

# An exploratory study on the relation between Compensatory Health Beliefs and Behavior

Bachelorthesis

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Student	Irma Sprangers
Date	19-06-2014
University	Twente University
Faculty	Behavioral sciences
Study	Psychology
Department	Psychology, Health and Technology
First supervisor	Dr. P.M. ten Klooster
Second supervisor	Dr. M. Pieterse

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## **Abstract**

Compensatory Health Beliefs (CHBeliefs) are beliefs people hold that certain unhealthy (but pleasurable) behavior can be compensated for or neutralized by engaging in healthy behavior (Knäuper, Rabiau, Cohen, & Patriciu, 2004). However, research shows that even though holding CHBeliefs, the actual compensational behavior (CHBehavior) is not always shown (Kaklamanou, Armitage, & Jones, 2013; Knäuper et al., 2004). This study aims to explore the relation between CHBeliefs and CHBehavior and the potential role of food focus, intention to compensate and intention to maintain current weight on this relation. A longitudinal online survey was distributed among participants twice, at T1 and T2 (T1  $N = 120$ , T2  $N = 112$ ). Results show a high correlation between CHBeliefs and CHBehavior, cross sectional as well as longitudinal. Both concepts were relatively stable over time. Food focus moderates the relation between CHBeliefs and CHBehavior at T2 and the intention to maintain current weight mediates the relation between CHBeliefs and CHBehavior at T2. A high intention to compensate correlates strongly with CHBehavior (T1+T2).

## **Samenvatting**

Compensatieopvattingen voor gezondheidsgedrag zijn opvattingen die mensen hebben dat voor de negatieve effecten van ongezond gedrag gecompenseerd (of geneutraliseerd) kan worden door het uitvoeren een gezonde gedraging (Knäuper et al., 2004). Onderzoek toont echter aan dat ook al heeft iemand compensatieopvattingen, het eigenlijke compensatiegedrag niet altijd wordt vertoond (Kaklamanou et al., 2013; Knäuper et al., 2004). Het doel van deze studie is het exploreren van de relatie tussen compensatieopvattingen en compensatiegedrag en de potentiële rol van food focus, intentie tot compenseren en de intentie tot het behouden van het huidige gewicht op deze relatie. Een longitudinale online survey is twee keer verspreid onder de participanten, op T1 en T2 (T1  $N = 120$ , T2  $N = 112$ ). De resultaten laten een hoge correlatie zien tussen compensatieopvattingen en compensatiegedrag, zowel cross sectioneel als longitudinaal. Beide concepten zijn relatief stabiel over tijd. Food focus modereert de relatie tussen compensatieopvattingen en compensatiegedrag op T2 en de intentie om huidig gewicht te behouden medieert de relatie tussen compensatieopvattingen en compensatiegedrag op T2. Een hoge intentie tot compenseren correleert sterk met compensatiegedrag (T1+T2).

## Introduction

In 2009-2011, 6.5 million people in the Netherlands were obese, which is approximately 41% of the Dutch population (Groot & Bruggink, 2012). It has increased from 2009 to 2011; severe obesity in adults increased from 5% to 12% and average obesity in adults from 28% to 36%. Obesity increases the risk for diabetes, heart- and vascular diseases, cancer and musculoskeletal disorders. Obesity in children and adolescents causes an increased glucose-intolerance and can cause heart- and vascular diseases and eye-, kidney- and nerve- disorders (Rijksoverheid, 2013). 82% of the Dutch female population and 64% of the male population is on a diet (Reader's Diet, 2010). It seems inconsistent that although lots of people are on a diet, obesity is still a growing issue. Are they not sticking to their diet, are diets themselves not effective or what other reason could explain why people do not seem to be losing weight despite of their effort to do so?

A relatively new concept in health behavior research might also be able to explain some of the discrepancy found between dieting and actual weight loss. This concept describes how compensatory health beliefs and behavior might influence one's food habits. To illustrate this concept, picture the following: You are craving for that piece of pie in front of you and you are not sure whether to take it or not, considering you are on a diet. Eventually, you convince yourself that it is okay, because you will just expand your time at the gym afterwards. This way of reasoning uses the concept of Compensatory Health Beliefs (CHBs) (Knäuper et al., 2004). CHBs are beliefs people hold that certain unhealthy (but pleasurable) behavior can be compensated for or neutralized by engaging in healthy behavior (Knäuper et al., 2004).

CHB appears to be a confusing term and is often mistaken for compensatory behavior instead of compensatory beliefs, according to previous studies (Kaklamanou et al., 2013). But there is an evident difference, one is only referring to beliefs a person can hold about compensation and the other is referring to the actual compensational behavior. Therefore the terms CHBeliefs and CHBehavior are used in this study to refer to the compensatory health beliefs and behavior, respectively.

CHBeliefs occur as a result of an intrapersonal conflict after being exposed to a certain temptation. The intrapersonal conflict, also known as cognitive dissonance (Festinger, 1957), is a conflict between giving in to the temptation or holding on to your long-term goal of staying healthy (Rabiau, Knäuper, & Miquelon, 2006). According to Rabiau et al. (2006), this discrepancy described in the CHB model can be reduced in different ways: individuals can (1) resist temptation, (2) change their risk perception and outcome expectancy or (3) can create or activate CHBeliefs (focus of this study). The decision on choosing a particular strategy depends on the desirability of the tempting behavior and a person's health goals self-concordance Rabiau et al. (2006). For example, the second

and third reaction to the discrepancy are applied if an individual finds the tempting behavior to be very satisfying and difficult to resist (Marlatt et al., 1998; Newcomb & Harlow, 1986; Norman, Conner, & Bell, 1999). The advantage of using CHBeliefs is that individuals can give in to the temptation they are confronted with and at the same time stay healthy, which implies a win-win situation. That is, when the CHBehavior is truly enacted.

According to Kaklamanou, Armitage, & Jones (2013) in reality this win-win situation is not always established. CHBeliefs can result or not result in the intended CHBehavior and sometimes the CHBehavior even occurs without the presence of CHBeliefs. But when CHBeliefs are not followed by the intended CHBehavior, for instance if you are not going to the gym after eating that piece of pie, it is of course not beneficial for one's goal to stay healthy. In another study it was assumed that CHBeliefs do not impair an individual's health if (1) CHBeliefs neutralize the effect of the unhealthy behavior (the CHBelief is correct) and if (2) the person indeed follows through with the CHBehavior (Knäuper et al., 2004). The latter often seems to be the problem, because CHBeliefs appear to hinder health behavior. Obesity is ultimately caused by an energy imbalance: eating too much or expending too little energy for the amount of food eaten (Ravussin & Bogardus, 2000). CHBehavior could compensate for this imbalance after someone has engaged in unhealthy behavior. In a longitudinal study confirming this claim it was found that people who hold more CHBeliefs show lower self-efficacy, more health related risk behavior and more illness symptoms (Knäuper et al., 2004).

CHBeliefs can be activated in relation to several contexts and one of them is food, which will be further examined in this study. There has already been some research done concerning this relation. In one study, CHBeliefs were activated more when people thought about deciding to consume high-calorie-food (Kronick & Knäuper, 2010; Monson, Knäuper, & Kronick, 2002). The CHBeliefs were activated in order to reduce the discrepancy between the tempting behavior of actually consuming this food and the desire to stay healthy. Possessing more CHBeliefs is also associated with poorer adherence to self-care behavior in adolescents with type 1 diabetes (Rabiau, Knäuper, Nguyen, Sufrategui, & Polychronakos, 2009), higher calorie-intake and decrease in goal adherence (Miquelon, Knäuper, & Vallerand, 2012). To summarize these findings: seeing high-calorie-food activates CHBeliefs, the activation of CHBeliefs results in a higher calorie-intake and poorer adherence to self-care behavior.

Participants in these studies were on a diet, which means they probably are aware of how much they eat, what they eat and its nutritional value. This implies that they were highly focused on food. This reasoning is supported by a study where men were asked to restrict their eating for six months to lose 25% of their initial body weight, it was found that the participants became increasingly focused on food (Polivy, 1996). So dieters are likely to have a high food focus, in contrast to non-dieters. However, non-dieters have never been participants in studies on CHBeliefs in combination

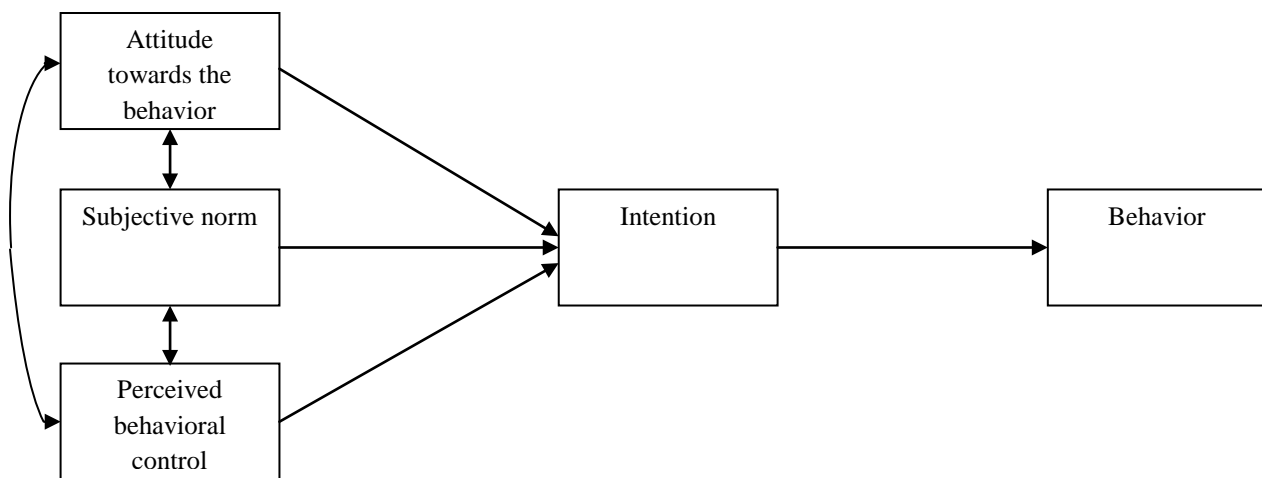
with food. Therefore, this study includes both groups, not just dieters. This way, it is not given that a high food focus is present. This offers an opportunity to see whether the food focus is of an influence on the relation between CHBeliefs and CHBehavior.

The first scale to measure CHBeliefs was developed by Knäuper et al. (2004). This scale consists of four subscales, one of them containing items about CHBeliefs in relation to food. In the available literature inconsistent results are published concerning the psychometric properties of this scale. There are multiple studies which could not find psychometric results comparable to those found by Knäuper et al. (2004). All show a high global internal consistency, but a low internal consistency on the four subscales (substance use, eat/sleep habits, stress, weight) (de Nooijer, Puijk-Hekman, & van Assema, 2009; Kaklamanou & Armitage, 2012). There are several reasons that could explain this instable factor structure (Kaklamanou et al., 2013). It was found that participants had a hard time understanding the concept CHBeliefs and therefore had difficulties with the questionnaire (Kaklamanou & Armitage, 2012). A think aloud study further examined whether the questionnaire was correctly interpreted (Kaklamanou et al., 2013). A think aloud study is a method to gather information, whereby participants say what they see and think out loud while they fill in the questionnaire. A result of this think aloud study was for instance that 23 of the 42 participants had difficulties with the conceptual difference between CHBeliefs and CHBehavior (Kaklamanou et al., 2013). Kaklamanou et al. (2013) made some recommendations for further use of the CHB scale. (1) It was recommended to create items for specific situations and behavior. This is integrated in this study by only including items about food from the CHB scale and adding new items about food. (2) Greater specificity could be achieved by contextualizing the listed compensations more firmly by, in this study, adding a timeframe. (3) It has to be clear to the participant that his/her own beliefs are required; therefore this should be included in the instructions of the questionnaire. (4) Researchers should also ensure that the wording is clear to the participants. (5) Finally it was recommended to separate CHBeliefs from CHBehavior by creating two different scales to measure both concepts. These recommendations are all implemented in the questionnaire used in this study to increase the psychometric quality of the measures.

An important limitation of studies on CHBs is that all but one (Knäuper et al., 2004) used a cross sectional design. The goal of this study is to measure the correlation between the beliefs and behavior at baseline and compare this to the correlation between beliefs and behavior found later (after two weeks). So therefore both cross sectional and longitudinal analyses are performed in this study. Hereby, it will be clear whether the relation between CHBeliefs and CHBehavior changes and if variables themselves are stable within a person over time. The moderating role of food focus on this correlation will be assessed; do CHBeliefs and CHBehavior correlate higher when a person is highly focused on food and vice versa? Besides CHBeliefs, CHBehavior and food focus intention to

compensate and the intention to maintain current weight will also be measured. According to the theory of planned behavior intention is at the base of behavior and this intention is determined by three variables: attitude, perceived behavioral control and subjective norm (Ajzen, 1991), figure 1). Because intention should be at the base of behavior, it is expected that intention to compensate and to maintain current weight will correlate strongly with CHBehavior. So, for instance, when an individual has the intention to compensate it is likely that he or she will show compensating behavior. Therefore it is of high importance to also measure intentions.

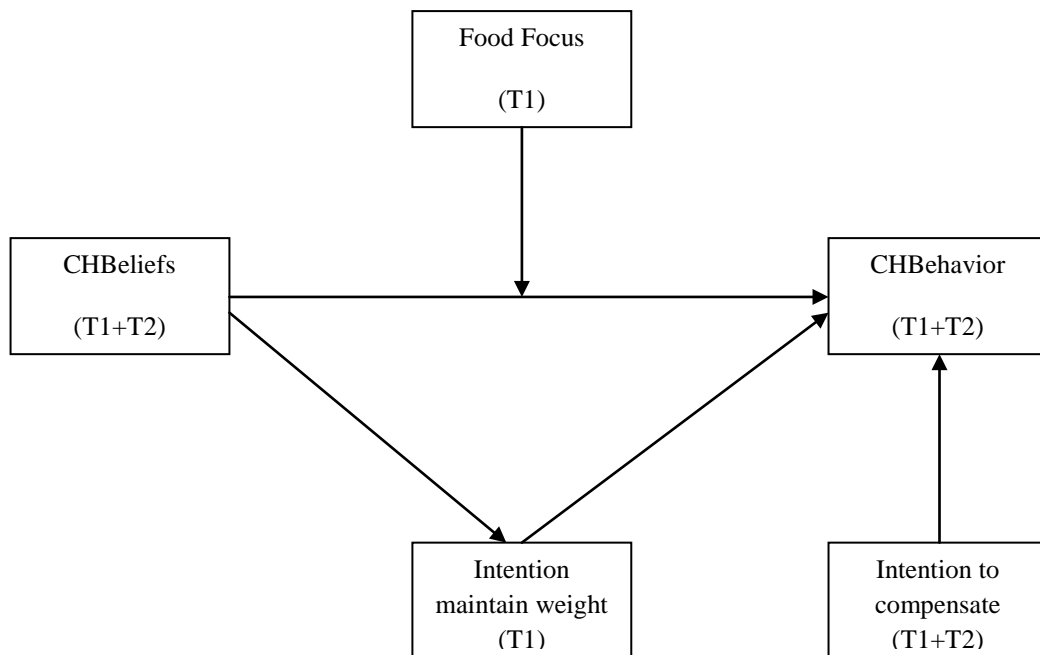
Figure 1. Theory of Planned Behavior



Thus, the main problem is that it is not sure what kind of relation exists between CHBeliefs and CHBehavior. It seems that when engaging in unhealthy behavior the CHBeliefs might be present, but it is uncertain whether CHBehavior is. This could be a possible explanation why dieters do not seem to lose weight and the issue of obesity does not decrease. Could this food focus be of an influence on the relation between CHBeliefs and CHBehavior? And could intention to maintain current weight also mediate the relation between CHBeliefs and CHBehavior? And how does intention to compensate correlate with CHBehavior? These hypothesized relations are shown in figure 2.



Figure 2. Hypothesized cross sectional and longitudinal relations



The main research question therefore is:

Are CHBeliefs predictive for CHBehavior?

The following hypotheses are formed:

- 1) Food focus moderates the relation between CHBeliefs and CHBehavior
- 2) Intention to maintain current weight mediates the relation between CHBeliefs and CHBehavior
- 3) Intention to compensate correlates with CHBehavior

## Method

### *Participants and Procedure*

Participants were recruited for this longitudinal research through social media and Sona-systems. Psychology students at Twente University are obligated to participate in studies from other students through this system. They received a link to an online survey (T1) which took approximately thirty minutes to complete. This first survey was distributed for two weeks. In the introduction of this survey it was made clear that participation was anonymous and voluntary. Participants were asked for their e-mail address, only to connect the two surveys (T1 and T2) and to send them a reminder of the second survey (T2). Two weeks after completing the first survey (T1) they were sent the link to the second survey (T2), which took fifteen minutes to complete. No exclusion criteria were used. This study was approved by the Ethical Committee of Twente University.

### *Measures*

At baseline (T1), some demographics were assessed such as age, highest completed or current level of education, current year of study, gender, nationality and e-mail address.

Besides these demographics, the following measures were administered:

### *Intention to compensate and to maintain current weight*

The survey measured intention to compensate (at T1+T2) and the overall intention to maintain current weight (at T1). The latter had to be answered on a 5-point Likert scale from 1 ('strongly disagree') to 5 ('strongly agree'). It consisted of three items in line with the theory of planned behavior, so it measured attitude, the subjective norm and the perceived behavioral control. The intention to compensate for unhealthy eating behavior was assessed with one item: 'If I ate more than I wanted before, I want to compensate for this now in order to not gain weight'. For both scales a high score indicated a high intention to respectively compensate or lose weight.

### *Food focus*

Food focus was assessed at T1 with six items ( $\alpha = .73$ ) on a 5-point Likert scale from 1 ('strongly disagree') to 5 ('strongly agree'). Alpha could not be raised through item deletion. An item to assess food focus was for instance: 'Do you find it important to eat healthy?'. These items were based on theoretically important processes underlying a large food focus, like having a lot of knowledge about food or having a high awareness of nutritional values. A high score on this scale meant that the person had a great focus on food.

### *CHBeliefs*

CHBeliefs were assessed with eight items (T1  $\alpha = .78$ , T2  $\alpha = .81$ ), for instance: 'eating less on weekdays compensates for eating more than you wanted during the weekend' (5-point Likert scale from 1 ('strongly disagree') to 5 ('strongly agree')). Also here, alpha could not be raised through item deletion. A high score on this scale meant that the person held more CHBeliefs on food. Of these items one was directly derived from CHB scale developed by Knauper et al (2004). Two of these items were derived from the CHB scale, but were customized for this study, in order to make it clear that it was about compensating, as was advised to do by Kaklamanou (2013). The basis for the last five items came from different forums about compensational behaviors to lose weight.

### *CHBehavior*

Nine items were developed to measure CHBehavior (T1  $\alpha = .86$ , T2  $\alpha = .90$ ). Answer categories ranged from 1 ('never') to 5 ('almost every day') on a Likert scale. If participants score high on this scale, they perform high on CHBehavior. For these items the recommendations following Kaklamanou's article (2013) were carefully incorporated. To make sure the participants knew the items were about the participant his or her own behavior, the instructions start with: 'How many times have you ...?' and end with: '... in the last two weeks?' It was also recommended to create items for more specific behavior or situations and contextualize these items more firmly. Therefore, an interval of the last two weeks was added and the questions asked for specific behavior. For instance: 'How many times in the past two weeks did you eat a sandwich less to compensate for eating snacks in the morning?'

At T2, two weeks after participants completed T1, the same items as were assessed at T1 for CHBeliefs and CHBehavior. These items remained the same to determine whether there is a difference in CHBeliefs or CHBehavior during these two weeks between T1 and T2. As participants might have been triggered by the awareness the first survey evoked, the sequence of answer categories of CHBehavior were reversed at T2, and also the questions for CHBeliefs and CHBehavior were given in different order at T2. Both at T1 and T2 almost similar questions to those for food were assessed for exercise, these results were used in a different study.

### *Statistical methods*

Statistical analysis was carried out using SPSS version 20. Participants who only filled in the demographics were removed. Some participants filled in some of the scales, but not all. However, all completed scales were used for analysis. For analyses of constructs averages were used. All constructs, food focus, CHBeliefs and CHBehavior, were checked on their normal distribution using skewness and kurtosis values.

Using Pearson correlation coefficients, at T1 cross sectional analysis on the relations at T1 between the intention to lose weight and CHBeliefs, intention to lose weight and CHBehavior and the intention to compensate and CHBehavior, were performed.

To see whether the CHBeliefs and CHBehavior of a participant changed during these two weeks, CHBeliefs at T1 was compared to CHBeliefs at T2 and CHBehavior at T1 was compared to CHBehavior at T2. To analyze these relations paired-samples t-tests were used.

Correlations between CHBeliefs and CHBehavior were analyzed on T1 as well as on T2 and between CHBeliefs at T1 and CHBehavior at T2. Furthermore, it was hypothesized intention to maintain current weight would operate as a mediator and food focus would operate as a moderator for the relation between CHBeliefs and CHBehavior. Regression analysis was performed to examine this mediation and moderation at T1 and T2, and also between CHBeliefs at T1 and CHBehavior at T2. These regression analyses were performed following the model prescribed by Baron and Kenny (1986).

## Results

### *Missing values*

151 participants started the survey at T1, data from 28 of them were excluded from further analysis, because they only filled in the questions for demographics. So, useful data at T1 was  $N = 123$ . 123 participants started the survey at T2, but only 112 remained after excluding data from 11 participants. These 11 participants did not answer any of the questions, besides demographics, on that survey. Of these 112 participants, 100 participants had also filled in survey T1. When longitudinal analysis was performed, only the data from these 100 participants was used. Several variables, food focus for instance, were only assessed at T1 and so only data of those who filled in both surveys was used in longitudinal analysis. For cross sectional analysis of the data on T1 and T2 the maximum amount of data was used, so for T1  $N = 123$  and for T2  $N = 112$ . Some participants completed only half of the scales at T1, data from the completed scales was used for analyses. This explains why  $N$  is slightly different in different analyses. Although intention to complete (1 item) was assessed twice, only data from T1 was used in longitudinal analysis.

### *Interpretation norms*

For the interpretation of the found correlations Cohen's norms were used (0 to 0.1 = no correlation, 0.1 to 0.3 = weak correlation, 0.3 to 0.5 = moderate correlation and  $> 0.5$  = strong correlation) (Cohen, 1988)

### *Demographics*

Demographics were assessed at T1 ( $N = 123$ ). The majority of the participants were female (65.3% ; male 34.7%), their age ranging from 15 to 75 years ( $M = 28.28$ ,  $SD = 6.38$ ). The majority of the participants answered University as their highest completed or current level of education (60.5 %). Those who were still studying were mainly in their first (28.4 %), third (33.3 %) or fourth year (18.6 %). Participants were mainly Dutch (63.7 %) or German (35.5 %). One question in the survey at T1 asked for people's weight balance. Here 57.4 % said to have roughly maintained their weight in the past 6 six years, 17.8 % had gained weight in the past 6 years, 12.9 % had lost weight, 10.9 % had gained as well as lost weight.

Table 1

*Description of scales characteristics at T1 and T2*

<i>Scales</i>	T1				T2			
	<i>M</i>	<i>SD</i>	<i>α</i>	<i>#items</i>	<i>M</i>	<i>SD</i>	<i>α</i>	<i>N</i>
CHBeliefs	2.32	.64	.78	8	2.34	.67	.81	8
CHBehavior	1.52	.61	.86	9	1.56	.65	.90	9
Food Focus	3.11	.70	.73	6				
Intention to maintain weight	3.32	.86		3				
Intention to compensate	3.22	1.26		1	3.90	.93		1

*Note:* At T1  $N = 120$  for CHBeliefs and CHBehavior,  $N = 122$  for Food Focus, Intention to maintain weight and Intention to compensate. At T2  $N = 112$  for CHBeliefs, CHBehavior and Intention to compensate.

*Paired samples T-tests*

Paired samples T-tests were conducted to compare CHBeliefs at T1 with CHBeliefs at T2, the same for CHBehavior at T1 and CHBehavior at T2. No significant difference was found between CHBeliefs at T1 ( $M = 2.32$ ,  $SD = .64$ ) and CHBeliefs at T2 ( $M = 2.34$ ,  $SD = .67$ );  $t(98) = -.28$ ,  $p = .78$ . This means that CHBeliefs did not significantly change during the two week interval between T1 and T2. The same result was found when comparing CHBehavior at T1 ( $M = 1.52$ ,  $SD = .61$ ) and CHBehavior at T2 ( $M = 1.56$ ,  $SD = .65$ );  $t(98) = -1.06$ ,  $p = .29$ , the average of these variables remained relatively stable over time.

*CHBeliefs and CHBehavior*

As noted before it cannot always be assumed that CHBehavior follows after CHBeliefs. One of the aims of this study was to explore this relation between CHBeliefs and CHBehavior, using the newly developed scales. CHBeliefs on T1 (skewness = .31, kurtosis = .61), and T2 (skewness = -.03, kurtosis = -.39), CHBehavior on T1 (skewness = .96, kurtosis = -.04) and on T2 (skewness = 1.02, kurtosis = .00) were approximately normally distributed. Therefore, to see how strong CHBeliefs and CHBehavior correlate, Pearson correlation coefficients were computed at T1 and T2. At T1, there was a moderate, positive correlation between CHBeliefs and CHBehavior ( $r = .38$ ,  $N = 120$ ,  $p < .001$ ) (see table 2). Also a moderate, positive correlation was found at T2 ( $r = .43$ ,  $N = 112$ ,  $p < .001$ ) (see table 3). Finally, a moderate, positive correlation was found between CHBeliefs at T1 and CHBehavior at T2 ( $r = .32$ ,  $N = 99$ ,  $p < .001$ ) (see table 4).

Table 2

*Description of cross sectional correlations between constructs assessed at T1*

<i>Scales</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1. Gender <sup>a</sup>	-					
2. CHBeliefs	.16	-				
3. CHBehavior	.27**	.38**	-			
4. Food Focus	.29**	.15	.47**	-		
5. Intention maintain weight	.15	.09	.41**	.57**	-	
6. Intention to compensate	.47**	.18	.41**	.49**	.48**	-

*Note:* \*  $p < .05$ , \*\*  $p < .01$  and <sup>a</sup>0 = male, 1 = female

Table 3

*Description of cross sectional correlations between constructs assessed at T2*

	<i>1</i>	<i>2</i>	<i>3</i>
1. CHBeliefs (T2)	-		
2. CHBehavior (T2)	.43**	-	
3. Intention to Compensate (T2)	-.07	-.01	-

*Note:* \*  $p < .05$ , \*\*  $p < .01$  and <sup>a</sup>0 = male, 1 = female

Table 4

*Description of longitudinal correlations between constructs assessed at T1 and T2*

	1	2	3	4	5	6	7	8
1. Gender (T1) <sup>a</sup>	-							
2. CHBeliefs (T1)		-						
3. CHBehavior (T1)			-					
4. CHBeliefs (T2)	.20*	-.28		-				
5. CHBehavior (T2)	.23*	.32**	-1.06	.43**	-			
6. Food Focus (T1)				.14	.51**	-		
7. Intention maintain weight (T1)				.19	.37**	.58**	-	
8. Intention to Compensate (T2)	-.07	.10	.03	-.07	-.01	.21*	.05	-

Note: \*  $p < .05$ , \*\*  $p < .01$  and <sup>a</sup>0 = male, 1 = female

#### *The intention to compensate*

The intention to compensate was assessed with one item. This intention is approximately normally distributed, at T1 (skewness =  $-.39$ , kurtosis =  $-.19$ ) as well as on T2 (skewness =  $-.69$ , kurtosis =  $.07$ ).

As shown in table 2, 3 and 4 an overall large difference is found in correlations between different constructs with the intention to compensate at T1 and at T2. At T1, four out of five correlations with other scales were moderate-strong and significant. At T2, only one out of five correlations is significantly weak, the other correlations are not significant. This is especially visible in the relation between gender and the intention to compensate. At T1 a moderate-strong and positive significant relation was found between gender and the intention to compensate, with a Pearson correlation coefficient ( $r = .47$ ,  $N = 122$ ,  $p < .001$ ). At T2 no significant relation was found between gender and the intention to compensate ( $r = -.72$ ,  $N = 101$ ,  $p = .48$ ). For further analyses with the intention to compensate only data from T1 is used, because of the large difference between the results on this item on T1 and T2.

#### *Relation intention to compensate and CHBehavior*

By conducting Pearson correlations the relation between the intention to compensate and CHBehavior was assessed. At T1 data from 120 participants was used, at T2 data from 100 participants. The linear correlation between the intention to compensate and CHBehavior found at T1



was moderate, positive ( $r = .41, N = 120, p < .001$ ). At T2, also a moderate, positive correlation was found between the intention to compensate and CHBehavior ( $r = .44, N = 100, p < .001$ ).

*Relation intention to maintain current weight and CHBeliefs and CHBehavior T1 and T2*

The intention to maintain current weight was approximately normally distributed (skewness =  $-0.65$ , kurtosis =  $-1.01$ ). It was assessed with three items, based on the Theory of Planned Behavior of Ajzen (1991). Using a Pearson correlation coefficient, it was found that there was no linear correlation between the intention to maintain current weight and CHBeliefs ( $r = .09, N = 120, p = .34$ ). For the relation between the intention to maintain current weight and CHBehavior the contrary was found, a moderate and positive linear correlation ( $r = .41, N = 120, p < .001$ ).

At T2, only data from participants who filled in both surveys was used to analyze the relation between the intention to maintain current weight and CHBeliefs and CHBehavior ( $N = 100$ ). There was a weak correlation found between the intention to maintain current weight and CHBeliefs at T2 ( $r = .19, N = 100, p = .05$ ). A moderate correlation was found between intention to maintain current weight and CHBehavior at T2 ( $r = .37, N = 100, p < .001$ ).

Following the proposed model (see figure 2), intention to maintain current weight should operate as a mediator between the CHBeliefs and CHBehavior. Analysis showed that the assumption of linearity was not met at T1 and therefore it was only possible to assess a mediation analysis on T2. Results show a significantly positive mediation effect of intention to maintain current weight on the relation between CHBeliefs and CHBehavior ( $p < .001$ , see table 5). It is a partial mediation, because the regression coefficient of CHBeliefs is reduced at the last step, but is still significant.

Table 5

*Linear regression analysis on the effect of the intention to maintain weight on the relation between CHBeliefs and CHBehavior at T2*

independent variable	B	SE B	$\beta$
Step 1 ( $R^2, R^2_{adj}$ )	(.14*.13)		
Constant	.54*	.21	
CHBeliefs	.44**	.09	.46
Step 2 ( $R^2, R^2_{adj}, R^2_{change}$ )	(.29*.28*.15)		
Constant	-.13	.28	
CHBeliefs	.38**	.08	.40
Intentionmaintainweight	.24**	.07	.30

Note. \*  $p < .05$ , \*\*  $p < .01$

### *Food focus*

To examine whether food focus moderates the relation between CHBeliefs and CHBehavior, a regression analysis was performed. Food focus is approximately normally distributed (skewness = .12, kurtosis = -.20 ; M = 3.11, SD = .70). Linear regressions were conducted to determine the potentially moderating role of food focus on the relation between CHBeliefs and CHBehavior at T1 and T2, and on the relation between CHBeliefs at T1 and CHBehavior at T2. For these analyses methods as prescribed by Baron & Kenny (1986) were followed. Centralized variables of CHBeliefs and food focus were computed by subtracting the mean of each variable from the variable itself. Next, the centralized CHBeliefs variable was multiplied with the new centralized food focus variable, forming a new variable 'CHBeliefs\*Food Focus'. Finally, a linear regression analyses was performed to see whether food focus was a significant moderator. Tables 6 and 7 show the results of the cross sectional regression analysis. No significant interaction effect was found at T1 ( $p = .76$ ), but there was a significant interaction effect at T2 ( $p = .03$ ) for food focus on the relation between CHBeliefs and CHBehavior. Table 8 shows the results of the longitudinal regression analysis on the relation between CHBeliefs at T1 en CHBehavior at T2, displaying the predictor value of food focus. No significant interaction effect was found for food focus on this relation ( $p = .83$ ).

Table 6

*Cross sectional linear regression analysis on the effect of food focus on the relation between CHBeliefs and CHBehavior at T1*

independent variabele	B	SE B	$\beta$
Step 1 ( $R^2, R^2_{adj}$ )	(.32**, .31) F = 20.42		
constant	1.54**	.05	
CHBeliefs	.29**	.07	.31
Food Focus	.36**	.07	.43
Step 2 ( $R^2, R^2_{adj}, R^2_{change}$ )	(.32, .31, .32) F = 13.51		
Constant	1.53**	.05	
CHBeliefs	.29**	.07	.32
Food Focus	.36**	.07	.43
CHBeliefs*Food Focus	.02	.10	.01

Note. \*  $p < .05$ , \*\*  $p < .01$

Table 7

*Cross sectional linear regression analysis on the effect of food focus on the relation between CHBeliefs and CHBehavior at T2*

independent variable	B	SE B	$\beta$
Step 1 ( $R^2$ , $R^2_{adj}$ )	(.41** .40) F = 33.80		
Constant	1.55**	.05	
CHBeliefs	.38**	.08	.39
Food Focus	.42**	.07	.46
Step 2 ( $R^2$ , $R^2_{adj}$ , $R^2_{change}$ )	(.30* .28, .41) F = 24.96		
Constant	1.54**	.05	
CHBeliefs	.39**	.07	.41
Food Focus	.40**	.07	.43
CHBeliefs*Food Focus	.21*	.10	.17

Note. \*  $p < .05$ , \*\*  $p < .01$

Table 8

*Longitudinal linear regression analysis on the effect of food focus on the relation between CHBeliefs at T1 and CHBehavior at T2*

Independent variable	B	SE B	$\beta$
Stap 1 ( $R^2$ , $R^2_{adj}$ )	(.32* .31) F = 22.51		
constant	1.56**	.05	
CHBeliefs	.25**	.09	.25
Food Focus	.44**	.08	.47
Stap 2 ( $R^2$ , $R^2_{adj}$ , $R^2_{change}$ )	(.32, .31, .32) F = 14.87		
constant	1.56**	.06	
CHBeliefs	.25**	.09	.25
Food Focus	.44**	.08	.47
CHBeliefs*Food Focus	.03	.12	.02

Note. \*  $p < .05$ , \*\*  $p < .01$

## Discussion

This study was aimed at exploring the relation between CHBeliefs and CHBehavior, a relatively new concept in health behavior research. It was found that CHBeliefs and CHBehavior were moderately and positively correlated, both cross sectional and longitudinal. The intention to maintain current weight has a partial mediation effect on the cross sectional relation between CHBeliefs and CHBehavior at T2. It was also found that food focus moderates the cross sectional relation between CHBeliefs and CHBehavior at T2. This study was one of the first to assess CHBeliefs and CHBehavior in a longitudinal survey and demonstrated that CHBeliefs, CHBehavior and the relation between CHBeliefs and CHBehavior is relatively stable over time.

The relation found between CHBeliefs and CHBehavior has not yet been examined in previous studies. This result shows that, in a longitudinal relation, CHBeliefs have a high predictive value for the occurrence of CHBehavior. This is inconsistent with findings in previous studies; previous studies show that CHBehavior is often absent when CHBeliefs are present (Kaklamanou et al., 2013), that people who hold more CHBeliefs show more health related risk (Knäuper et al., 2004), poorer self-care behavior (Rabiau et al., 2009), higher calorie-intake and decrease in goal adherence (Miquelon et al., 2012). Findings in this study contradict that people who hold many CHBeliefs do not perform many CHBehaviors and consequently have a larger difficulty reaching their goals to stay healthy. If applied to the growing problem of obesity among the Dutch population (Groot & Bruggink, 2012), people should have some degree of maintaining their weight, as CHBs is one of the factors contributing to this problem.

High correlations were found between CHBeliefs at T1 and T2 and CHBehavior at T1 and T2, also in longitudinal analyses. Knäuper et al. also found that CHBs were stable constructs (2004). It must be noted that this current study did not address the issue of causality. If high consistency is found between T1 and T2 for CHBeliefs and CHBehavior, then T1 and T2 are the same, so associations are bi-directional. This would mean that CHBeliefs might not be predictive for CHBehavior. Then, both CHBeliefs and CHBehavior as well as their relation were just stable. Further research using a cross lagged panel, for instance, is suggested to examine the possible causality of the relation between CHBeliefs and CHBehavior.

The correlation between CHBeliefs and CHBehavior might also be explained by the distribution of education among participants in this study. The participants were mainly students and therefore do not represent the general population as has been assessed in previous studies. This might explain a divergent result in this study compared to what has been found in previous studies. Another possible explanation might be that the difference between CHBeliefs and CHBehavior was not as clear

as intended to achieve in this study. In that case, a reason for the correlation between CHBeliefs and CHBehavior is that participants were still unable to distinguish between both variables. In this study, however, recommendations from the article from Kaklemanou (2013) were taken into account. For example, separate questions for CHBeliefs and CHBehavior were composed. Here, the CHBehavior questions resulted from slight adjustments to CHBeliefs questions, so the essence of both questions was the same. Perhaps this was not enough to reduce to confusion between CHBeliefs and CHBehavior addressed by Kaklemanou (2013).

Another difference between the participants in this study and in previous studies might be the distribution of dieters and non-dieters. As mentioned before, in previous studies only dieters were assessed and in this study a mixed group of dieters and non-dieters was assessed. Dieters are presumed to have a high food focus. Polivy (1996) demonstrated in his study that participants following a diet became more focused on food during the six months of the study. Therefore, food focus was included in this study as a hypothesized moderator, to see whether this might have an influence (and what kind of influence) on the relation between CHBeliefs and CHBehavior.

The results only revealed a moderating role of food focus on the relation between CHBeliefs and CHBehavior at T2, not on T1 or on the relation between CHBeliefs at T1 and CHBehavior at T2. At T2 this means that the higher the food focus, the stronger the correlation between CHBeliefs and CHBehavior. Although the interaction effect was quite small, it suggests that when a person holds many CHBeliefs and has a high food focus, he or she is likely to perform CHBehavior. Dieters have been shown previously to have a high food focus (Polivy, 1996). In this study a high intention to maintain weight correlates strongly with a high food focus. Thus, people on a diet and people who want to maintain their current weight have a high food focus. Food focus and intention to maintain current weight also correlate moderate to CHBehavior, a high food focus and intention to maintain current weight would therefore imply compensating behavior. According to the found moderation, when a dieter or one that tries to maintain current weight (both with a high food focus) holds CHBeliefs, it is also likely that CHBehavior will be performed. This way, one does compensate for unhealthy behavior and maintains or loses weight, which is in line with what the participants in this study answered about their weight balance (almost 70 % had maintained or lost weight).

In this study only the reflective and deliberate food focus is assessed, but also an implicit and automatic compound is involved in deliberate food choices (Rothman, Sheeran, & Wood, 2009). It is uncertain whether food focus is indeed explicit as assumed in this study. It might be interesting for further research to examine the implicit compound, this might reveal more information about the construct food focus.

Another variable assessed in this study, intention to maintain current weight, might also be of an influence on the relation found between CHBeliefs and CHBehavior. According to Ajzen (1991) intention is at the base of behavior, this is in line with the results found in this study. At T1 and T2 moderate and positive relations between the intention to maintain current weight and CHBehavior were found. The intention to maintain current weight was hypothesized to mediate the relation between CHBeliefs and CHBehavior. At T2 a partial mediation effect was found. So when someone wants to perform CHBehavior (in order to maintain current weight) and holds CHBeliefs, it is important that the person also shows high intention to maintain current weight.

It must be noted that, although not customary to do so, for the analysis of intention to maintain current weight the average of the three items together was used.

Also the intention to compensate was assessed to determine whether this was of an influence on the presence of CHBehavior. This study confirmed that this third hypothesis, intention to compensate correlated strongly with CHBehavior, was true (at T1 and T2). Here, only the item assessing the intention to compensate from T1 is used, therefore it is predictive for CHBehavior at T2.

As mentioned in the results, when using both items for intention to compensate as assessed at T1 and T2, a large difference was found between the intention to compensate at T1 and T2. This was especially visible in relation to gender. The correlation between the intention to compensate and gender at T1 was moderate and significant and at T2 no significant results were found. At T1 females showed a significantly higher intention to compensate than males, this relation was absent at T2. Many variables mainly correlate moderately to intention to compensate at T1 and do not correlate to intention to compensate at T2. These variables have remained relatively stable over time or were only assessed at T1. Therefore, the variance between T1 and T2 shown in correlation coefficients on the relation between multiple variables and the intention to compensate must be due to variance in the intention to compensate.

A paired samples t-test shows that the intention to compensate changed significantly between T1 and T2 (data not shown). The way the items were composed might explain this difference. At T1, the item is formulated as following: 'If I ate more than I wanted before, I want to compensate for this now in order to not gain weight'. At T2 it is formulated differently; 'If you want to compensate for eating too much or unhealthy food, to what extent do you plan to carry this out?' As you can see both are formulated in a different way, T1 concerns a hypothesized act and T2 the actual intended act. It is not possible to see how both items were interpreted. So change in intention to compensate might be actual change in intention to compensate, but might also be due to other facts, e.g. place in the survey or the way the question is composed. These possible explanations for the discrepancy between intention to compensate at T1 and T2 imply a methodological error.

Still, it is difficult to explain why the intention to compensate assessed at T2 correlates so weakly with CHBehavior at T2. This contradicts the Theory of Planned Behavior, which states that

behavior always follows intention (Ajzen, 1991). But it might explain why people who try to lose weight might not be successful at it. They want to compensate for that piece of pie, have the intention to do so, but do not actually compensate for it.

This study showed some interesting results on the relation between CHBeliefs and CHBehavior, but there is still a lot to explore about this relation in future research. This was one of the first times CHBeliefs and CHBehavior were assessed in a longitudinal study, although a larger interval might offer the opportunity to make firmer statements about stability of and predictive value for CHBeliefs and CHBehavior. For future research it is recommended to expand the time between T1 and T2. This will be beneficial for the longitudinal character of the study. As mentioned before, a cross lagged panel study is, for instance, suggested to explore causality between CHBeliefs and CHBehavior. Also, to ensure the distinction between CHBeliefs and CHBehavior is clear, it is also recommended to give participants more information in advance about the difference between these concepts.

This explorative study shed some light on the relation between CHBeliefs and CHBehavior. It was one of the first to show that CHBeliefs and CHBehavior correlate to one another, in a cross sectional as well as a longitudinal context. This study also proved that they are stable constructs and their relation is as well. Food focus moderates the relation between CHBeliefs and CHBehavior at T2 and the intention to maintain current weight mediates the relation between CHBeliefs and CHBehavior at T2. A high intention to compensate correlates strongly to CHBehavior (T1+T2).

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## Appendix 1

### Food focus scale

Do you know exactly what you eat?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Do you consciously eat food with little calories?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Do you consciously eat less in order to lose weight?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Do you find it important to eat healthy?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

When buying food, are you aware whether the food contains many or little calories?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

When buying food, are you aware whether the food is healthy or unhealthy?

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

## Appendix 2

### CHBeliefs scale

Exercising half an hour more can compensate for eating too much.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

A sandwich less can compensate for eating snacks in the morning.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Skipping a meal can compensate for eating too much.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Eating less on weekdays compensates for eating more than you wanted during the weekend

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Quitting a diet today can be compensated for by starting a new diet tomorrow.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Skipping lunch can compensate for eating too much at breakfast.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Eating low-calorie food can compensate for eating too much.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

Not eating anything after 20.00 hour can compensate for eating too much during the day.

- Strongly disagree
- Do not agree
- Nor agree, nor disagree
- Agree
- Strongly agree

### Appendix 3

#### CHBehavior scale

How many times in the past two weeks did you exercise half an hour more to compensate for eating more than you wanted?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you eat a sandwich less to compensate for eating snacks in the morning?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you skip a meal to compensate for eating more than you wanted?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you eat less on weekdays to compensate for eating more than you wanted during the weekend?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you start a new diet to compensate for quitting a diet the day before?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you skip a lunch to compensate for eating more than you wanted during breakfast?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you eat low-calorie food to compensate for eating more than you wanted?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you eat less to compensate for gaining weight?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day

How many times in the past two weeks did you ate nothing after 20.00 hour to compensate for eating more than you wanted?

- Never
- Almost never
- Sometimes
- Almost every day
- Every day