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Are Diet-Specific Compensatory Health Beliefs Predictive of Dieting Intentions and Behaviour?

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Abstract

Compensatory health beliefs (CHBs) - beliefs that an unhealthy behaviour can be compensated for by healthy behaviour - are hypothesised to be activated automatically to help people resolve conflicts between their desires (e.g. eat chocolate) and their long-term goals (e.g. dieting). The aim of the present research was to investigate diet-specific CHBs within the context of a theoretical framework, the Health Action Process Approach (HAPA), to examine the extent to which diet-specific CHBs contribute to dieting intentions and dietary intake. Seventy five dieting women were recruited in Switzerland and England and were asked to complete measures of diet-specific CHBs, risk perception, outcome expectancies, self-efficacy, intention, and behaviour. Path modelling showed that, overall, diet-specific CHBs were not related to dieting intentions (ß = .10) or behaviour (ß = .06) over and above variables specified in the HAPA. However, risk perception moderated the relationship between diet-specific CHBs and intention (ß = .26). Diet-specific CHBs positively predicted intention in women with high risk perception, but not in women with low risk perception. This positive relationship might be explained by the assumption that CHBs play different roles at different stages of the health-behaviour change process. Future studies should further examine moderators and stage-specific differences of the associations between CHBs, intention and health-behaviour change.

Keywords: Compensatory Health Beliefs; dieting; Health Action Process Approach; intention; moderator; Switzerland; England;

Introduction

People who diet routinely face situations in which their immediate desires (e.g. eat a dessert) interfere with their long-term goals (e.g. lose weight) resulting in a mental conflict between the desire to eat the tempting food and the superordinate goal of dieting (e.g. Carver & Scheier, 1998; Festinger, 1957; Rabiau, Knäuper, & Miquelon, 2006). Although people try to act in accordance with their long-term goals, they often fail because their need to fulfil their desires (e.g. eat a dessert) is greater than the willpower to achieve the long-term goal (e.g. Baumeister & Heatherton, 1996; Baumeister, Heatherton, & Tice, 1994; Trope & Fishbach, 2000). According to Rabiau et al. (2006), individuals may activate compensatory health beliefs (CHBs) to resolve such dilemmas. CHBs are thoughts that an unhealthy behaviour (e.g. eating unhealthy) can be compensated for (or neutralised) through the performance of a healthy behaviour (e.g. physical activity). According to the CHB model, the use of CHBs allows people the best of both worlds, namely, to indulge their temptations while working toward their health goals (Rabiau et al., 2006).

In line with the CHB model (Rabiau et al., 2006) and as emerging evidence shows, the use of CHBs interferes with successful adherence to health-behaviour changes among dieters, adolescents with type 1 diabetes, and smokers (Kronick & Knäuper, 2010; Rabiau, Knäuper, Nguyen, Sufrategui, & Polychronakos, 2009; Radtke, Scholz, Keller, & Hornung, 2012; Radtke, Scholz, Keller, Knäuper, & Hornung, 2011). For example, women who are on a diet have been shown to activate diet-specific CHBs by planning to engage in future compensatory behaviour when faced with tempting, high caloric food choices and end up consuming more calories as a result (Kronick, Auerbach, Stich, & Knäuper, 2011; Kronick & Knäuper, 2010). However, no studies to date have investigated diet-specific CHBs in comparison with other well-established concepts like self-efficacy, risk perception, or planning found in theoretical models of

behavior change (e.g. Health Action Process Approach, HAPA; Schwarzer, 1992, 2008). The fact that diet-specific CHBs were examined without (e.g. Kronick & Knäuper, 2010) or just in comparison with one construct (e.g. motivation; Miquelon, Knäuper, & Vallerand, 2012) raises the possibility that CHBs merely account for variance that is routinely accounted for by concepts such as self-efficacy or intention (e.g. Armitage & Conner, 1999; Scholz, Nagy, Göhner, Luszczynska, & Kliegel, 2009). Thus, it might be that CHBs are not as relevant for the prediction of intentions and/or behaviour as concluded from the studies mentioned above. To examine the unique explained variance of intention and/or behaviour by the CHBs a comparison with other well-established concepts is necessary. In addition, until now it has not been investigated under which conditions the relationship between CHBs and intention or behaviour is more likely. Therefore, the investigation of moderators for the relationship between CHBs and intention and/or behaviour is advisable, especially because Rabiau and her colleagues (2006) stated that CHBs will be activated when self-efficacy is low. In contrast, when individual's self-efficacy is high, it is more likely that individuals resist a desire like eating a cake which in turn makes the activation of CHBs unnecessary. Furthermore, it is hypothesised that CHBs interfere with risk perception and outcome expectancies such that CHBs will be activated whenever risk perception and positive outcome expectancies are high (Rabiau et al., 2006). Nevertheless, the empirical evidence is currently lacking.

Thus, the present study aims to investigate diet-specific CHBs within the context of the Health Action Process Approach (HAPA; Schwarzer, 1992, 2008) and will examine the extent to which diet-specific CHBs can contribute to the prediction of dieting intention and behaviour relative to the HAPA, a parsimonious, well-established model in the field of health behaviour change.

The HAPA (Schwarzer, 2008) distinguishes a pre-intentional motivational from a post-intentional volitional phase. Furthermore, it states that risk perception, as a distal starting point of a deliberation process for health behaviour change, outcome expectancies, and self-efficacy as predictors of behavioural intention. Outcome expectancies are defined as a reflection of possible pros and cons of behavioural consequences, whereas self-efficacy is defined as one`s belief in one`s own ability to overcome barriers in everyday life. Individuals within this phase are characterised as pre-intenders. After the formation of an intention people enter the volitional phase. In this phase there are individuals who already act according to their intentions (actors) and those who have not yet translated their intentions into actions (intenders). In this case, the HAPA suggest action planning and action control as mediators between the intention and the behaviour. Planning is understood as the prospective formation of concrete plans about when, where and how to implement intended behaviour. In contrast, action control is defined as a self-regulation strategy, where one`s own behaviour is monitored with regard to the behavioural standard (Schwarzer, 2008). The HAPA has already demonstrated applicability across a variety of health behaviours, such as chronic illness and disability (Schwarzer, Lippke, & Luszczynska, 2011) or smoking behaviour (Radtke et al., 2012; Scholz et al., 2009), as well as to diverse samples (e.g. Schwarzer, 2008). However, one criticism of the HAPA is that it assumes implicitly that the individual is a rational decision maker. The role of a motivational conflict that arises between affective states (e.g. temptations, cravings, or desires) and motivation (e.g. health goals) as well as situational variables is rather neglected. Thus, the integration of CHBs, which are activated by a motivational and emotional conflict (Rabiau et al., 2006), into the HAPA might be of special benefit for the model. In line with this, preliminary research shows that smoking- and physical exercise-specific

CHBs are an additional predictor of behavioural intentions within the HAPA (cf., Berli, Loretini, Radtke, Hornung, & Scholz, in press; Radtke et al., 2012).

Moreover, including CHBs into a model of health behaviour change might be advantageous in terms of developing theories of multiple health behaviour change. As of now, it is poorly understood how different healthy and/or unhealthy behaviour are linked with each other (Spring, Moller, & Coons, 2012). Therefore, the investigation of CHBs within a health behaviour change model might be of special advantage to understand how different health behaviours are bundled with each other (e.g. dieting and physical activity) and how this can guide interventions.

Aim of the study and hypothesised model

The present study hypothesised that diet-specific CHBs will be negatively related to the intention to diet over and above the standard predictors of the motivational and volitional phases of the HAPA (cf. Figure 1). Moreover, the CHB model states that the use of CHBs in the long-run should reduce a certain health behaviour because individuals a) have a strategy at hand to resolve their experienced dissonance without engaging in the health behaviour and b) often fail to engage in the intended compensatory behaviour (e.g., go to the gym the next day instead of going today) because of procrastination or because time passed by and the initially felt dissonance weakens over time (Rabiau et al., 2006). Thus, we hypothesise a direct negative effect of CHBs on behaviour. Furthermore, we expected a mediation of diet-specific CHBs on planning and action control via intention based on previous findings on smoking-specific CHBs (Radtke et al., 2012). In addition, we tested whether the relationship between the diet-specific CHBs and intention is moderated by self-efficacy, outcome expectancies, and/or risk perception. According to Rabiau et al. (2006) the relationship should be higher for individuals with low self-efficacy as well as high positive outcome expectancies and risk perception.

Method

Participants

Participants were recruited in Switzerland (CH) and England (ENG)[1] from the undergraduate and employee populations of two Universities [blinded for peer review] via e-mailing lists and notices posted on campuses advertising a study to women who were dieting or trying to maintain their weight. In Switzerland, recruitment also took place in "Weight Watcher" meetings.

As a cover story all women were told that the study was a taste test to understand how colour preference is linked to taste perception in women who diet versus women who do not diet in different cultures (cf. Kronick & Knäuper, 2010).

Overall, $N = 250$ people expressed interested in taking part in the study. Before the invitation to the laboratory, all women had to fill in an online-questionnaire for measuring e.g. food allergies, or dieting behaviour. Inclusion criteria for invitation and participation in the study were that the women needed to have a wish to lose or maintain weight and/or were currently dieting (excluded: $n = 25$). Moreover, study participants were required to be fluent in (Swiss-) German and English respectively. Exclusion criteria were being allergic to nuts (because women had to taste M&Ms) and/or latex glove (because women had to wear gloves when tasting the M&Ms; $n = 23$), or having an eating disorder ($n = 18$). From the remaining women ($n = 184$) who met these criteria, $n = 99$ did not provide their contact details, did not reply to our invitation mail, or were absent at the appointed date. Of the 85 participants, 10 women were excluded from further analyses because their body mass index was < 20, which classifies them as being underweight. Therefore, the final sample size consisted of 75 women who were

[1] In the following we use the words *English/England* and *Swiss/Switzerland* for the distinction between residents from England or Switzerland, even though their nationality might be another one.

on a diet aged 19 to 66 years with a mean age of 31.95 years (*SD* = 12.40). Thirty eight were residents of Switzerland and 37 of England.

Participating in the study was rewarded through the research participation schemes of each University, whereas all non-students in Switzerland were paid 10 Swiss Francs (10.6 US-Dollars).

All individuals attended voluntarily, gave their informed consent to participate and were treated in accordance to the ethical standards of the Declaration of Helsinki (World Medical Organization, 1996). Furthermore, all participants were debriefed after the experiment. Ethical approval for the study was given by the internal review board of the University of [blinded for peer review] and the study protocol adhered to British Psychological Society ethical guidelines.

Design

This study was designed as a randomised control trial to investigate whether diet-specific CHBs that propose exercise as compensation can be manipulated. For the present analyses the experimental design is not of interest, because this paper focuses on diet-specific CHBs in the framework of the HAPA and not on physical activity. Importantly, there was no significant effect of experimental condition on any of the variables reported here (further description available upon request from the authors or [blinded for peer review]).

Measures

The following instruments were included in the questionnaire to investigate diet-specific CHBs concurrently with the HAPA. All of the listed materials were available in German and English and were completed after the taste test. Furthermore, all of these measures have proven their validity and reliability (Cronbach`s Alpha is given in parenthesis) as can be referred in the listed references. Table 1 the means, standard deviations, and the internal consistencies resulted in this study are shown.

Diet-specific CHBs (Knäuper, Rabiau, Cohen, & Patriciu, 2004; Lippke, Hohmann, Kalusche, & Knäuper, 2007). The original CHB scale proved to be valid regarding construct and criterion related validity. Furthermore, internal consistency of the overall scale is α = .80 and α = .57 of the subscale weight regulation. From the general CHB scale only CHBs related to dieting and maintaining weight were used in this study. The five items (α = .44) were answered on a five-point Likert-scale of 'strongly disagree' (0) to 'strongly agree' (4). Items are 'If one exercises one can eat without many restrictions,' 'Using artificial sweeteners compensates for extra calories,' 'Skipping the main dish can make up for eating dessert,' 'Starting a new diet tomorrow compensates for breaking a diet today,' and 'Eating whatever one wants in the evening is OK, if one did not eat much during the day.'

Risk perception (Scholz et al., 2009; α > .89). Risk perception was measured with three items (e.g. 'If I continue the way I live now, there`s a high probability that I will suffer from serious health issues.') according to the Health Action Process Approach (HAPA). The items (α = .94) are scored on a 6-point Likert-scale ranging from 'not true at all' (1) to 'very true' (6).

Positive outcome expectancies (Renner, Hahn, & Schwarzer, 1996; Renner, Schwarzer, Kwon, Spivak, & Panzer, 2005; Sniehotta, Scholz, & Schwarzer, 2005; α > .80). Positive outcome expectancies defined as evaluations of the pros of certain consequences of behaviours, were measured with five items (α = .63) concerning the positive consequences of reducing weight (e.g. 'If I lose weight, I feel physically more attractive.'). The items are scored on a 6-point Likert-scale ranging from 'not true at all' (1) to 'very true' (6).

Self-efficacy (Renner et al., 1996; Renner et al., 2005; Scholz et al., 2009; α > .84). Seven items (α = .74) assessing dieting self-efficacy, which is defined as an individual's belief of competency to adhere to a diet to lose weight or to maintain a

current weight status, were scored on 6-point Likert-scales ranging from 'not true at all' (1) to 'very true' (6). An item example is 'I am sure that I can reduce my weight, even if I initially have to make plans.'

Intention (Renner et al., 1996; Renner et al., 2005; Sniehotta et al., 2005; $\alpha >$ .82). Intentions concerning nutrition behaviour and diet were measured with five items (α = .72; e.g. 'I intend to eat low-fat food.'). Answering format was a six-point Likert-scale of 'not true at all' (1) to 'very true' (6).

Action planning (Scholz et al., 2009; $\alpha >$ .81). Four items (α = .69) assessed action planning with a 6-point Likert-scale ranging from 'not true at all' (1) to 'very true' (6). The item stem 'I already have concrete plans…,' was followed by the items like '…of when I will start to lose weight,' or '…of how I can lose weight.'

Action control (Scholz et al., 2009; $\alpha >$ .68). Action control was measured by five items (α = .61). The items were introduced by the stem 'During the last seven days, I have...' and followed by items that addressed self-monitoring, awareness of standards, and self-regulatory effort. Examples are '...constantly monitored what I eat,' or '… done everything to act the way I intended.' The items are scored on a 6-point Likert-scale ranging from 'not true at all' (1) to 'very true' (6).

Dietary Intake (Renner et al., 1996; Renner et al., 2005). Eight items (α = .63) were chosen from the 28-item nutrition style questionnaire which measure the amount of sugar and fat intake as well as the food preference for fatty and sugary products. Items which measure food preferences for e.g. vegetarian, whole meal products or salty foods were excluded, because we were interested in sugar and fat intake among dieters and not among the food preferences. The answers are on a 6-point scale ranging from 'not true at all' (1) to 'very true' (6). Item examples are 'I pay regard to eating little fat' or 'I drink soft drinks without sugar.'

Socioeconomic status was operationalized as four groups ranging from (0) no degree, (1) secondary school diploma, (2) high-school diploma to (3) university diploma. Body mass index (BMI; Bray, 1978) was also measured.

(over here Table 1)

Data analysis

To test the hypothesised model, a path analysis with manifest variables was analysed with Mplus 6.12 (Muthén & Muthén, 2007). Manifest instead of latent variables were inserted in the model due to the small sample size. The predictors of intention, the control variables as well as planning and action control were allowed to covary. To account for missing values the Full Information Maximum Likelihood technique (FIML), which is an integral part of Mplus, was applied. The FIML estimates model parameters on the basis of all available information of all observed cases. Overall missing data were below 2%.

For evaluation of the model-fit, the χ^2-test of Model Fit for the Baseline Model is informative (Kline, 2005). Bollen and Long (1993) recommend that χ^2 should not be larger than two to five times the degrees of freedom. Furthermore, the comparative fit index (CFI), and the Tucker Lewis Index (TLI), which should be > .95 as well as the standardized root mean square residual (SRMR) which should be < .05 (Kline, 2005) are presented. The hypothesised mediation of CHBs on planning and action control via intention was tested by the use of bootstrapping to test the strength and significance of the indirect effects (Preacher & Hayes, 2008). The nature of the assumed moderation effects was probed by plotting the moderation by generating regression equations for low to high diet-specific CHBs. The interaction was plotted by an online-tool (Dawson & Richter, 2006) as suggested by Aiken and West (1991). Furthermore, for examining statistical significance, simple slopes analyses were conducted (O'Connor, 1998).

Results

Descriptives

Initially, potential differences in socio-demographic variables were tested to ensure no differences between participants from Switzerland and England. *T*-tests revealed no significant differences for most of the variables. Swiss women (M = 30.87, SD = 13.59) were of the same age as English women (M = 33.05, SD = 11.14), $t(73) = -0.76$, $p = .45$, $d = .18$. Furthermore, the mean of the BMI in the whole sample was 24.89 (SD = 4.42; Switzerland: 24.45, SD = 4.50; England: 25.33, SD = 4.35, $t(73) = -.86$, $p = .39$, $d = .10$) and the average participant intended to lose 8.44 kilograms (SD = 7.8; Switzerland: 8.38, SD = 8.33; England: 8.58, SD = 7.37; $t(72) = -.11$, $p = .92$, $d = .03$) with no differences between both countries. The only significant difference was found for education. Overall, 32% had a university degree, 46.7% a high-school diploma, and 21.3% a diploma from secondary school. Participants from Switzerland (M = 1.61, SD = .79, range 0-3) were less educated compared to participants from England (M = 2.11, SD = .91), $t(73) = -2.56$, $p = .01$, $d = .57$.

In Table 1 the means and standard deviations of all measures are shown for the whole sample and separated by country. As can be seen, there were significant differences in the diet-specific CHB scores between the Swiss and the English participants, $t(73) = 5.26$, $p < .01$, $d = 1.05$, whereby Swiss women had higher CHBs. Moreover, Swiss participants had a higher intention to diet than the English women, $t(73) = 2.51$, $p = .01$, $d = .56$, higher values in action control $t(73) = 3.20$, $p = .01$, $d = .67$, and marginally higher values in planning, $t(73) = 1.81$, $p = .08$, $d = .41$, as well as a lower risk perception, $t(72) = -1.94$, $p = .06$, $d = .44$. For all the other variables there

were no significant differences. Nevertheless, we included the country of residence within all analysis as control variable[2].

Inter-correlations

Table 2 presents the intercorrelations among all measures and possible control variables. As can be seen the control variables age (r = .10; p = .38), BMI (r = .18; p = .13), education (r = .01; p = .90), and the experimental condition (r = -.03; p = .82) were not related with the intention to diet for the whole sample. Furthermore, education, and the experimental condition were not correlated with any of the other endogenous variables (cf. Figure 1) of the hypothesised model. Therefore, these two variables were excluded from further analysis. As also shown in Table 2, the control variable country of residence was significantly correlated with the intention to diet and the diet-specific CHBs. Regarding the CHBs and the HAPA-specific variables, intention was significantly positively correlated with diet-specific CHBs, positive outcome expectancies, planning, action control, and marginally with diet-specific self-efficacy but not with risk perception.

(over here Table 2)

Hypothesised model integrating diet-specific CHBs into the HAPA

The path model specifies the prediction of the intention to diet with the predictors of self-efficacy, outcome expectancies, risk perception, and diet-specific CHBs as well as the control variables country of residence, age, and BMI. Furthermore, according to the HAPA, planning and action control are predicted by intention and self-

[2] It should be noted that we do not assume differences in the results due to country, as both countries have similar health campaigns, nutrition recommendations and prevention campaigns (e.g. Five a day). The eatwell plate in England and the nutrition pyramid in Switzerland contain similar recommendations on healthy diets (The Department of Health (DH), 2012; Schweizerische Gesellschaft für Ernährung, 2011) and physical activity (cf., Bundesamt für Sport, 2009; DH, 2011).

efficacy and in accordance with Radtke et al. (2012), by the CHBs, which are altogether defined as predictors of the dietary intake.

Figure 1 presents the parameter estimates (standardized solution) of the model integrating diet-specific CHBs into the HAPA ($\chi^2(34, N = 75) = 134.30$; $p < .001$; CFI = .98, TLI = .93, SRMR = .03). In line with our hypothesised model intention was predicted by positive outcome expectancies ($\beta = .37$, $p < .01$), and on a 10%-level by diet-specific self-efficacy ($\beta = .19$, $p = .06$). Contrary to our assumptions, diet-specific CHBs ($\beta = .10$, $p = .36$) and risk perception ($\beta = .01$, $p = .76$) were not related to the intention to diet. Instead a significant association between the country of residence and the intention was found ($\beta = .28$, $p = .02$). Overall, 29% of the variance in intention could be explained.

Contrary to our expectation the mediation analysis revealed no mediation of diet-specific CHBs on planning and respectively action control via intention. Furthermore, diet-specific CHBs were not directly related to the dietary intake.

In terms of the HAPA most of the assumptions were confirmed, but however, the effect of intention on behaviour was not meditated via planning and/or action control. Intention was rather directly associated with the dietary intake ($\beta = .42$, $p < .001$).

(over here Figure 1)

In a next step, we tested whether the interaction term of the diet-specific CHBs with a) the self-efficacy, b) the outcome expectancies, and c) the risk perception might explain further variance within the path analysis. All variables were centered. Neither the interaction term of CHBs with self-efficacy ($\beta = -.03$, $p = .77$) nor the interaction with outcome expectancies ($\beta = -.06$, $p = .57$) was significantly related to intention to diet. However, analysis revealed that risk perception moderated the CHB – intention relationship ($\chi^2(38, N = 75) = 143.29$; $p < .001$; CFI = .99, TLI = .94, SRMR = .03): the

interaction term was significantly related to intention to diet (β = .26, p = .01). No main effects of diet-specific CHBs (β = .08, p = .50) and risk perception (β = .05, p = .74) on intention emerged. Figure 1 displays the parameter estimates of the model including the interaction term of CHBs and risk perception. Next, the moderation effect was probed (see Figure 2) by generating regression equations for low to high diet-specific CHBs. The simple slopes analyses demonstrated that the higher the diet-specific CHBs the higher the intention to diet in participants with a high (t(70) = 2.93, p = .01) and medium (t(70) = 2.04, p = .05) risk perception, but not in women with low risk perception (t(70) = .07, p = .95). These results suggest that the relationship between diet-specific CHBs and intention to diet varied depending upon participants' risk perception.

(over here Figure 2)

Discussion

This study is to our knowledge the first one investigating diet-specific CHBs within the framework of a health behaviour change model, HAPA. The results of the hypothesised model demonstrated that diet-specific CHBs were neither significantly related to the intention to diet nor related to the behaviour of dietary intake. However, a significant moderating effect of risk perception for the relationship between CHBs and intention was found. As can be seen, only in women with a high or moderate risk perception diet-specific CHBs were related to the intention to diet: the higher the diet-specific CHBs the higher the intention to diet or vice versa. This interaction is in line with assumptions of the CHB model (Rabiau et al., 2006). However, contradictory to our hypothesis and previous results of other studies (e.g., Kronick & Knäuper, 2010; Radtke et al, 2012), the moderator analysis revealed that diet-specific CHBs were significantly positively, and not negatively, related to the intention to diet. How might this difference be explained? One explanation might be that CHBs are differently relevant at different

stages of a health behaviour change process. According to Schüz, Sniehotta, Mallach, Wiedeman, and Schwarzer (2009) different information is relevant at diverse points of a behaviour change process. Perhaps CHBs act as a motivator for individuals at an earlier stage of the health behaviour change process to strengthen one`s own intention, because CHBs reduce the level of difficulty to reach the aim of losing weight by believing that compensation is possible. Therefore, high CHBs might support the intention to diet because the goal seems reachable. This might also explain why no moderating effect of outcome expectancies and self-efficacy have been found: According to the HAPA, risk perception is a distal starting point of the health behaviour change process whereas outcome expectancies and self-efficacy are stimulated afterwards (Schwarzer, 2008).

Nevertheless, Knäuper and colleagues (2004) stated that in the long run, the activation of CHBs will result in a negative relationship between CHBs, intention and behaviour, as the need to compensate for the unhealthy behaviour decreases over time. This in turn will result in the pathogenesis of diseases, which might explain the negative association of CHBs with intention or behaviour found in other studies (e.g., Kronick & Knäuper, 2010; Rabiau et al., 2009; Radtke et al., 2011; Radtke et al., 2012). In line with this, it is conceivable that the continuous activation of CHBs undermine the intention to change behaviour over time, especially in the action stage. This is reasonable, because in the action stage, individuals will experience several lapses that result in negative and guilty feelings regarding their intention change behaviour. According to the CHB model (Rabiau et al., 2006) the activation of the CHBs neutralise these negative feeling, which again might undermine intention.

Overall, most of the assumptions in regards to the HAPA were confirmed. Comparable to other studies (Scholz et al., 2009) no significant direct association of risk perception with the intention to diet was found. This non-significant link between risk perception and intention might be due to the different ascertainment of measurement,

because risk perception was measured in general whereas intention was measured behaviour-specific.

In our study most of the participants had high intentions to diet. However, intention was not associated with planning and not mediated via planning/or action control on behaviour. Intention was rather directly associated with dietary intake. One possible explanation might be that the measurement of planning and action control did not match the general measure of dietary intake. Whereas planning and action control were formulated regarding weight loss, the dietary intake measured the amount of sugar and fat intake as well as the food preference for fatty and sugary products.

Next to the results of the HAPA model it should be noted that the country of residence was significantly related with the diet-specific CHBs and the intention to diet: Swiss women had higher CHBs and higher intentions than English women. One explanation for these differences might be due to sampling bias between the two countries, because most of the Swiss participants were recruited in "Weight Watcher" meetings whereas the English women were students and staff members of the University, and to our knowledge did not attend any weight loss programs. Therefore, it is reasonable that the intention to diet was stronger in the Swiss sample. Moreover, as stated in the CHB model (Rabiau et al., 2006) a higher importance of one`s own health goal (here: intention to diet) is more likely to lead to an activation of CHBs, because the guiltiness when failing to act according to one`s intention is higher. Thus, CHBs will be higher in the Swiss sample, because CHBs are activated as a self-regulation strategy.

In sum, the most central result of our analyses demonstrated that the relationship between diet-specific CHBs and intention to diet depends upon ones risk perception whereby CHBs were significant positively related with the intention to diet in participants with a high or medium risk perception.

This study is not without limitations. A first limitation is the small group size, which can result in skewed results. Therefore, the results need to be interpreted cautiously (Tabachnik & Fidell, 2007). In line with this, our conclusions need to be further tested within a larger, cross-cultural population to confirm them.

A second limitation is that due to the translation process some of the face validity of the variables might have been reduced. Nevertheless, all questionnaires (German and English) were checked by native speakers to ensure that they measured what they were supposed to measure. Furthermore, the majority of the measures proved to be valid and reliable in German and in English (cf. Renner et al. 1996; Renner et al., 2005). However, the internal reliability of some measures (e.g. positive outcome expectancies or CHBs) in our study were questionable (<0.70; Cortina, 1993), which might be due to the translation of the questionnaire items from English to German or vice-versa. Regarding the CHB items, one further explanation for the rather low internal consistency might be that the items measure different compensatory behaviours as justification for a neglected diet (e.g. exercise, using artificial sweeteners, or skipping the main dish; cf. Radtke, Scholz, Keller, Perren, and Hornung, in press). Nonetheless, the inclusion of a broader range of different compensating behaviours in the CHB scale provides a more realistic picture of dieting behaviour and justification beliefs than including only one compensating behaviour. In addition, it should be mentioned that only eight out of 28 items from the scale to dietary intake were chosen. However, the remaining 20 items measure food preferences we were not interested in, e.g., like vegetarianism. Furthermore, adaptions of this scale proof to be valid and reliable measures as shown by other research (e.g., Ochsner, Scholz, & Hornung, 2013).

A third limitation is that in both countries participants were rewarded differently, but we believe this can be disregarded, because the incentives were adapted to the conditions of rewarding in the two countries.

Fourthly, due to the small sample size the path model could only be defined with manifest mean values instead of specifying latent variables. This kind of SEM – path analysis – assumes that all variables are measured without error, which is normally not the case. Therefore, future research should analyse the present research questions in larger samples with the use of structure equation model with latent variables in order to take errors in measurement into account (Kline, 2005).

A fifth limitation is the cross-sectional design, because differentiating between causal inference for cause and effect relations and simple association is limited. Future studies might want to test the added value of CHBs in a longitudinal, if not experimental design in order to clarify causal directions. Furthermore, this study is based on self-reports. Objective measures of the behaviour are preferable. Moreover, the CHBs were measured with the general CHB scale (Knäuper et al., 2004) which includes no situational or emotional aspects of the CHBs even though these are characteristics of CHBs according to Rabiau et al. (2006). Future studies should therefore measure the CHBs in a more situation-specific way (cf. Kronick & Knäuper, 2010) and use items that also capture the affective aspects to fully cover the construct as originally intended. An item example would be "At the very moment of snack consumption I was thinking that it is OK to snack because today I have not eaten much yet." (Radtke, Inauen, Rennie, Orbell, & Scholz, 2013). Implicit measurements of CHBs are also suggested (cf. Glock, Müller, & Krolak-Schwerdt, 2013). In addition, it is also recommended to examine CHBs together with a stage algorithm over and above continuous measures of social-cognitions (cf. Schwarzer, 2008). Thus, it can be examined in more detail whether or not CHBs are differently relevant at diverse points of a health behaviour change process.

A final limitation within this study is that the samples across countries were heterogeneous in terms of the recruitment procedures. In England mostly students were

recruited, whereas in Switzerland recruitment also took place in "Weight Watcher"-meetings. Future studies should try to harmonise the enrollment of participants and avoid different recruitment methods.

This study is one of the first investigating diet-specific CHBs in the framework of a health behaviour change model. Therefore, it provides important and new information to better understand the significance of these beliefs for the prediction of intention and health behaviour.

According to our results, future research should further investigate moderators of the relationship between diet-specific CHBs and the intention to diet. In addition, the investigation of CHBs at different stages of a health behaviour change process is suggested. The question should be answered whether there is a difference in the influence in pre-intenders, intenders, and actors in terms of the diet-specific CHBs and their influence on a health behaviour change (Schwarzer et al., 2011). Knowing how to handle or prevent diet-specific CHBs would contribute to the development of future successful interventions for successful dieting.

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Table 1

Scale characteristics (mean, SD, range)

Scale	*M*			*SD*		
	Overall	CH	ENG	Overall	CH	ENG
Diet-specific CHBs (range 0-4)	1.50	1.82	1.16	0.63	0.54	0.54
HAPA variables:						
Risk perception	2.38	2.07	2.71	1.47	1.44	1.44
Positive outcome expectancies	4.64	4.52	4.77	0.81	0.88	0.74
Diet-specific self-efficacy	4.20	4.09	4.33	0.88	0.88	0.87
Intention	5.11	5.31	4.91	0.72	0.64	0.75
Planning	4.66	4.86	4.47	0.95	0.87	0.99
Action control	4.05	4.36	3.74	0.90	0.79	0.91
Dietary intake	4.00	4.01	3.88	0.82	0.70	0.92

Note. CHBs = Compensatory Health Beliefs. CH = Switzerland, ENG = England. If not noted the range of the scales was from 1-6.

Table 2

Intercorrelations between the manifest variables used in path analysis and control variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Diet-specific CHBs	1.00												
2. Risk perception	-.04	1.00											
3. Positive outcome expectancies	.01	.36**	1.00										
4. Diet-specific self efficacy	-.22	.05	.23	1.00									
5. Intention	.24*	.12	.37**	.20†	1.00								
6. Planning	.02	-.02	.24*	.29*	.29*	1.00							
7. Action Control	.27*	.08	.17	.13	.34**	.58**	1.00						
8. Dietary intake (Low fat/sugar preference)	.26*	.05	.37**	-.14	.62**	.41**	.47**	1.00					
9. Age	-.20	.01	.38*	.33**	.10	.23*	.10	.19	1.00				
10. BMI	.04	.63**	.32**	.20	.18	.26*	.22†	.26*	.21	1.00			
11. Education	-.20	-.07	-.01	.03	.01	.09	.06	.01	.16	.01	1.00		
12. Experimental condition	-.17	-.07	.19	.10	-.03	.03	.01	.05	.21	-.15	.06	1.00	
13. Country of residence	.52**	-.22	-.15	-.14	.28*	.12	.27*	.13	-.09	-.25*	-.29*	-.04	1.00

Note. Experimental condition: control group = 0, experimental group = 1. Country of residence: CH = 1, ENG = 0. †p<0.10. *p<0.05. **p<0.01.

Figure caption

Figure 1. Hypothesised model of diet-specific CHBs within the Health Action Process Approach. *Note*. CHBs = Compensatory Health Beliefs; Standardised solution of the path model conducted with MPlus 6.12. The correlations between the predictors of intention are not displayed as well as the control variables age and BMI in order to allow a simplified overview and because both control variables were not significantly related to any of the other variables. The numbers in parenthesis are the results when including the interaction term (displayed by dotted lines) into the analysis. When no parenthesis is provided, the estimators are the same in both analyses. †p = 0.10. *p < 0.05. **p < 0.01. ***p < 0.001.

Figure 2. Risk perception as moderator. *Note.* CHBs = Compensatory Health Beliefs. Standardised solution. The figure displays simple slops for low to high diet-specific CHBs at three levels of the moderator. The interaction is plotted by an online-tool of Dawson and Richter (2006).