

Reasons for Unhealthy Eating -

How Compensatory health beliefs and Personality are related to Eating Behavior

by

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Abstract

Despite high risks of unhealthy food intake many people engage in unhealthy eating behavior. One reason why they do not succeed to fulfil a healthy diet may be caused by compensatory health beliefs (CHBs). CHBs are beliefs that the negative effects of an unhealthy behavioral choice can be compensated or neutralized by engaging in a healthy behavior. Some research shows a negative influence of CHBs on health. Little research focuses on eating-specific CHBs and on factors which may be related to CHBs. Therefore, this study refers to CHBs related to eating behavior and on personality as a possible factor which might have a moderating effect on CHBs and eating behavior.

For the measurement of CHBs, eating behavior and personality an online survey was designed. The total sample consisted of 139 participants of whom the majority was student.

The study shows that people who tend to eat healthier are holding less CHBs, because CHBs were related weakly but negatively to healthy eating behavior ($r=-.22$). Personality did not moderate the relation between CHBs and eating behavior. But neurotic people are inclined to hold more CHBs, because Neuroticism was weakly positively related to CHBs ($r=.20$) and conscientious people tend to eat healthier, because Conscientiousness was weakly positively related to healthy eating behavior ($r=.24$).

It can be concluded that CHBs and healthy eating behavior are related. Moreover, CHBs and eating behavior are related to personality. It might be effective to develop interventions which focus on the enhancement of Conscientiousness and the improvement of Neuroticism in order to reach healthier eating behavior.

Keywords: Compensatory health beliefs; Compensatory health behavior; Eating behavior; Personality

ABSTRACT	2
1. INTRODUCTION	4
1.1 Eating behavior	4
1.2 Compensatory health beliefs	5
1.3 Personality	6
1.4 Aim of the study	8
2. METHOD	10
2.1 Procedure	10
2.2 Measures	10
2.2.1 Eating-specific CHB scale	10
2.2.2 Personality	11
2.2.3 Fruit, vegetables and snack consumption	12
2.2.4 Body-Mass-Index	12
2.4 Analysis	12
3. RESULTS	13
3.1 Participants	13
3.2 Vegetables and fruit consumption standard	14
3.3 Snack consumption	14
3.4 Correlation analysis	15
3.5 Moderation analysis	16
4. DISCUSSION	18
REFERENCES	22
APPENDIX	24

1. Introduction

1.1 Eating behaviour

Eating behavior has a high impact on people's health status. People who engage in an unhealthy diet are at increased risk of chronic diseases, like cardiovascular diseases, cancer, diabetes, and other conditions linked to obesity (World health organization [WHO], 2015). A healthy diet contains enough fruit and vegetable intake and little sugar, salt and fat intake. But due to an increase in processed food production, rapid urbanization and changing lifestyles many people are consuming now more foods high in energy, saturated fats, industrial trans fats, sugars, salt and not enough fruit and vegetables (WHO, 2015). According to the WHO, in 2014, globally more than 1.9 billion adults were overweight (body mass index (BMI) ≥ 25) and of these more than 600 million were obese (BMI ≥ 30). Overweight and obesity is ranked at the fifth position of the 19 leading risk factors for mortality in the world. Also, several other risk factors for mortality in the world, like high blood pressure, high blood glucose, high cholesterol and low fruit and vegetables intake, are the result of an unhealthy diet.

These numbers demonstrate how important it is to develop interventions against unhealthy food intake. Therefore, it is necessary to understand the reasons for people's food choices. The determinants for people's eating behavior are complex and influenced by biological, developmental, social, cultural and economic factors (Chadwick, Crawford & Ly, 2013). One common theory to understand people's behavior is the theory of planned behavior (TPB) (Ajzen, 1985). The TPB describes three factors as determinants of people's behavior. These factors are attitude towards the behavior, subjective norm and perceived behavioral control. Together these determinants create a behavioral intention which leads to the behavioral action. Thus intention is postulated as the antecedent of behavior (Ajzen, 1985).

On the one hand, a lot of research supported that the theory can explain health related behavior and that intention is a good predictor of the performance of a healthy diet (Godin & Kok, 1996; Povey, Conner, Sparks, James & Shepherd, 2000; Sheeran & Orbell, 1999). But on the other hand, much criticism exists about the predictive validity of the TPB, especially about the role of intention as predictor for the behavioral action (Sniehotta, Preeceau & Araújo-Soares, 2013). People who have the intention to perform a certain action but fail to act are described by Orbell and Sheeran (1998) as 'inclined abstainers'. This criticism is relevant for eating behavior, because often people have the intention to eat healthy but do not engage in healthy eating behavior. The question which arises here is why people with an intention to eat healthy do not engage in a healthy diet. There might be more factors explaining people's

eating behavior than the three factors of the TPB and intention. The concept of compensatory health beliefs (CHBs) deals with the gap between the intention to eat healthy and the behavior which is carried out but which is in contrast to the intention. The concept might give an answer to the question why people engage in unhealthy eating despite having the intention to eat healthy.

1.2 Compensatory health beliefs

CHBs are beliefs that the bad effects of an unhealthy behavior can be compensated by engaging in a healthy behavior (Knäuper, Rabiau, Cohen & Patriciu, 2004). People use CHBs to justify unhealthy behavior choices. For example: 'I can eat this piece of chocolate because I am going to the gym tonight.' CHBs are used when people are confronted with temptations like drinking a wine after finishing work or eating a tasty cake (Radtke & Scholz, 2012). In such situations a conflict arises between one's desires (eating the cake) and one's health goals (e.g. be healthy or lose weight). Because of the incompatibility between both goals, this conflict leads to a so-called cognitive dissonance. CHBs can be seen as a strategy to resolve this conflict (Knäuper et al., 2004). As mentioned by Knäuper and colleagues (2004), CHBs are an automatic motivated regulatory process to reduce cognitive dissonance, by justifying unhealthy behavior with the plan to carry out compensatory health behavior (CHbehavior). A CHbehavior is for example: eating less during the day, because of eating unhealthy the day before. Likewise, an unhealthy behavior can be justified by a CHbehavior which has been carried out in the past, for example: doing extra exercise, because of having a big dinner in the evening. Thus, CHBs can be activated before or after the behavior has occurred (Radtke & Scholz, 2012).

Continuously engaging in an unhealthy behavior, because of the assumption that healthy behavior can compensate for it can have bad effects on health in the long run (Knäuper et al., 2004). Several studies show a negative influence of CHBs on health. Knäuper et al. (2004) developed a scale to measure CHBs and the results showed a positive correlation with health-related risk behaviors (e.g, alcohol consumption, smoking or unhealthy food intake) and illness symptom reports. Also, higher CHBs scores were associated with a higher Body-Mass-Index (BMI), an important risk factor for obesity. Furthermore, research demonstrates that holding CHBs is related to lower goal achievement. Especially in tempting situations (e.g. eating a high calorie cookie) dieters use CHBs to justify a goal-inconsistent choice as shown by Monson, Knäuper and Kronick (2008). The assumption that CHBs undermine people's intentions and goal achievements to behave healthily is in line with

research on smokers. These studies indicate that smoking specific CHBs are negatively associated with the intention to stop smoking (Radtke, Scholz, Keller & Hornung, 2012; Radtke, Scholz, Keller, Knäuper & Hornung, 2011).

CHBs do not necessarily lead to negative health effects (Knäuper et al., 2004). CHBs can be accurate, partially accurate or inaccurate (Rabiau, Knäuper, Miquelon, 2006). This depends on CHbehavior, which is actually carried out or not. CHBs are accurate if the person really engages in the CHbehavior and it effectively reduces the negative effects of the unhealthy behavior. But unhealthy behavior often causes diverse negative effects on health and CHbehavior may not neutralize all negative effects of the performed unhealthy behavior. Moreover, people often do not actually carry out the planned CHbehavior, because too much time has passed and the felt dissonance decreases (Knäuper et al., 2004). So CHBs are usually only partially accurate or inaccurate which can have negative effects on health.

1.3 Personality

Some research exists about factors which affect CHBs, but few studies have focused on personality traits. For example, evidence can be found that self-efficacy influences CHBs. High scores on the CHB scale by Knäuper et al. (2004) were related to low health-related self-efficacy. Moreover, if self-efficacy is low CHBs often are inaccurate and the person does not engage in the compensatory behavior. On the other hand, if self-efficacy is high it is more probable that the behavior is actually carried out (Rabiau, Knäuper & Miquelon, 2006). The same may be true for specific personality traits. People with a particular personality trait might be more likely to use CHBs to justify unhealthy behavior than people with other traits. Furthermore, it is possible that a person's personality influences whether the compensatory behavior will actually be carried out or not.

This study focuses on the Five-Factor Model of personality traits (FFM) or the Big Five from Costa and McCrae (1992), as represented in their self-report inventory, the NEO-PI-R. The five traits demonstrate basic dimensions of personality and each can be divided into six sub traits: Extraversion (warmth, gregariousness, assertiveness, activity, excitement seeking, positive emotions), Neuroticism (anxiety, angry hostility, depression, self-consciousness, impulsiveness, vulnerability), Openness to Experience (fantasy, aesthetics, feelings, actions, ideas, values), Agreeableness (trust, straightforwardness, altruism, compliance, modesty, tender-mindedness,) and Conscientiousness (competence, order, dutifulness, achievement striving, self-discipline, deliberation).

Like CHBs, personality traits have an impact on people's health behavior and their health status. Personality traits are predictive of whether a person is more likely to engage in bad health behaviors, like smoking or alcohol consumption (Turiano, Chapman, Grunewald & Mrocek, 2013). Especially, much evidence can be found for Conscientiousness and Neuroticism as predictors of health. A study by Atherton, Robins, Rentfrow & Lamb (2014) demonstrated the relation between the Big Five traits and three important health outcomes: general self-report health, BMI and substance use. Conscientiousness was connected to all three health outcomes. People with poor self-control and less responsibility (low Conscientiousness) were disposed to report poorer general health, be more overweight and more involved in substance use (Atherton et al., 2014). Results of another study illustrate that only Conscientiousness and Neuroticism of the Big Five traits predict health behavior. In this study, health behavior related to physical activity and frequency of fatty food consumption (Hall, Fong & Epp, 2013). According to Turiano et al. (2013) higher levels of Conscientiousness were related to a lower mortality risk and lower levels of Conscientiousness were related to a greater mortality risk. This relation was mediated by engaging in unhealthy behaviors: smoking, alcohol use and bad eating and exercise habits (Turiano et al., 2013). Personality traits can also influence eating styles and food choices. Individuals higher in Extraversion, Openness and Conscientiousness are more likely to consume healthy food like cereal products, fish, fruits and vegetables. People scoring higher on Neuroticism are more likely to consume sweet and savoury foods (Keller & Siegrist, 2014; Mottus, Allik, Esko, Realo, Deary & Metspalu, 2012).

The findings mentioned above demonstrate how big the impact of personality traits on health can be. Because personality traits influence health related behaviors, like food consumption, they have an important effect on people's health. Due to this high impact on health it is necessary to get more insight in the role of personality on CHBs. If personality traits have an impact on health related behaviors and people with specific personality traits are at more risk to engage in unhealthy behaviors, it is possible that personality traits also influence whether a person uses CHBs to justify the unhealthy behavior. However, little research has directly examined the association between personality and CHBs. Only Knäuper et al. (2004) measured the relation between CHBs and the Big Five personality traits. They only found a negative correlation between Conscientiousness and CHBs.

1.4 Aim of the study

The study from Knäuper et al. (2004) measured CHBs in general. The present study focuses on CHBs in eating behavior. To get better insight in the influence of personality traits on CHBs and eating behavior more research is necessary which especially takes healthy and unhealthy eating behavior into account. The study's goal is to give more insight in the relation between CHBs and eating behavior, as well as to figure out which influence personality has on this relation. Based on previous research mentioned above it can be expected that the variables personality, CHBs and eating habits are related and several suggestions can be made. The conflict between the temptation to eat unhealthy food and someone's health goals leads to the use of CHBs to justify the behavior. It can be expected that this process is influenced by personality. Research showed that the personality trait Conscientiousness is more often related to healthy behavior and Neuroticism is more often related to unhealthy behavior. (Atherton et al., 2014, Hall et al., 2013, Turiano et al., 2013). One explanation for this relation might be that conscientious people tend to have higher self-control and neurotic people lower self-control (Hall et al., 2013). Self-control is very important to withstand unhealthy, tasty food, especially when the eating of that food does not match with someone's health goals. For this reason, it might be possible that people who are more conscientious make less use of CHBs and have a healthier diet and people who are more neurotic make higher use of CHBs and have a less healthy diet.

Furthermore, it can be suspected that personality also influences the relation between CHBs and CHbehavior. Knäuper et al. (2004) mentioned that CHBs can be accurate, partially accurate or inaccurate. This depends on whether the person actually carries out the CHB into CHbehavior. Research already demonstrated that this relation depends on self-efficacy (Rabiau et al., 2006). The same can be true for personality. People who are conscientious and have higher self-control might more often actually carry out the CHbehavior and people who are neurotic and have less self-control might less often carry out the CHbehavior.

Based on the suggestions mentioned above, the following research questions can be formulated:

1. Are personality traits related to eating specific compensatory health beliefs and compensatory health behavior?
2. Do personality traits moderate between compensatory health beliefs and eating behavior? (figure 1)

3. Do personality traits moderate between compensatory health beliefs and compensatory health behavior? (figure 2)

By measuring personality, CHBs, CHbehavior and eating behavior, the study tries to answer these questions. Because people often engage in unhealthy eating despite their health goals, this study can be useful to develop interventions which deal with determinants people are less aware of like CHBs and personality. More information about the influence of personality on the relation between CHBs and eating behavior can be useful to understand why some people are more likely to engage in an unhealthy diet or have more problems to withstand the temptation of unhealthy food. More comprehension about the influence of personality can be helpful to develop interventions which reduce unhealthy eating behavior.

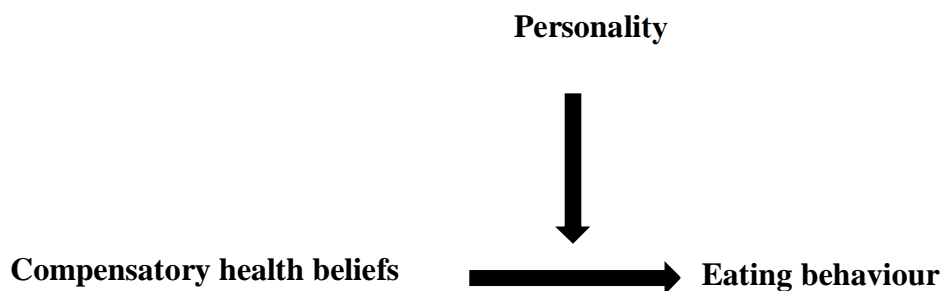


Figure 1. Moderating effect of personality on CHBs and eating behavior

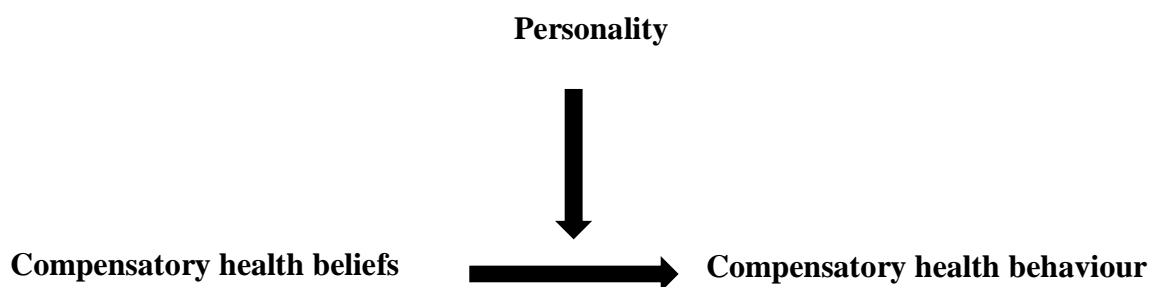


Figure 2. Moderating effect of personality on CHBs and compensatory health behavior

2. Method

2.1 Procedure

An English online questionnaire was set up with the *Qualtrics Survey Software*. After the study was approved by the ethical commission of the University of Twente, participants were recruited through the research system *Sona-system* of the University of Twente and the online social networking service *Facebook*. The *Sona-system* is an experiment management system of the behavioral science faculty which enables researchers to acquire respondents who use the system to earn studycredits for their participation. By participating via the *Sona-system* students from the University of Twente were rewarded with 0.5 credits. Participation was possible from March, 25th until May 1st, 2015. To avoid social desirable answers, participants were not informed about the measuring of compensatory health beliefs, beforehand. They only were informed that the study measured eating habits. They were asked to think of the answers that fit them and their habits the most and to answer the questions as honest as possible. Participants were told that the survey would take 20 minutes. They were informed that all provided information would be dealt with confidentiality and that they could stop the questionnaire at any time, if they felt uncomfortable. After participants gave their informed consent to take part in the survey they had to answer demographical questions (gender, age, profession, nationality, length, weight) which were used for descriptive analysis. Furthermore, the questionnaire contained the Big Five Inventory-10 to measure personality traits, ten items about CHBs, nine items about CHbehavior and five items to measure fruit, vegetables and snack consumption. After completing the survey, respondents were informed about the main study's goal, measuring the influence of personality traits on compensatory health beliefs and eating habits. To get more information about the study and the results, participants had the opportunity to give their email-address.

2.2 Measures

2.2.1 Eating-specific CHB scale

To measure CHBs a scale which was previously developed to measure eating related CHBs was used (te Wilde, 2013). The eating-specific CHB scale was developed because of criticism about the original CHB scale from Knäuper et al. (2004). The original scale consisted of 17 items which were subdivided into four subscales (substance use, stress, weight regulation, eating/sleeping habits). According to Kaklamanou, Armitage and Jones (2013), respondents had problems to understand the formulation of the items and their study has shown poor reliability of the subscales. Furthermore, the scale from Knäuper et al. (2004)

measured general CHBs. Just two items referred to eating habits and they belong to the same subscale as sleeping habits. Due to the aim of the present study to measure eating related CHBs a scale which focuses on eating habits was considered more useful.

The eating-specific CHB scale consisted of ten items which were subdivided into three different types of compensating behavior. The first three items referred to *eating- less/nothing* to compensate unhealthy eating. For example, whether people believe that it is ok to eat unhealthy once in a while as long as they eat less the rest of the day. The next three items were related to *doing sport* to compensate unhealthy food. For example, that working out today can compensate for eating unhealthy on yesterday. The last four items referred to *eating healthy* to compensate unhealthy food. Here it was assumed that an unhealthy meal can be neutralized by eating a healthy meal (te Wilde, 2013). The items were scored on a five-point scale ranked from strongly disagree (1) to strongly agree (5). The Cronbach's alpha of the scale was $\alpha=.83$. By deleting item 8, because of the item's low internal consistency, Cronbach's alpha increased $\alpha=.85$.

To measure CHbehavior the items of the eating-specific CHB scale were translated into actual behavior for this study. For example, how often someone worked out to compensate for eating unhealthy the day before in the last two weeks. The scale consisted of nine items which were subdivided into the three different types of compensating behavior (*eating – less/nothing, doing sport, eating healthy*) again. The items were scored on a five-point scale ranked from never (1) to always (5). The Cronbach's alpha of the scale was $\alpha=.86$. The two scales can be found in the appendix.

2.2.2 Personality

To evaluate the participants' personality traits a 10-item short version (BFI-10) of the Big Five Inventory (BFI-44) was used (Rammstedt, John, 2007). The BFI-10 was developed for studies in which participants' time is restricted and showed good levels of reliability and validity (Rammstedt, John, 2007). The questionnaire consisted of ten items which were scored on a five-point scale ranged from strongly disagree (1) to strongly agree (5). Each of the Big Five dimensions was measured by two items. For example: 'I see myself as someone who does a thorough job' measures Conscientiousness and 'I see myself as someone who gets nervous easily' refers to Neuroticism. To classify respondents' personality the score of each Big Five dimension was calculated. The Cronbach's alpha for each trait was weak to moderate: Extraversion $\alpha= .58$, Agreeableness $\alpha=.15$, Conscientiousness $\alpha= .43$, Neuroticism $\alpha= .70$ and Openness $\alpha= .07$.

2.2.3 Fruit, vegetables and snack consumption

To define whether people were having healthy eating habits or not, the consumption of fruit, vegetables and snacks was measured. To measure fruit and vegetables consumption four questions from the standardized questionnaire on food consumption used for the Public Health Monitor in the Netherlands were used (Rijksinstituut voor Volksgezondheid en Milieu, 2005). According to the World Health Organization (2015) a healthy diet consists of the daily consumption of 200g fruit and 200g vegetables. Therefore, participants were asked how many days per week they eat vegetables and fruit. The score ranged from zero to seven days per week. Next to frequency participants were asked about the amount of consumed fruit and vegetables per day. The amount of consumed vegetables was measured in serving spoons (where one serving spoon is about 50g). The score ranged from zero to seven serving spoons per day. The amount of consumed fruits was measured in pieces. The score ranged from zero to seven pieces per day.

Besides frequent and sufficient consumption of fruit and vegetables a healthy diet consists of rare intake of unhealthy food or snacks. Assema, Brug, Ronda and Steenhuis (2001) developed a Fat List to measure the frequency of different kinds of unhealthy food consumption. In the present research only one question about weekly snack consumption (sweets and/or chips) was used. The score ranged from zero to seven days per week. To fulfil a healthy diet, it is necessary to eat at least four serving spoons vegetables and two pieces of fruit on each day (WHO, 2015). Next to this, low snack consumption can be seen as healthy eating behavior.

2.2.4 Body-Mass-Index

The questionnaire contained items about length and weight to measure respondent's Body-Mass-Index (BMI). To do so, the weight in kg is divided by the length in m² (kg/m²). Because the BMI provides information about overweight or healthy weight, it might be an indicator for unhealthy eating habits. A BMI under 18,5 indicates underweight, 18,5-25 is considered normal, 25-30 is regarded as overweight and above 30 indicates obesity.

2.3 Analysis

For the data analysis the Statistical Package for the Social Science (SPSS 22.0 for Windows) was used. First of all, the demographic information of the sample was analysed. Next, to ensure reliability of the items, internal consistency was measured with Cronbach's alpha (α) for each construct. Correlation analysis was used to indicate whether there are

correlations between the constructs. The standard level of statistical significance has a value less than .05 (Fisher, 1956, cited in Field, 2009). The strength of a relationship between variables is based on the effect size. An effect size of $r=.10$ is a small effect, $r=.30$ is a medium effect and $r=.50$ is a large effect (Cohen, 1988, 1992, cited in Field, 2009). Finally, to measure whether personality moderates the effect of CHB on eating behavior and CHbehavior, a moderation analysis was done with multiple regression analysis, described by Baron and Kenny (1986). For this, the two predictor variables were centred and their interaction was computed. Then the predictor variables, the interaction term and the dependent variable were entered into a simultaneous regression model for measuring the possible moderation.

3. Results

3.1 Participants

The survey was started by 187 people and completed by 139 participants. Of the total sample 64% were females and 36% males. The mean age was 22 (SD=3.7) years. The youngest participant was 18 and the oldest 52 years. The majority of the sample was German (66.9%) and student (92.8%), 33.7% were Dutch. Most women (75.3%) as well as most men (78.0%) had a BMI in the normal range. 13% of the participants were overweight, whereof 9 (10.1%) were female and 4 (8.0%) men. From the total sample 2 (1.4%) women were obese. Table 1 shows the descriptive statistics of the measured constructs BMI, CHB, CHbehavior and the five personality traits.

Table 1. *Descriptive statistics of BMI, CHB, CHbehavior and personality*

	Scale	Minmum	Maximum	Mean	SD
BMI		17.0	40.0	22.2	3.2
CHB	1-5	1.0	4.3	2.7	0.6
CHbehavior	1-5	1.0	3.7	2.2	0.7
Extraversion	1-5	1.5	5.0	3.5	0.7
Agreeableness	1-5	2.0	5.0	3.5	0.6
Conscientiousness	1-5	1.5	5.0	3.3	0.8
Neuroticism	1-5	1.0	5.0	2.9	0.9
Openness	1-5	1.5	5.0	3.5	0.7

3.2 Vegetables and fruit consumption standard

Most participants did not meet the requirement of the vegetables and fruit consumption standard (table 3). Of the total of 139 people who participated, only 14 (10.1%) complied with the standard to eat at least 200g vegetables and 200g fruit every day. More men (14.0%) than women (7.9%) complied with the standard. The number of participants who complied either with the vegetables consumption standard or fruit consumption standard was a bit higher. 31 (22.3%) participants whereof 21 (23.6%) were women and 10 (20.0%) male ate 200g vegetables per day. The same was true for the fruit consumption standard to eat at least 200g fruit every day.

Table 2. *Compliance with vegetables and fruit consumption standard related to gender*

		Women	Men	Total
Vegetables standard	Comply	21 (23.6%)	10 (20.0%)	31 (22.3%)
	Not comply	68 (76.4%)	40 (80.0%)	108 (77.7%)
Fruit standard	Comply	21 (23.6%)	10 (20.0%)	31 (22.3%)
	Not comply	68 (76.4%)	40 (80.0%)	108 (77.7%)
Combined vegetables and fruit standard	Comply	7 (7.9%)	7 (14.0%)	14 (10.1%)
	Not comply	81 (91.0%)	43 (86.0%)	124 (89.9%)

3.3 Snack consumption

As shown in figure 3 most participants consumed snacks like chips or sweets on 3 (23.7%) or 2 (22.3%) days per week. 10.8% ate snacks on every day. The majority of women (24.7%) consumed snacks on 2 days per week (n=89). Most men ate snacks on 3 days (28.0%) or 1 day (26.0%) per week (n=50).

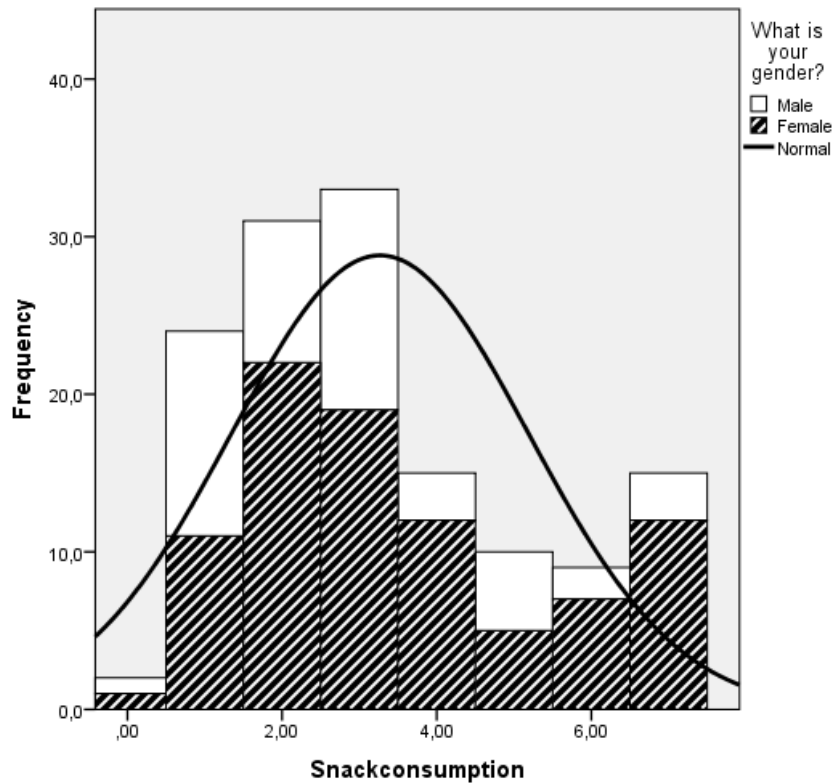


Figure 3. *Snack consumption related to gender*

3.4 Correlation analysis

Table 4 shows the correlation coefficients between CHB, CHbehavior, healthy eating behavior, snack consumption, BMI and the five personality traits. Healthy eating behavior is represented by the mean of the questions according to participants' daily fruit and vegetables consumption in a continuous size, because the number of participants who comply with the vegetables and fruit consumption standard was too small for statistical analysis.

There was a moderate positive significant relationship between CHBs and CHbehavior. That means that participants with a high score of CHBs scored high on CHbehavior and participants with a low score on CHBs scored low on CHbehavior. Furthermore, CHBs were weakly positively correlated with Neuroticism and CHbehavior with Openness. Therefore, participants with higher CHBs scored higher on Neuroticism and participants with lower CHBs scored lower on Neuroticism. Participants who engaged in CHbehavior more often scored higher on Openness, whereas participants who engaged in CHbehavior less often scored lower on Openness.

Healthy eating behavior was weakly related to CHBs. Because the relationship was negative, participant's with a high amount of daily fruit and vegetables consumption scored

low on CHBs and the other way around. Next to CHBs, healthy eating behaviour had a weak positive correlation with Conscientiousness. That implies that participants who ate more fruit and vegetables, scored higher on Conscientiousness, whereas participants who consumed less fruit and vegetables scored lower on Conscientiousness.

Table 4. *Correlation analysis between CHB, CHbehavior, Healthy eating behavior, Snack consumption, BMI and Personality.*

	CHB	CH-behavior	Healthy eating behavior	Snack-consumption	BMI	E	A	C	N	O
CHB	1									
CH-Behavior	.44**	1								
Healthy eating behavior	-.22**	-.04	1							
Snack consumption	.13	.12	.19	1						
BMI	-.12	.07	.17*	-.05	1					
E	-.06	.08	.16	-.11	.16	1				
A	.12	-.01	-.00	-.01	.12	.18*	1			
C	-.01	.01	.24*	-.10	.02	.13	.10	1		
N	.20*	.12	-.05	-.04	-.12	-.06	.02	-.05	1	
O	.16	.17*	-.02	-.02	.03	.14	.19*	.04	.15	1

Note. * $p < .05$, ** $p < .01$, E: Extraversion, A: Agreeableness, C: Conscientiousness, N: Neuroticism, O: Openness

3.5 Moderation analysis

Because CHBs were significantly correlated with eating behavior and there was a significant relationship between Conscientiousness and eating behavior, the first suggestion that personality has a moderating effect on the relation between CHBs and eating behavior was possible. Because Conscientiousness was the only personality trait significantly related to eating behavior, the moderation analysis was done with this trait. A multiple regression model was used to analyse whether the association between CHBs and eating behavior was depended on the degree of Conscientiousness. After centring the variables CHBs and Conscientiousness and computing their interaction, the two predictors and the interaction term

were entered into a multiple regression model with eating behavior as dependent variable. The results are shown in table 5. CHBs ($b=-.37$, $SE=.14$, $\beta=-.22$, $p<.01$) and Conscientiousness ($b=.37$, $SE=.12$, $\beta=.27$, $p<.01$) were both related to eating behavior. The interaction between CHBs and Conscientiousness was not significant ($b=.19$, $SE=.17$, $\beta=.09$, $p>.05$). The effect of CHBs on eating behavior was not dependent on the degree of Conscientiousness. There was no moderating effect of Conscientiousness on the relation between CHBs and eating behavior.

Because Openness was significantly correlated with CHbehavior the second suggestion that personality moderates the effect of CHBs on CHbehavior was tested with this trait. The results are shown in table 6. CHBs was related to CHbehavior ($b=.49$, $SE=.10$, $\beta=.42$, $p<.001$). Openness was no longer related to CHbehavior ($b=.11$, $SE=.08$, $\beta=.11$, $p>.05$). The interaction between CHBs and Openness was not significant ($b=.04$, $SE=.11$, $\beta=.03$, $p>.05$). The effect of CHBs on CHbehavior was not dependent on the degree of Openness. There was no moderating effect of Openness on the relation between CHBs and CHbehavior.

Table 5. Multiple regression analysis with healthy eating behavior as dependent variable.

	B	SE(B)	β
Constant	4.91	.07	
CHB	-.37	.14	-.22*
Conscientiousness	.37	.12	.27*
Interaction CHB and Conscientiousness	.19	.17	.09

Note. * $p<.01$

Table 6. Multiple regression analysis with compensatory health behavior as dependent variable.

	B	SE(B)	β
Constant	2.2	.06	
CHB	.49	.10	.42*
Openness	.11	.08	.11
Interaction CHB and Openness	.04	.11	.03

Note. * $p<.00$

4. Discussion

The aim of the study was to get more insight in the relation between CHBs and eating behavior, as well as to figure out which influence personality has on this relation. It can be concluded that CHBs are negatively but weakly related to healthy eating behavior. People who tend to have more CHBs eat less healthy and people who have less CHBs are inclined to eat healthier. This finding is in line with previous researches that CHBs are related to unhealthy behavior like smoking, alcohol consumption or unhealthy food intake and that people holding CHBs are at a higher risk to behave in unhealthy behavior (Knäuper et al., 2004; Radtke, Scholz, Keller & Hornung, 2012; Radtke, Scholz, Keller, Knäuper & Hornung, 2011). The present result extends earlier findings about the relation between CHBs and eating behavior, because the study was focused on eating specific CHBs in contrast to the measurement of CHBs in general which was done earlier by Knäuper et al. (2004). By this, a deeper insight in the connection between CHBs and eating behavior is given. According to the present result, people holding eating-specific CHBs might be at a higher risk to behave in unhealthy eating.

Furthermore, it can be reasoned that CHBs are determinants of unhealthy eating behavior and food choices. Understanding the determinants which lead to unhealthy eating habits is important for enhancing healthy eating behavior. By this, interventions can be developed in order to improve or overcome the factors which lead to unhealthy eating behavior. CHBs as a determinant for unhealthy eating behavior expands already existing reasons like biological, developmental, social, cultural and economic factors (Chadwick, Crawford & Ly, 2013). Therefore, it might be useful to reduce the impact of CHBs in order to improve people's eating habits, which is important with regard to the risks caused by unhealthy food intake.

Moreover, the finding may help explain why people with the intention to eat healthy do not fulfil a healthy diet. Referring to the TPB, intention is seen as reason for a behavioral action (Ajzen, 1985). But this is not in line with people who have the intention to eat healthy but do not fulfil a healthy diet (Orbell & Sheeran, 1998). Mostly, CHBs are used to resolve conflicting situations between one's desires (e.g. eating a delicious cake) and one's health goals or intention (e.g. losing weight) by justifying the unhealthy behavior with the plan to carry out healthy behavior (Knäuper et al., 2004; Radtke&Scholz, 2012). Because CHBs were negatively related to eating behavior, it may be possible that someone's CHBs keep them away from fulfilling his/her intention to eat healthy and instead engage in unhealthy food intake more often.

Next to eating behavior, CHBs were also moderately related to CHbehavior. That means that people who have CHBs might engage in CHbehavior more often. On the one hand, this can be seen as positive, because earlier studies claim that if CHBs are used to justify unhealthy behavior, people do not actually engage in the CHbehavior which causes negative effects for people's health (Knäuper et al., 2004). CHBs can be accurate, partially accurate or inaccurate, depending on the CHbehavior which is actually carried out or not (Rabiau, Knäuper, Miquelon, 2006). The participants of the present study tend to hold more accurate or partially accurate CHBs, because CHBs were positively related to CHbehavior. On the other hand, it is not sure if CHbehavior can neutralize all negative effects of the performed unhealthy behavior. Especially with eating behavior this is questionable. Can eating less or nothing the next day really compensate for eating unhealthy the day before? More research is needed to answer questions like this. At this point it only seems obvious that eating less or nothing cannot be the desired eating behavior for a healthy diet. The study shows that the participants are holding CHBs and engaging in CHbehavior. If CHbehavior cannot neutralize all negative effects of the performed unhealthy eating behavior, those people endanger their health by holding CHBs. So it seems clear that interventions are needed which make people conscious about their CHBs to enhance healthy eating habits and take them away from holding the belief to compensate performed unhealthy eating behavior by engaging in a healthy behavior.

To get a better understanding of the relation between CHBs and eating behavior the study focused on personality as well, because personality traits play an important role in health behavior. The findings help to understand why some people are more likely to engage in an unhealthy diet or have more problems to withstand the temptation of unhealthy food. Despite expectations, the relation between CHBs and eating behavior was not moderated by personality. However, Conscientiousness was weakly positively related to healthy eating behavior and Neuroticism correlated weakly positively with CHBs. This is in accordance with the suggestions that conscientious people tend to eat healthier and that neurotic people are more likely to make use of CHBs to justify unhealthy eating behavior choices. The positive relation between Conscientiousness and health was already reported by earlier studies (Atherton et al., 2014; Hall et al., 2013; Keller & Siegrist, 2014; Mottus et al., 2012; Turiano et al., 2013). Little is known about the relation between CHBs and personality. Only Knäuper et al. (2004) found a negative relation between Conscientiousness and CHBs. The present study cannot support this correlation, but the measured positive relation between Neuroticism and CHBs does not contradict the earlier finding. Together the findings can be useful for

interventions against CHBs to improve people's eating behavior by taking the two personality traits into account. Characteristics of the Conscientiousness trait can be enhanced to increase healthy eating behavior and characteristics of the Neuroticism trait can be improved to reduce the use of CHBs. The interventions can focus on the enhancement of self-control and self-discipline which belong to Conscientiousness and are important to fulfil a healthy diet and are often not present in people having problems to eat healthy (Elfhag & Morey, 2008). Neuroticism contains factors like impulsiveness which are related to unhealthy eating behavior and should be reduced to enhance a healthy diet (Claes, Vandereycken, Luyten, Soenens, Pieters & Vertommen, 2006). CHBs are usually used when people are confronted with temptations (Radtke&Scholz, 2012). In such situations self-control to withstand unhealthy food intake might be especially important. People high in Conscientiousness are used to having more self-control than people high in Neuroticism (Hall, et al., 2013). So focusing on the personality traits Conscientiousness and Neuroticism might be helpful to overcome and reduce the impact of CHBs in tempting situations.

The relation between CHBs and CHbehavior was also not moderated by personality, but Openness was weakly positively related to compensatory health behavior. People high in Openness tend to make more use of CHbehavior. As mentioned above, it is not clear if CHbehavior really compensates for performed unhealthy behavior, therefore more research is needed to decide whether it is useful to enhance the use of CHbehavior by focusing on the trait Openness or not. It seems more important to focus on the reduction of CHBs, because then no CHbehavior is necessary to compensate for a performed unhealthy behavior.

The present study gives a greater insight in the relation between CHBs, healthy eating behavior and personality, but for future research some limitations and suggestions for improvement can be mentioned. Healthy eating behavior was measured by the daily consumption of fruit and vegetables. According to the standard, people have to eat at least 200g fruit and 200g vegetables every day to fulfil a healthy diet. This standard is very high and many people do not comply with it. But it is questionable to conclude that those people have unhealthy eating habits. Often, people only eat enough vegetables or fruit, not both but it cannot be concluded that they are eating unhealthy. Because few respondents comply with the standard, the consumption of fruit and vegetables was measured in a continuous size in the present study. Next to the measurement of fruit and vegetables consumption, this study only contained one question about weekly snack consumption. For future research in the area of eating specific CHBs a broader measurement of people's eating habits is useful. More questions can be helpful to get a better overview of people's eating habits. Next to this, more

general questions about how often people eat during the day and at what time, can give a better insight. Moreover, it might be valuable to focus future studies on the consumption of energy drinks, because their consumption increases and the growing criticism about possible health risks, especially for young people (Seiferts, Schaechter, Hershorin & Liphultz, 2010).

The study's goal was to figure out the role of personality in eating specific CHBs and eating behavior. The reliability of the used BFI-10 scale to measure personality was moderate to weak and the observed relations were not very strong. For further research a longer questionnaire may be necessary to get more reliable results. Despite this limitation, the present study was able to show some relations between personality, CHBs and eating behavior. Prospective research can be used to test the reliability of these findings.

The majority of the sample was student and most participants had a BMI in the normal range. This has to be taken into account for the interpretation of the present findings, because by carrying out the same study with another group different results might be possible. For example, different relations between CHBs, eating behavior and personality in a sample of overweight or less educated people might be expected. Further research in eating specific CHBs can focus on target groups like this.

The existing study allows a better comprehension of the relation between eating specific CHBs and eating behavior. It can be concluded that CHBs and healthy eating behavior are related. People with less CHBs tend to eat healthier than people with more CHBs. Moreover, CHBs and eating behavior are related to personality. Conscientious people are inclined to eat healthier and neurotic people tend to hold more CHBs. These findings are important because they show that people holding CHBs may be at a higher risk to eat unhealthy. Interventions which focus on CHBs can be useful to enhance people's eating behavior. Moreover, the insight about the role of Conscientiousness and Neuroticism in eating behavior and CHBs can be helpful to set up effective interventions which take the characteristics of those traits into account. It might be effective to enhance factors of the Conscientiousness trait like self-control and to improve neurotic traits like impulsiveness. By taking personality traits into account, people's CHBs can be decreased in order to develop better eating habits and to help people fulfilling their health goals. The enhancement of society's healthy eating behavior is a necessary step with regard to the alarming risks caused by unhealthy food intake.

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6. Appendix

Eating-specific CHbehavior scale

How well do the following statements describe your behavior?

How often in the last two weeks did you...

... eat less the rest of the day, because you ate unhealthy?

- Never
- Rarely
- Sometimes
- Most of the time
- Always

... eat sweets and/or chips in the evening, because you didn't eat much during the day?

- Never
- Rarely
- Sometimes
- Most of the time
- Always

... eat less the rest of the day to compensate for eating unhealthy?

- Never
- Rarely
- Sometimes
- Most of the time
- Always

... eat snacks or unhealthy things, because you exercised during the day? Never

- Rarely
- Sometimes
- Most of the time
- Always

... work out to compensate for eating unhealthy the day before? Never

- Rarely
- Sometimes
- Most of the time
- Always

... neutralize an unhealthy meal by eating a healthy meal (fruits, vegetables etc.)? Never

- Rarely
- Sometimes
- Most of the time
- Always

... eat one or two unhealthy things because you ate healthy during the entire day? Never

- Rarely
- Sometimes

- Most of the time
- Always

... eat only low-calorie food to compensate for eating sweets and/ or chips the day before?
Never

- Rarely
- Sometimes
- Most of the time
- Always

... eat only low-calorie food to compensate for an unhealthy meal? Never

- Rarely
- Sometimes
- Most of the time
- Always

Eating-specific CHB scale

How well do the following statements describe your beliefs?
I think that...

... it is OK to eat unhealthy once in a while as long as I eat less the rest of the day

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... it is OK to eat sweets and/or chips in the evening, when I didn't eat much during the day
Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... eating less the rest of the day can compensate for eating unhealthy
Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... it is OK to eat snacks or unhealthy things as long as I exercise during the day
Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... I can work out today to compensate unhealthy eating from yesterday
Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... working out can compensate for eating unhealthy Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... I can neutralize an unhealthy meal by eating a healthy meal (vegetables, fruits etc.)

Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... when I eat healthy during the entire day, I am allowed to eat one or two unhealthy things

Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... when I eat unhealthy today I can compensate this by eating only low-calorie food tomorrow Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

... low-calorie food can compensate an unhealthy meal Strongly Disagree

- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree