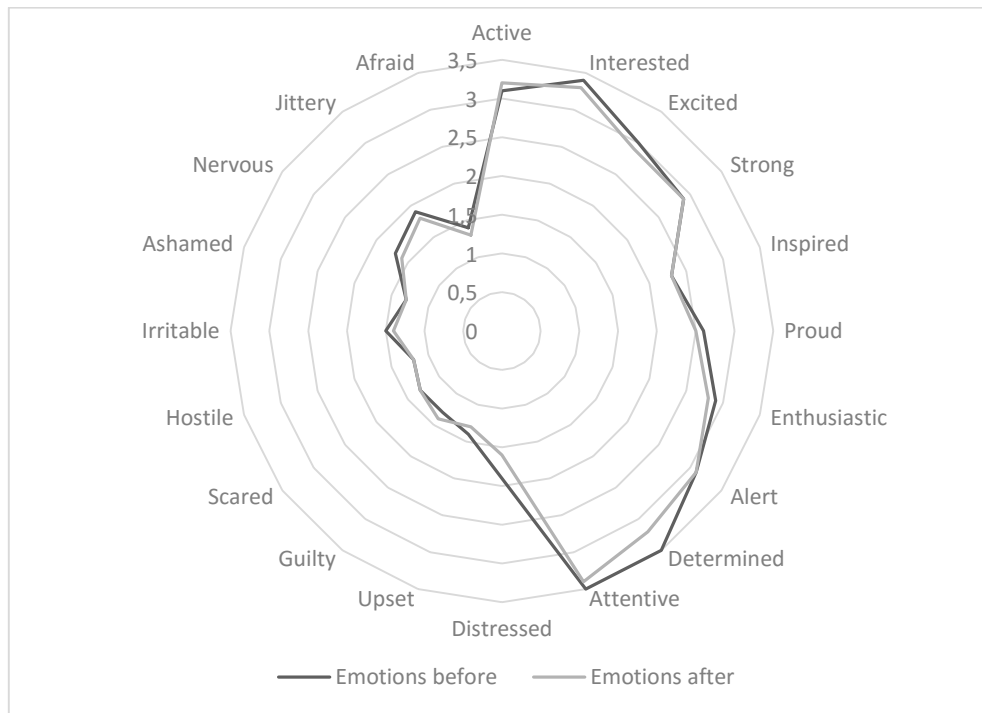
Figure 3. Emotional levels of participants before and after the experiment

Results show that emotional levels before and after the experiment are not significantly different from each other. Hence, we only include emotions measured before the experiment in the further analysis.

The distribution of participants regarding BMI is as follows: 49 participants are in the category 1 - underweight, the majority (287) in category 2 – normal weight, 54 participants are in the category

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[1] https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmi_tbl.htm

3 - overweight, and only 4 participants in category 4 - obese. In the further analysis we use only the first three categories.

Table 1 below summarizes major characteristics of the sample, such as, calories ordered, calorie goal indicated before the order, BMI, self-control and hunger. The results are presented for the whole sample, as well as, for the three identified BMI groups (underweight, normal weight, overweight.

Table 1: Descriptive statistics

| Variable | Description | Mean (std. dev.) | | | |
		Total sample	BMI=1	BMI=2	BMI=3
Calories	calorie level of the order	829.01 (307.67)	775.88 (287.37)	826.36 (312.88)	858.26 (306.13)
Goal	self-selected calorie goal for the order	768.58 (400.86)	682.65 (158.62)	782.23 (441.78)	782.41 (357.16)
BMI	1 – lowest, 4 - highest	2.03 (0.56)	---	---	---
Self-control	summary score based on 13 questions	42.12 (6.79)	43.37 (8.14)	42.02 (6.66)	41.43 (6.47)
Hunger	1 – not at all, 5 – very much	2.60 (1.30)	2.43 (1.24)	2.60 (1.30)	2.71 (1.33)

The average level of calories ordered differs between groups of participants according to BMI category with the lowest amount of calories ordered by underweight group and highest by overweight group.

To assess the influence of emotions on the calories of food ordered, exploratory factor analysis was performed using STATA 13.1 on 20 questions regarding positive and negative emotions from the PANAS scale. We report the results of factor analysis in Table 2.

Three factors were identified, which describe negative and positive emotions experienced by participants before the experiment. The "negative" factor includes all 10 negative emotions. The "positive" factor includes emotions like interested, excited, strong, inspired while the "active" factor includes emotions like active, alert, determined, and attentive. Cronbach's alpha for the three factors are: 0.9 for "negative" factor, 0.7 for "positive" factor and 0.7 for "active" factor. The related factor scores are used in the subsequent analysis.

Table 2: Varimax rotated factor loadings for emotions before the ordering process

	1 Negative	2 Positive	3 Active
Active	-.1585	.3872	**.5267**
Interested	-.2715	**.5512**	.3893
Excited	-.0559	**.7164**	.1790
Strong	-.0921	**.4377**	.4088
Inspired	.2712	**.5807**	-.1398
Proud	.1421	**.6742**	-.0327
Enthusiastic	.0481	**.7532**	.1815
Alert	-.0135	-.0036	**.7422**
Determined	-.0684	.3053	**.6054**
Attentive	-.0568	.1042	**.7549**
Distressed	**.6435**	.0703	.0963
Upset	**.8035**	-.0668	-.0017
Guilty	**.8322**	-.0099	.0102
Scared	**.7984**	-.0016	.0261
Hostile	**.7986**	-.0187	-.0019
Irritable	**.7608**	-.0136	-.1310
Ashamed	**.8402**	-.0515	-.0763
Nervous	**.7343**	.1962	.1295
Jittery	**.6294**	.1481	-.2673
Afraid	**.7854**	.0393	-.1496

Bold items are used in the interpretation of the respective factor.

In the next step, a Tobit regression is used to analyze the determinants influencing the amount of calories ordered. Observed levels of calories per order ranges from 26 to 3000. These values are used as lower and upper limits in the Tobit model.

The results are presented in Table 3. We estimate four models: one for the whole sample, and three models for each of the BMI groups. The explanatory variables include the three experimental conditions (order assistant, traffic light labeling, and highlighting choices), calorie goal, gender, hunger level, self-control score and emotional state.

Table 3: Results of Tobit models

	Total sample	BMI=1	BMI=2	BMI=3
Variable	Coefficient (std. err.)			
OA	-112.94***	-121.28*	-106.20***	-143.48***
	(28.58)	(66.28)	(34.53)	(78.60)
TLL	12.84	-5.79	40.54	-102.52
	(28.37)	(62.89)	(34.25)	(75.42)
HLC	12.71	68.60	16.93	-159.03*
	(28.34)	(62.22)	(34.31)	(79.70)
Goal	0.22***	0.17	0.22***	0.24**
	(0.04)	(0.21)	(0.04)	(0.10)
Female	-114.85***	-276.45***	-102.66***	-226.03**
	(30.23)	(86.66)	(35.35)	(89.37)
Self-control	-3.45	-10.72**	0.31	-8.21
	(2.14)	(4.20)	(2.66)	(6.45)
BMI	32.31	---	---	---
	(26.45)			
Hunger	32.68***	66.70***	26.01*	30.64
	(11.05)	(25.40)	(13.32)	(27.94)
Negative E	-17.91	68.58*	-12.93	-56.52*
	(22.54)	(38.82)	(19.65)	(29.48)
Positive E	6.30	-9.57	7.63	22.92
	(27.17)	(32.87)	(17.37)	(36.83)
Active E	-14.35	-9.29	-16.40	18.62
	(23.21)	(32.91)	(17.63)	(40.51)
Constant	812.97***	1207.28***	645.39***	1229.33***
	(137.65)	(258.55)	(123.59)	(293.30)
N of obs.	392	49	286	52

OA=Order assistant, TLL=traffic light labeling, HLC, Highlighting calories, E=emotions
*** refers to 0.01 significance level, ** to 0.05 and * to 0.10 significance levels respectively

Looking at the results for the whole sample, none of the factors indicating emotions is significant. The condition of the order assistant, as well as, being a female negatively influenced the amount of calories ordered. The self-selected goal and the level of hunger influenced the amount of calories ordered positively. When the sample is split by the level of BMI, more interesting results can be observed. First, the order assistant remains an effective on-screen communication method that led to a decrease in the amount of calories ordered for all three groups. The effect was strongest for overweight individuals. Second, for these overweight individuals, another effective method of on-screen communication was highlighting choices. Participants in the overweight group ordered most of the products from the upper (green) bar with low-calorie options. Third, the self-selected calorie goal was not a significant factor for the underweight group, when the

self-control score was a significant factor only for this group. Finally, being female reduced ordered calories in all of the groups, and hunger was a significant factor for underweight and normal weight groups. Interestingly, negative emotions led to an increase in calories ordered by underweight participants, while this was the opposite for overweight participants. For the majority of participants in the normal weight group, neither positive nor negative emotions played a significant role in the choice of food options.

4 Discussion

While the emotional factors we identified do not show significant effects for the whole sample, we find an effect for the "negative" factor when splitting the sample which leads to a considerable increase in calories ordered for underweight participants (68 calories) while there is a significant decrease for overweight participants (56 calories). It is interesting that it is negative emotions - and not positive ones - that have an effect on calories ordered that can be called desirable, i.e., making underweight participants order more food and overweight ones less.

This finding is in line with previous research, Barthomeuf et al. (2009) report that the intensity of negative as well as positive emotions felt towards food pictures differs in adolescents depending on their BMI. To be more exact, they find that the intensity of negative emotions towards desirable foods was higher in the obese than in the overweight and normal-weigh participants. Although our sample only contained 4 participants who can be classified as obese, we find the same tendency as the above cited authors for overweight participants. It is interesting that it is negative emotions - and not positive ones - that have an effect on calories ordered that can be called desirable.

Previous literature showed mixed findings concerning the interplay between emotions and food intake. Garg and Lerner (2013) find a positive relationship between sadness and food intake, while Konttinen et al. (2010) do so for depressive symptoms in general. In contrast, Bongers et al. (2013) found that it is positive mood that leads to an increased amount of food consumed. Emery et al. (2014), however, found a decreased amount of calories consumed resulting from positive mood. These mixed findings can partly be explained by the role of the large number of influencing variables that play a role in this field of research but often remain unconsidered in experimental settings. The salience of long-term goals (Gardner et al., 2014) or being an emotional eater (Van Strien et al., 2013) were found to be moderating variables. Gender was also found to have a moderating effect by Mooreville et al. (2014). While the above cited evidence suggests that

emotions do play a role in food consumption in general, the special case of emotions or mood eating out of home still remains a underresearched area (Edwards, Hartwell, & Brown, 2013).

To conclude, our findings suggest that the interplay between emotions and food intake is moderated by BMI. The overweight subsample stands out as they order significantly less calories not only in the condition "order assistant" but also in the condition "highlighting choices". No other subsample's reduction in calories is as large as theirs, also no other subsample shows a significant reaction to highlighting food choices. The underweight subsample is the only group where self-control significantly lowers calories ordered.

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