Food Choices under Stress: Considering Internet Usage and Social Support

Larissa S. Drescher* and Johanna Hasselbach*
Technische Universität München, Marketing and Consumer Research, Alte Akademie 16, D-85354 Freising,
Germany
ldrescher@tum.de; johanna.hasselbach@tum.de

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ABSTRACT

It is a known fact that stress negatively affects food choices. Consequentially, this paper analyzes three different research questions using a sample of 330 international students in Germany. Firstly, it is observed if stress affects students' motivations to eat, i.e. if it triggers changes in the motivation behind food choices. Results show that this is not the case. Secondly, it is tested if social support acts as a buffer on the relationship between stress and healthy eating, similarly to the model proposed by Lakey and Cohen (2000), where social support buffers the negative consequences of stress on health. Specifically, it is tested whether social support affects Internet usage and subsequently if Internet usage is a coping strategy and eases the negative consequences of stress on healthy eating. Taking into account that there is no effect of social support on Internet usage and since Internet usage does not moderate the relationship between stress and healthy eating, the paper continues to show that instead social support is a moderator for the relationship between stress and healthy eating. Interestingly however, Internet usage has a direct and positive relationship with healthy eating, i.e. the more the Internet is used the healthier do students eat. Thirdly, the paper elaborates on the question if students in Germany use the Internet as an information source for diet and health related problems for example on social media sites and additionally if the use of this information did change their dietary behavior. Results show that people with high dietary information search tendencies are 1.76 times more likely to change their diets due to the information found online. The results of this study are important for public policy measures dealing with student health.

Key Words: Stress, healthy eating, Food Choice Motives, Internet usage, social support, comfort eating

INTRODUCTION

It is a well-researched fact that food choices in times of stress become less healthy. This relationship has often been studied using samples of college students (Oliver and Wardle, 1999). For instance, a study of 272 college students shows that those students that felt under stress react with increasing appetite and report to select more unhealthy food such as sweets or pizza and fast food. Even those students that were not stressed report to eat less healthy when they are stressed (Kandiah et al., 2006). Similarly, in a cross-national study conducted in three European countries, Mikolajczyk et al. (2009) report that especially female students' perceived level of stress is positively connected with the frequency of sweets and fast food consumption and negatively linked to the frequency of fruits and vegetables consumption.

Not only does dietary behavior change when people are stressed, there are other factors that may affect the role of stress on food choices. When people are stressed or face a problem they develop different reactions to help them dealing with these problems (Deatherage, Servaty-Seib and Arksoz, 2014). Internet plays a big role in people's everyday life (Abedniya and Mahmouei, 2010) and especially so in students life's (Deatherage, Servaty-Seib and Aksoz, 2014). Therefore, this paper assumes that students under stress will use the Internet to cope with their stressful life. On the other hand, people under stress will reach out to family and friends they feel close with for support. Both, using the Internet and the social ties with others might lead to a relief of the stressful situation.

This paper analyses food choices made by a group of 330 international students in Germany and aims at analyzing the following three research question regarding the relationship between food choices (motivations and real choices) and stress. ***First***, it is observed if stress affects people's motivations to eat. Previous studies confirm that negative emotional states can influence food choice (Spoor et al., 2007; Sproesser et al., 2011), but to the knowledge of the authors no studies

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analyzed stress as a trigger for changes in the motivation behind food choices. For looking into the motives behind making a food choice we refer to the Eating Motivation Survey (Renner et al., 2012). Out of the 15 Eating Motives, six motives were chosen for the present study. Namely these are Habits, Convenience, Price, Visual Appeal, Sociability and Social Image. Besides Price, the motive reflecting each consumer's economic constraint, all motives are thought to be related to the topic of stress. It can be assumed that when people are stressed this also influences the importance of habits. According to lay theory respondents experiencing higher levels of negative emotions prefer a status quo alternative, which means familiar products (Luce, 1998). This finding however is controversially, as Wood (2010) showed in an experiment that in stressful life situations like life changes, the likelihood of choosing a familiar product decreases. Similarly Convenience is expected to be of high importance in relation to stress, as stress goes in line with a feeling of limited time and/or cognitive capacity, wherefore stressed people probably have a higher tendency towards convenience in their food choice. Further it can be assumed that when people are stressed, they might want to socialize more and that looking good in front of others, the social image, becomes more important when self-esteem is low, which is often the case when people feel stressed.

Second, it is questioned if and how perceived stress affects students' real food choices, i.e. if they eat more or less healthy (healthy eating). Within this second research question it is also detected if Internet usage and social support have any moderating or coping effect for the relationship between stress and healthy eating. As theoretical background for doing so it is referred to Lakey and Cohen (2000). They argue that support acts as a stress buffer meaning it decreases the negative effects of a stressful life on health. Support is understood either as supportive actions of others or as the perceived support, i.e. the perceived availability of support. Based on the so-called supportive actions approach, received support helps dealing with stress, which in turn

buffers the negative consequences of stress on health outcomes. On the other hand, perception of available support helps people to assess a potentially threatening situation as less stressful, which again helps to buffer the effect of stress on health. This is known as the appraisal perspective. As a *third* research question, the paper will shed some first light on the question if students in Germany use the Internet as an information source for diet and health related problems and additionally if the use of this information had any effect on their behavior. The question about information search tendencies is fed by recent research in the area of public health where it is argued that the use of social media is gaining increasing importance for people having diet or health related questions and/ or problems (Centola, 2013). We are interested in the question if and how often participants use the Internet to inform about various aspects of their diet. If they do, it might be of interest to identify if they consider the information as useful and also, if the information led to a behavioral change. In light of the research question described above it will be interesting to see if there are differences by the level of stress and levels of support.

This paper is structured as follows. The next section gives an overview of different research fields related to the research questions, if and how perceived stress affect food choices, and the role of Internet usage and social support. Also, it is dealt with literature of social media and diet information Internet search tendencies. Derived from the literature, the conceptual framework of our paper is presented followed by a part about the data used and the empirical model applied. The results are given next. The paper closes with a conclusion about the most relevant findings.

LITERATURE REVIEW

Stress and eating

These days, many people perceive their lives as stressful, for example due to the increase of technology in the work and private environment but also due to personal and health problems. Under stress, the management of food and energy intake is essential (Adam and Epel, 2007).

Stress results in food pattern changes. When people are stressed, however, one has to differentiate two different reactions. Stress leads either to hyper- or hypophagia (Kandiah et al., 2006; Oliver and Wardle, 1999; Zellner et al., 2006) – or both for the same person depending on the duration of stress. Hyperphagia describes an increased appetite and amount of food eaten whereas hypophagia defines the opposite effect, people loose appetite and eat less. As a result of stress, a group of people starts losing their appetite and weight as a consequence (sometimes as a short-term reaction to stress). When people successfully dealt with the stressor, they start gaining weight again, oftentimes more weight than they had before the stressful situation. For another group of people, or when stress becomes chronic (and therefore a long term problem) people tend to overeating because they learn that eating helps them to cope with or ease the stressful situation. A number of neurobiological adaptions are responsible for this learnt coping strategy as described elsewhere (Adam and Epel, 2007). In stressful situations, food choices differ by age, sex and type of stressor or other characteristics. However, there is clear evidence that under stress specifically the consumption of fat and sweet foods increases (Kandiah et al., 2006). There are an increasing number of studies showing that people can be addicted to food, similar to be addicted to drugs (Adam and Epel, 2007). This contributes to the obesity epidemic observed in many countries all around the world.

As initially mentioned, the effect of stress on food choice is oftentimes studied using samples of students. Students are an especially suitable sample because they were or recently are in a transition phase of their life after moving out of their parents' home – and transition means stress. Already Oliver and Wardle (1999) report that stress influences food choices negatively based on results of a sample of 212 British students. No gender differences were observed, so did the amount of snacking increase for both male and female students. Also dieting status was not

correlated with snacking behavior. It shows that an equal amount of students did eat more and less as a result of stress (hyper- and hypophagia).

One of the more recent studies looking at the food choices of students under stress is Kandiah et al. (2006). They analyze the effect of stress on appetite and eating habits of comfort food using a sample of 272 female college students at a Midwestern university in the US. Comfort food is defined as food that makes the person eating feel better. Results of an online questionnaire show among others that when students are stressed, appetite changed for 81% of the surveyed female students. Of these students with changed appetite, 63% report that their appetite did increase under stress while appetite decreased for 37%. Those students reporting an increase in appetite ate significantly more sweet foods (dessert, chocolate/ candy bars, candy, ice cream etc.) and mixed foods (burgers, sandwich meat items, pizza etc.), also known as comfort food. When stressed, female college students tended to eat less diverse within all food categories considered.

Mikolajczyk et al. (2009) document gender differences in eating pattern changes due to perceived stress and depressive symptoms. Using data from a Cross National Student Health Survey with three European countries (Germany, Poland, and Bulgaria) it shows that female but not male (first-year university) students react to both stress and depressive symptoms with unhealthy eating patterns. Females who perceive stress (measured using Cohen's Perceived Stress Scale) have a higher consumption of unhealthy food items such as sweets and fast foods and ate less fruits, vegetables and meat (healthy food items), in all countries.

Also Zellner et al. (2006) report that stress alters food choices, they confirm that food choices become less healthy. This is the result of a first experiment described in their study (experiment 1). They also show that specifically women are starting to eat more when stressed (experiment 2) in order to feel better. If people report to be on a diet they increase their food consumption under stress more. It shows that people under stress select those food items that they avoid under

normal circumstances in order to keep their weight or health. In another study, Zellner, Saito and Gonzalez (2007) show that males that were *not* stressed ate more unhealthy food than males in a stressed situation. They conclude that there is a gender difference in the effect of stress on food choice.

Internet usage

Internet plays a big role in people's everyday life (Abedniya and Mahmouei, 2010). For today's students, Internet is everywhere (Deatherage, Servaty-Seib and Aksoz, 2014). While at the beginning of the 2000s, the use of Internet in schools has been praised a lot and it was stated it would make students brighter, it is also true that heavier Internet usage impairs academic student performance (Kubey et al., 2006). Similar to food, people can become addicted to Internet usage. People may use the Internet excessively because they need the stimulation or to escape from personal "real-life" problems. Especially low self-esteem can explain addiction to the Internet or the amount of time spent on the Internet (Armstrong, Phillips, and Saling, 2000). Niemz et al. (2005) for example show with a sample of British students that 18% were pathological Internet users.

Separate from Internet addiction, people with a non-abusive Internet usage can also benefit from its use. Within the social-cognitive theory, the uses and gratification framework proposes that people use the Internet because they expect positive outcomes, namely gratifications (LaRose, Mastro and Eastin, 2001). They use the Internet because it helps them, for example with various questions, such as financial, diet or health to name a few. In terms of social network sites such as Facebook or LinkedIn research has questioned whether or not these networks have real benefits for its users. Hampton et al. (2008) show for the US that 79% of adults reportedly use the Internet and almost half of the American adults (47%) are member and use at least one social network site. By far, Facebook is the most popular social network site in the US. The users of Facebook

are shown to be more trusting than other Internet or non-Internet users, they have more close relationships and get more social support than other Internet-users (Hampton et al., 2008).

To an increasing amount the Internet is used to inform about health related problems. This goes so far that nowadays, social media is regarded a cornerstone of public health (Centola, 2013). Areas of this increasing use are weight loss coaching and smoking cessation, but also as general information source for health questions. It is clear that health behavior is influenced by peer groups; for example, if family and friends regularly engage in sports, the individual is also more likely to do so (Centola, 2013). Likewise, social networks can affect health behaviors (health dynamics). Previous examples from e.g. smoking indicate that social networks can affect collective health outcomes. Centola (2013) argues that the recent growth in peer-to-peer social media represents a new resource to analyze health dynamics. Lefebreve and Bornkessel (2013) analyze how social media and social network sites influence people's health information-seeking and health-related behaviors. They confirm that the Internet is increasingly being used to search for health related information, not only on Laptops but also using smart phones (Lefebreve and Bornkessel, 2013). The information searched has an impact on peoples own health management and understanding of certain types of illnesses. What is unsolved so far is how social network sites can best be used to improve health for all population groups. Related to the literature presented, this study will shed some light on students' use of the Internet and social media sites when looking for health or diet-related problems (second research question).

Furthermore, the present study argues that under stress students use the Internet as a coping strategy to ease the effects of feeling stressed (as a part of the *second* research question).

Recently, Deatherage, Servay-Seib and Aksoz (2014) have provided evidence that when college students use the Internet to cope with their problems this is associated with a higher stress level. On the other hand, when students report to use the Internet to have fun and for entertainment

purposes this is associated with lower stress levels based on the Perceived Stress Scale (PSS). There are a growing number of studies demonstrating that people facing a heavy illness use the Internet successfully to cope with that (stressful) situation. For example, according to Kalichman et al. (2005) people living with HIV/AIDS use Internet searching activities as a coping strategy to help them dealing with their illness and so do cancer patients in another study (Beatty and Scott, 2013).

Social support

Young people's ability to deal with life events and environmental stressors is a determinant of health (Bovier, Chamot, and Perneger, 2002). Literature differentiates two different resources that young people need to have to cope with stress: psychological resources (e.g. self-esteem) and social support (family and friends). Social relationships are linked to health and well-being (Cohen, Gottlieb and Underwood, 2000). Social support has an effect on mental as well as physical health because it influences emotions, cognitions, and behaviors (Cohen, Gottlieb and Underwood, 2000).

According to Lakey and Cohen (2000, p. 29) there are three perspectives on which to ground social support research. First, there is the stress coping perspective which assumes that support helps to keep people healthy because support protects people from negative effects of stress. Second, according to the social constructionists' perspective, support has a direct effect on health because it fosters self-esteem and self-regulation (and this irrespective of the stressful situation). Third, the relationships perspective assumes that the health effects of support are intertwined with the relationship processes, namely companionship, intimacy, and low social conflict.

One of the most important theoretical perspectives on social support is the assumption that support leads to a reduction of the effects of stressful life events on health. In others words, support buffers the negative stress effects (Lakey and Cohen, 2000) by supportive actions of

others as giving advices or simply the belief that there is support available if needed. The supporting actions of others enhance coping performance. On the other hand, perceptions of available support enable a person currently under stress to evaluate the threatening situation as not so stressful.

Conceptual framework

The conceptual framework is threefold. According to the three research questions initially introduced, the following three Figures describe this paper's conceptual framework.
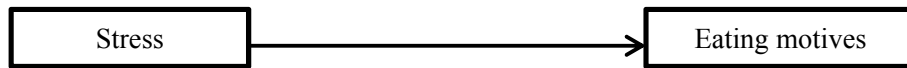

Figure 1: Relation between stress and eating motivations

Figure 1 shows the first research question which looks at the impact of stress on the motivation to eat making use of the Eating Motivation Survey (Renner et al., 2012). For the second research question the theories summarized in Lakey and Cohen (2000) are translated to the area of healthy eating. The health outcome of the original model is represented here by the extent of healthy eating, thus the influence of stress on the healthiness of food choices is observed. Moreover, the moderating and possibly interacting effects of Internet usage as a coping strategy are considered. Additionally we are interested in identifying how social (structural) support influences Internet usage, level of stress and ultimately healthy eating. The second research question can be summarized graphically (adapted from Lakey and Cohen, 2000) as follows:
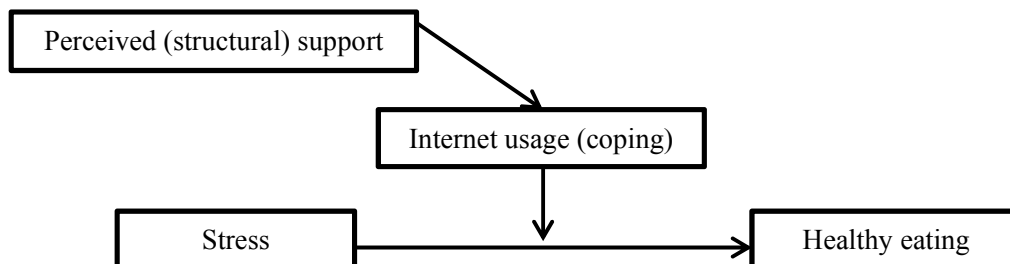
Figure 2: (Inter)relations between support, Internet usage on stress and healthy eating

As the third research question, the framework depicted in Figure 2 will be adapted to diet information Internet search tendencies. Recently, a number of studies have documented the health information seeking activities of adults (Lefebvre and Bornkessel, 2013). Here, it is of interest to see if and how often students use the Internet to inform about various aspects of their diet. If they do search, it might be of interest to identify if they consider the information as useful and also, if finally, the information led to a dietary behavior change. It will be interesting to see if there are differences by the level of stress and levels of support.
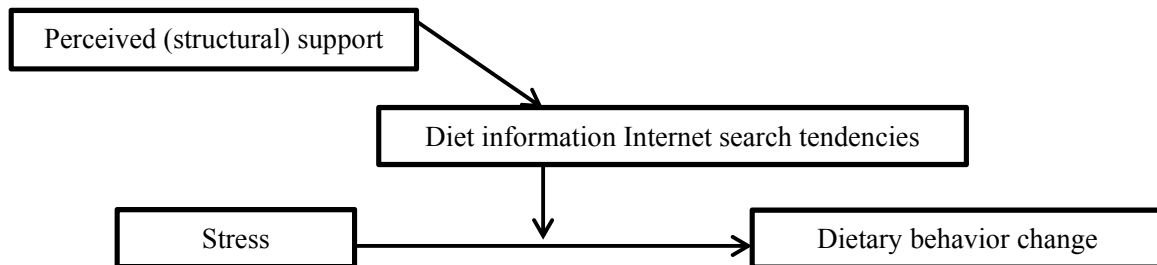
Figure 3: (Inter)relations between support, diet information Internet search tendencies, stress on dietary behavior change

DATA AND MODEL

Data was collected in November 2013 via face-to-face interviews surveying 330 students living in Germany, precisely in Munich and the surrounding area. A student sample was explicitly aimed at, as previous studies showed that they are especially prone to stress (Kandiah et al., 2006). This finding seems reasonable considering the transition in the life-cycle and the major life changes that students face from leaving home to going to university.

To address the research questions of this paper, the impact of stress on eating (motivation and real choices) the questionnaire was designed as follows. For the first research question and in order to analyze respondent's motivations to eat, the questionnaire included six selected Food Choice Motives, namely 'Habits', 'Convenience', 'Sociability', 'Social Image', 'Price' and

'Visual Appeal' from the Eating Motivation Survey, a list of 15 motives developed by Renner et al. (2012). These motives have been chosen based on the assumption that, as outlined in the introduction, the level of stress might trigger these motivations. Further, the Food Choice Motive 'Habits' has been chosen as it was one of the most important motives in the study by Renner et al. (2012). 'Visual Appeal' has been chosen as it is one dimension which can actively be experienced when shopping food and 'Price' has been chosen as it represents the economic constraint when making a choice. Due to students restricted financial resources Price might be highly relevant in the chosen sample. Last but not least the motives 'Sociability' and 'Social Image' are not only assumed to be related to the level of perceived stress, but also to the topic of social support addressed in this study.

For the second research question, the healthiness of food choices (healthy eating) is evaluated based on the results of a short Food Frequency Questionnaire considering the frequency of consumption of twelve different food groups (Sweets, Cakes/ Cookies, Snacks, Fast Food, Fresh Fruit, Salad, Cooked Vegetables, Soft Drinks, Meat, Fish, Milk Products, Cereal/ Cereal Products), which have proven to be important when studying dietary habits (Mikolajczyk et al., 2009). The frequency of consumption is rated by the respondent on a five-point scale with the classification never, 1-4 times a month, several times a week, daily and several times a day.

Using the information from the Food Frequency Questionnaire, a simple and straightforward indicator is constructed to measure healthy eating. Healthy eating includes the following food groups: fresh fruits, salad, cooked vegetables, meat, fish, milk products, cereals/ cereal products. For every group, the frequency of eating is translated in amount per week, and is subsequently added up and divided by the number of groups considered. This gives information about the mean healthy eating per week. The indicator gets higher the more frequent the food groups

considered are eaten. For the second research question the new constructed variable healthy eating is set as the dependent variable.

For the third research question, the dietary behavior change is measured using a question devolved from the Health Tracking Household Survey (Center for Studying Health System Change, 2012) on information search behavior about health which has been adapted onto the topic of information Internet search about food and diet related topics in general. Specifically, it was asked 'How often did you go online to look for information about food or your diet during the past 12 months' as well as 'For which of the following topics did you look for information in the Internet during the past 12 months?', 'On average, how useful was the information you found online' and finally, 'Did the information affect your dietary behavior?'. The latter is used to construct a binary variable indicating dietary behavior change. The first question is used to get information about the Internet information search tendencies regarding food and diet in general and is used to build a dummy variable on high information search activities.

Stress is measured using the Perceived Stress Scale (PSS) developed by Cohen, Kamarck and Mermelstein (1983), a reliable and valid 14 item instrument. It is supposed reflect nonspecific appraised stress and it measures the extent to which respondents regard situations in their life as stressful. This is done by asking the respondents to indicate the experienced frequency of 14 perceived stress statements. Similar to the food frequency, perceived stress is measured on a five-point scale ranging this time from never, almost never, sometimes and fairly often to very often. The PSS fits well into our study as, according to Cohen et al. (1983), it is especially suitable for a linkage with social support questions, since social support can alter the way (potentially) stressful situations are perceived. Since then, the PSS is a commonly used measure to detect stress levels in everyday life (Deatherage, Servaty-Seib and Aksoz, 2014), as well as under various different conditions such as smoking and alcohol consumption (Steptoe et al., 1996).

As a potentially moderating variable general Internet usage is captured with several questions. On the one hand rather general questions are asked about the frequency of Internet usage. On the other hand it is asked about the usage of social networks. The measurement of social support is quite sophisticated and many constructs exists. In order to keep the questionnaire short we decided for a rather narrow approach to measure social support. Exactly, the level of support is measured with the structural support question "About how many close friends and close relatives do you have (people you feel at ease with and can talk to about what is on your mind)" from Sherbournce et al. (1991). Finally, the questionnaire included some socio-demographic questions. In order to test the research questions, descriptive and inductive statistics are produced using SPSS Statistics 21. Inductive statistics include the application of one-way ANOVA (for the first research question), multiple regression analyses for the second and binary regression analysis for the third research question. Considering possible moderating effects for example of Internet usage on the relationship between stress and food choice in the regressions, interaction effects are also considered. Interactions test the combined effect of one or two variables on a dependent variable (Field, 2009). They help to explain if the magnitude of the effect that an independent variable has on a dependent variable depends on another third (moderator) variable (Hayes, 2012). Specifically, the following regression models are tested to answer the second research question:

(1) $Internet\ usage = \alpha_0 + \beta_1 * \#friends + e$

Regression model 1 tests according to the framework in Figure 1 if Internet usage is linked to social support (measured as number of close friends and relatives).

(2) $Healthy\ Eating = \alpha_0 + \beta_1 * stress + \beta_2 * Internet\ usage + \beta_3 * stress * Internet\ usage + e$

With regression model 2 it is tested if Internet usage moderates the relationship between food choice and stress.

(3) $Healthy\ Eating = \alpha_0 + \beta_1 * stress + \beta_2 * \#friends + \beta_3 * stress * \#friends + e$

Alternatively, regression model 3 observes if social support also moderates the relationship

between food choice and stress.

(4) $Healthy\ Eating = \alpha_0 + \beta_1 * stress + \beta_2 * Internet\ usage + \beta_3 * \#friends + \beta_4 *$
$stress * Internet\ usage + \beta_5 * stress * \#friends + e$

Regression 4 extends regression models 2 and 3 and considers the combined model.

(5) $Healthy\ Eating =$
$\alpha_0 + \beta_1 * Internet\ usage + \beta_2 * \#\ friends + \beta_3 * Internet\ usage * \#friends + e$

Finally, regression model 5 tests, independent of the stress relationship, if Internet usage can

explain food choice and also, if social support (measured as number of close friends and

relatives) moderates this relationship.

For the third research question, the impact of stress on dietary behavior change, moderated by

social support and diet information Internet search tendencies, model 6 is estimated as a binary

regression:

(6) $Behavioral\ Change =$
$\alpha_0 + \beta_1 * stress + \beta_2 * Diet\ information\ Internet\ serach\ tendencies\ (high)\ +$
$\beta_3 * \#friends + \beta_4 * stress *$
$Diet\ information\ Internet\ search\ tendencies\ (high) + \beta_5 * stress * \#friends + e$

The results will be shown in the following.

RESULTS

The sample

As the analysis of the socio-demographics shows, the gender ratio in the sample is about equal,

with 50.2% males and 49.8% females. The mean age of the sample is 24.6 years (SD = 3.1),

indicating that students are in the graduating stage of their studies. In line with rising

internationalization of study programs, the analysis of nationality shows a considerable amount of

international students (44.2%). Only 55.8% respondents are German, another 6.1% of

respondents are Italian, 5.5% of respondents are Chinese and another 3.1% of respondents are Spanish, followed by Russians with 2.5%. Concerning their living situation only 10% of the students still live at their parents' house. The other 90% moved out, with the majority of students living in shared apartments (57.6%). Another 16.1% of students indicate to live alone and 15.7% live together with their partner. The analysis further shows a relatively high educated sample with 55.2% of respondents holding a Bachelor's degree and 21.8% already been Postgraduate, which goes in line with the before mentioned relatively high mean age for a student sample. The income levels however are, characteristic for a student sample, relatively low, with the majority of respondents (41.5%) specifying their monthly budget between 500 and 899 €.

All participants were part of the target group, as they all confirmed to use the Internet. As expected the stated frequency of Internet usage within the sample was high, with 92.7% of respondents using the Internet several times a day. Only few respondents indicated a lower Internet usage of once a day (4.2%) or less (3%). The usage of social networks showed higher diversification in the sample, still however, with 75.5% most respondents indicated to use social networks often. Further 20.6% state to use social networks sometimes and only a small group of 3.9% reject to use social networks.

As outlined before, the questionnaire also asked about number of Facebook friends and the number of close friends or relatives, defined as "people you feel at ease with and can talk to about what is on your mind". Looking at the results, the number of Facebook friends ranged between 0 and 1500, with a mean of 385 Facebook friends (SD=232). On the contrary the number of close friends or relatives ranged between 0 and 40, with a mean of 7.6 (SD=5.2). Bringing these two questions into a ratio reveals that the number of Facebook friends clearly exceeds the number of 'real-world' friends or relatives. The two variables number of close friends and number of

Facebook friends are significantly correlated, the magnitude of correlation is rather small, however (r = .14, p>.05).

As outlined earlier, the level for perceived stress is obtained through the PSS. After reversing the scores on the positive expressed statements, a global stress value is obtained by summing across all 14 items. A performed reliability analysis confirms internal consistency with a Cronbach's Alpha of 0.794. Gender differences in the perceived level of stress are analyzed in a T-Test, with the result that women perceive significantly higher stress (M=31.99, SD=6.49) compared to men (M=29.35, SD=6.68); t(326)= -3.609, p < 0.001.

Research Question 1: Stress and eating motivations

In order to answer the first research question, the motives behind the food choices shall shortly be outlined. The performed Principal Component Analysis revealed the expected six Eating Motives: 'Habits', 'Convenience', 'Price', 'Sociability', 'Visual Appeal' and 'Social Image'.

Table 1: Motives for Food Choices

Factor	I select certain foods because…	Factor loading	Mean	Cronbach's Alpha
Habits	… I usually eat it	.895		
	… I am accustomed to eating it	.786	3.87	.784
	… I am familiar with it	.781		
Convenience	… it is quick to prepare	.863		
	… it is easy to prepare	.834	3.49	.792
	… it is the most convenient	.755		
Price	… I don't want to spend any more money	.876		
	… it is inexpensive	.823	3.16	.776
	… it is on sale	.760		
Sociability	… it makes social gatherings more comfortable	.853		
	… I can spend time with other people	.815	2.78	.728
	… it is social	.726		
Visual Appeal	… it spontaneously appeals to me (e.g. situated at eye level, appealing colours)	.840		
	… the presentation is appealing (e.g. packaging)	.808	2.64	.703
	… I recognize it from advertisements or have seen it on TV	.644		
Social Image	… it makes me look good in front of others	.801		
	… it is trendy	.758	1.88	.699
	… others like it	.731		

The subsequently performed reliability analysis also showed good results, with all Cronbach's Alphas above 0.7, besides the factor Social Image with a Cronbach's Alpha of 0.699. As Table 1 further shows 'Habits' is the motive rated most important with a mean of 3.86 on a five point scale, followed by 'Convenience' (3.48) and Price (3.16). The motives 'Sociability' and 'Visual Appeal' are rated considerably lower in importance with a mean of 2.78 and 2.64 respectively. Lastly with a mean of only 1.88 'Social Image' is rated as the least important motive for the selection of food.

To answer the first research question, the PSS is taken into account and related to the Food Choice Motives. Results of Oneway-ANOVA do not show any significant differences in the Food Choice Motives between respondents with higher/lower levels of perceived stress. Due to space constraints, the results are not shown here but are available from the authors upon request. This indicates that stress does not affect the motivations to eat.

Second research question: (Inter)relations between support, Internet usage on stress and healthy eating

Table 2 shows descriptive statistics of variables used to answer research questions 2 and 3.

**Table 2: Descriptive statistics of variables used in regression analyses**

Variable	Description	Mean (SD); Min / Max
Healthy Eating	Average frequency of fresh fruits, salad, cooked vegetables, meat, fish, milk products, cereals/ cereal products eaten per week	2.10 (0.40); 0.86/3.43
Perceived Stress Scale	Sum of 14 stress related items (Cohen, Kamarck and Mermelstein, 1983)	30.65 (6.71); 11/48
Number of friends	Number of close friends and close relatives (people one feels at ease with and can talk to about what is on mind)	7.66 (5.23); 0/40
Internet usage	Number of times person goes online per week	19.85 (4.16); 0.10/21
Diet information Internet search tendencies high	Dummy variable which is set equal to 1 if the person did go online 10 or more times in the past12 months for information about food or diet and 0 otherwise	0.33 (0.47); 0/1

Prior to a regression analysis checking for a moderator effect, it has to be tested if the dependent variable is normally distributed. Figure 4 shows a histogram with a normality curve of the dependent variable (healthy eating). Based on Figure 4 it is assumed that the dependent variable is approximately normally distributed.
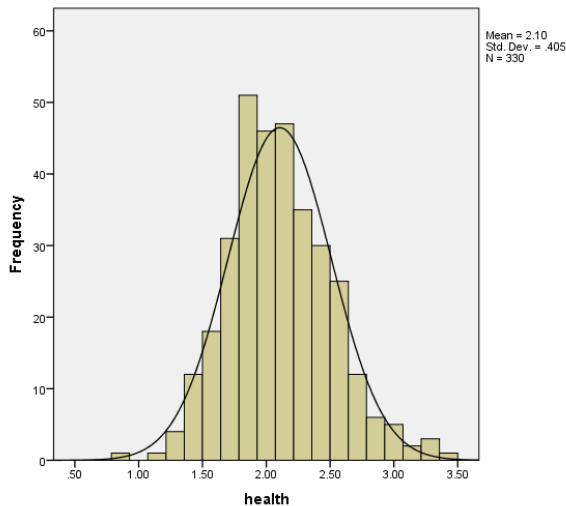
Figure 4: Histogram of the dependent variable (healthy eating) with normality curve

Moreover, for unification of the regression coefficients, and to make sure that the interacted variables have the same weight in the regression, the metric independent variables in the regressions have been z-transformed prior to regression estimation. Regarding regression model 1 (compare Figure 2) results of ordinary least squares estimation reveal that there is no significant relationship between social support and number of friends (results not shown). Thus, regarding the proposed framework in Figure 2, the first link between social support and Internet usage does not exist in the present sample. As a result, the framework is adjusted to Figure 5, which is then tested with regression models 2, 3 and 4. It assumes that perceived support and Internet usage are independent moderators of the relationship between stress and healthy eating.

Perceived (structural) support | Internet usage (coping)

Stress → Healthy Eating
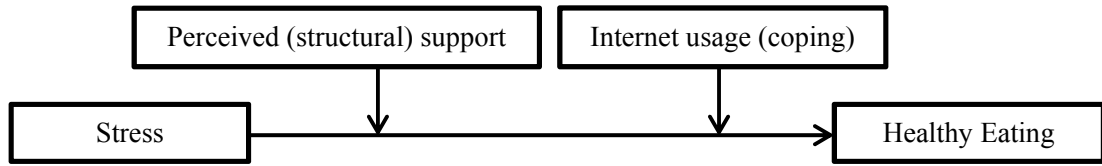
Figure 5: Adjusted framework to analyze the (inter)relations between support, Internet usage on stress and food choices

Figure 5 proposes to test the following relationships: if Internet usage moderates the relationship between stress and food choice (regression model 2), if social support moderates the relationship between stress and food choice (regression model 3), and finally, the relationship between stress and food choice is moderated by social support and Internet usage (regression model 4). Results are shown in Table 3.

Table 3: Factors influencing healthy eating – linear regression results

	Model 2 β-values (SE)	Model 3 β -values (SE)	Model 4 β -values (SE)
Constant	2.11*** (0.02)	2.10*** (0.02)	2.10*** (0.02)
Perceived Stress Scale (PSS)	-0.05** (0.02)	-0.05** (0.02)	-0.04* (0.02)
Number of friends		0.02 (0.02)	0.02 (0.02)
Internet usage	0.05** (0.02)		0.05* (0.02)
PSS * Internet usage	-0.03 (0.03)		-0.02 (0.03)
PSS * number of friends		-0.05** (0.02)	-0.05** (0.02)
F-value	3.61**	4.07***	3.22***
R^2	0.03	0.04	0.05

Note: ***, **, * denote significance level at 1%, 5%, and 10%, respectively.

Model 2 shows that there is a significant and negative relationship between stress and food choice, i.e. the more stressed students are the less healthy is their food choice (the less frequent do they eat healthy food groups per week). Internet usage is also significant but positively linked to food choices indicating that if students use the Internet more often, their food choices are healthier. The interaction effect between stress and Internet usage is not significant, indicating that Internet does not moderate the relationship between stress and food choice. However, there is a direct and positive relationship between Internet usage and food choice.

In model 3, social support, measured as number of close friends and relatives is considered to moderate the stress-food choice relationship. Again, there is a negative and significant relationship between stress and food choice. The relationship between number of friends and relatives and food choice is insignificant, however. On the contrary, the interaction effect between stress and number of close friends and relatives is negative and significant. This means that social support moderates the relationship between stress and food choice. The more close friends and relatives a student has, i.e. the better the social support, the smaller the negative effect of stress on food choice. Put differently, the diet of stressed students with a higher number of close friends and relatives is not so unhealthy compared to students under stress reporting a lower number of close friends and relatives. The relationships identified in models 2 and 3 replicate also in the combined model 4. In summary, social support moderates the relationship between stress and food choice while Internet usage has a direct (positive) effect on food choice. So, Internet usage is not a coping strategy while social support helps coping with stress. This result is shown in Figure 6.
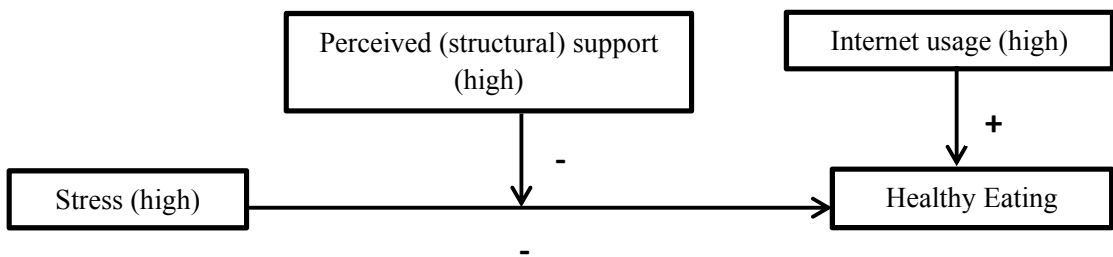
Figure 4: The (inter)relations between stress, support and Internet usage on food choice

Model 5 was used to test if the number of close friends and relatives has an effect on food choice independent of the level of stress, and also if the number of friends moderates the effect of Internet on food choice. Results of model 5 regression indicate that the number of friends is not a moderator for the relationship between Internet and food choice. The direct and positive effect of

Internet usage on food choice is however confirmed in this model (results not shown but available from the authors upon request).

Third research question: (Inter)relations between support, diet information Internet search tendencies, stress and dietary behavior change

The survey also analyzed the information sources for food and diet related topics, including recipes. Thereby the Internet could be identified as the most important information source being used by 79.1% of respondents, followed by friends and family as an information source (68.5%) and books and magazines being used as an information source by 45.8%. Looking further into which food and diet related topics are searched for in the Internet, recipes are named most often (82.0%), followed by health issues (49.6%), food ingredients (43.2%) and information on diets named by 30.3%. The information found on the Internet was thereby found somewhat useful (53.1%) or even very useful (28.7%) and 40.4% of respondents even stated that the information found on the Internet affected their dietary behavior. The latter is used to build the binary dependent variable for the regression model 6.

Subsequently the survey aimed at looking into the role of social networks as a platform for food and diet related discussions and information. For this, Facebook was taken as the representative for social networks and only those respondents who stated in the beginning to use social networks were taken into consideration. As the results show 13.2% of respondents engage in food or diet related discussions on Facebook, with again recipes being the topic named most often (9.8%). This is followed by the topics diets (5.7%), health (5.4%), food ingredients (5.4%) and food production (5.0%).

For answering the third research question, model 6 is estimated as a binary regression with dietary behavior change (changing diet or health behavior as a result of diet information search tendencies) as dependent variable, PSS and a dummy for high diet information tendencies and

number of friends (social support) as predictors as well as interactions between stress and

information search tendencies and stress and number of friends (Table 4) (compare Figure 3).

Table 4: Factors influencing behavioral change – binary regression results

	B (SE)	95% CI for Odds Ratio		
		Lower	Odds	Upper
Included				
Constant	-0.71 (0.13)			
Perceived Stress Scale (PSS)	0.03 (0.13)	0.83	1.05	1.35
Diet information search tendencies high	0.568*** (0.12)	1.40	1.76	2.22
PSS *diet information search tendencies high	0.006 (0.13)	0.71	0.99	1.13
# of friends	0.11 (0.12)	0.88	1.11	1.36
PSS* # of friends	-0.06 (0.13)	0.73	0.94	1.20

Note: ***, **, * denote significance level at 1%, 5%, and 10%, respectively. R^2 = 0.08 (Cox and Snell), .10 (Nagelkerke). Model $\chi^2(5)$=25.43, p<.01

Results indicate that there is no direct effect of stress on behavioral change. Also, there is no

moderator effect of neither diet information search tendencies nor social support (number of

friends) on the relationship between stress and dietary behavior change. However, the effect of

high diet information search tendencies in the Internet turns out to be highly significant and

therefore to have a direct effect on dietary behavior change. The odds of a change in dietary

behavior is about 1.76 times higher for students with high diet information Internet search

tendencies compared to students with lower search tendencies.

CONCLUSION

This paper presents results of an analysis about the impact of stress on dietary behavior, namely

food choice motives and healthy eating using a sample of international students in Germany.

While this study shows that stress is not related to different motivations to eat, such as sociability

or convenience (using the Eating Motivation Survey (Renner et al., 2012), the present study

confirms a number of previous studies on the extent of students (perceived) level of stress on

eating showing that diets become less healthy the more stressed students are (for example

Kandiah et al., 2006). Here, it also shows that more stressed students eat less healthy. Also it is

found that female students are generally more stressed than male students. Additionally, this

paper tries to answer the question whether Internet usage acts as a coping strategy to ease the

stressful situation and affects or moderates the relationship between stress and healthy eating.

Additionally, against the background of Lakey and Cohen (2000) this paper observes whether or

not social support can help to buffer the negative consequences of a stressful life on healthy

eating. Initially, it was looked for an association between social support and Internet usage, which

turned out to be not significant, however. In a second step this study therefore examined

interaction effects between social support measured as number of close friends and relatives, and

stress as well as Internet usage and stress to observe whether Internet usage or social support

independently moderate the relationship between stress and healthy eating. Results of multiple

regressions with interactions show that while Internet usage is not a moderator of the relationship

between stress and healthy eating, it has a direct effect on healthy eating. This indicates that

Internet usage is not a coping strategy, but rather that the more frequently the Internet is used, the

healthier are students' diets. Regarding social support, i.e. number of close friends and relatives,

this study identifies in fact a moderating effect. Social support moderates the relationship

between stress and healthy eating. The higher the social support, the lower is the negative effect

of stress on healthy eating, i.e. a higher number of close friends and relatives buffer the negative

consequences of stress on healthy eating.

In a third step it is observed whether or not stress has an effect on the statement that students

changed their dietary behavior due to Internet information search tendencies on diets and health.

Interaction effects between stress and information search are also considered as well as

interactions with social support. Results indicate that only information search activities have a

direct impact on dietary behavior change, i.e. the more students engage in Internet information search activities regarding health and diet related topics the more likely they are to change their dietary behavior.

The results of this study are important for public policy measures dealing with student health. Internet is everywhere and is shown to impact students' behavior – it is linked positively to healthy eating. More research is needed to identify exactly how the Internet can be used to alter health outcomes. Moreover, since social support moderates the relationship between stress and healthy eating, it seems advisable to enhance students' abilities to strengthen their support system while they are in the transition phase of living away from their family. Especially the fact that diet information search activities are positively associated with a dietary behavior change is promising. While it is unclear from this studies' findings whether the dietary behavior change is positive or lasting, it allows to postulate that using the Internet should increasingly being incorporated into public health measures targeted at students. More research is needed in this area and should be extended to other target groups as well.

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