The Relation between Personality and Compensatory Health Beliefs and – Behavior Concerning Regular Physical Activity

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Abstract

This study investigated the relation of personality and compensatory health beliefs and behavior concerning regular physical activity. Compensatory health beliefs are beliefs that the negative consequences of an unhealthy behavior can be compensated by engaging in another volitional healthy behavior. These beliefs can cause problems, for example if the individual does not follow their own planned compensatory health behavior, or if they do, not all effects of the negative behavior can be compensated for effectively by compensatory health behaviors.

Participants of this study consisted of university students who filled in an online survey. The survey consisted of questions dealing with their personality, compensatory health beliefs, compensatory health behaviors and their level of physical activity as well as their physical fitness. In total 139 participants completed the online survey.

Results showed that compensatory health beliefs correlated positively with the personality traits agreeableness and neuroticism. Furthermore a complete mediation effect of compensatory health beliefs between the constructs of compensatory health behavior and physical fitness was found. The personality traits conscientiousness as well as compensatory health beliefs predicted the level of physical fitness to a similar amount. Moreover, it was found that high neuroticism was a protective factor for the negative effects of compensatory health beliefs on physical fitness.

This research found several interesting findings regarding compensatory health beliefs and physical activity. It can be seen as an introduction to the domain of compensatory health beliefs and behavior concerning physical activity, as this field of research is still relatively unexplored. Further research should focus on the relation of personality traits and compensatory health beliefs and behavior to find out how these constructs relate to, and possibly influence each other with the purpose of improving health behavior.

Key Words: compensatory health belief, physical activity, personality, health behavior

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1. Introduction

Regular exercising is an essential part of everyday life of a large part of the population. In terms of health-related research three different categories can be distinguished. These three are physical activity, exercise and physical fitness (Caspersen, Powell, & Christenson, 1985). Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen et al., 1985). Everyday movements like walking, shopping or lifting bags fall into this category. Exercise can be seen as an addition to physical activity. Although they have elements in common, like bodily movement via skeletal muscles resulting in an energy expenditure that varies continuously from low to high, exercises are planned, structured and repetitive bodily movements (Caspersen et al., 1985). Moreover a feature of exercise is to improve or maintain physical fitness. Practicing football in a club twice a week can be seen as an example for exercise. The third category, physical fitness, can be regarded as "a set of attributes that people have or achieve" (Caspersen et al., 1985). While movement is the basis of physical activity, physical fitness can be reached through exercise. Daily tasks can be performed without suffering from fatigue, thus people have a higher muscular endurance and strength than average people due to exercising.

According to In ´t Panhuis, Luijben and Hoogenveen (2012), being physically active leads to a higher life expectancy. The Dutch population over 20 years of age can add 0,7 years for men and 1,2 years for women to their life expectancy by being physically active. The population over 65 years of age benefits even more of being active. In comparison to risk factors such as smoking and overweight, being physically active adds the highest plus on life expectancy, with an average of 0,6 years for men and 1,0 years for women (in ’t Panhuis, Luijben, & Hoogenveen, 2012).

In contrast to physical activity and its benefits, physical inactivity has been identified as the fourth leading risk factor of global mortality, causing an estimated 5.3 million deaths each year worldwide (Lee et al., 2012). In the Netherlands, 6% of the total number of deaths is caused by a lack of physical activity (Wendel-Vos, 2014). The ´Nederlandse Norm Gezond Bewegen´ (NNGB), the Dutch index for healthy movements, states that adults should at least be physically active half an hour five times per week with moderate effort. For children from 4 – 17 years of age it advices at least one hour of moderate bodily activity per day, whereof at least two times per week strength, agility and coordination should be practiced to improve or maintain physical fitness. People older than 55 are advised to be physically active for half an

hour on at least five days per week with moderate intensity. According to the NNGB, physical fitness is defined as working out at least three times per week with minimal 20 minutes heavy physical activity, for both young as well as older people (volksgezondheidenzorg.info, 2014). Possible negative results of not moving enough are apoplectic strokes, heart attacks and diabetes. Approximately one out of five (21%) new incidences of apoplectic strokes is the result of inadequate physical activity (in ’t Panhuis et al., 2012). The same is true for heart attacks, with one out of five (20%) new incidences being caused by physical inactivity. For diabetes, one out of ten (10%) new incidents is caused by inactivity. Furthermore, dealing with these illnesses has another negative side effect, besides the physical one. The Dutch government spends 1.3 million euro on care-giving expenses because of physical inactivity each year, which accounts for almost 2% of the overall costs of health care spending (in ’t Panhuis et al., 2012).

A possible explanation for the lack of being physically active could be the self-efficacy of an individual. Self-efficacy is defined as one´s belief in one´s ability to succeed in specific situations (Bandura, 1977). This social cognitive theory was used to explain specific behavior of individuals, explaining success or failure of the individual. Self-efficacy is developed through external experiences, like observational learning and social experience. According to Bandura (1977), people who believe in themselves performing well, thus people with high self-efficacy, see difficulties more as a task to be mastered rather than something to be avoided. In terms of physical activity this means that high self-efficacy can lead to being more active and therefore living a healthier life. Researchers already found that physical activity self-efficacy, an individual’s belief in their abilities to be physically active, shows the most consistent correlation with actual physical activity behavior (Trost, Owen, Bauman, Sallis, & Brown, 2002).

Another reason for not being physically active could be the intention to perform a certain behavior. Intention is assumed to capture motivational factors that influence behaviors. In theory the general rule can be reasoned, that the stronger the intention is to engage in a behavior, the more likely this behavior will be performed (Ajzen, 1991). Ajzen (1991) states in his “Theory of planned behavior” that three determinants are important to execute these intentions. These three are the attitude towards the behavior, the subjective norm and the perceived behavioral control. The motivational aspect on decision making is lacking in Ajzen´s theory, which makes it a purely rational based theory (Rabiau, Knäuper, & Miquelon, 2006). Making the decision to be physically active does not imply the actual execution of the volitional behavior. This is called the “intention-behavior gap” (Rhodes & De Bruijn, 2013).

A possible explanation for this gap could be the temptations people are exposed to throughout the daily life (Berli, Loretini, Radtke, Hornung, & Scholz, 2014). Instead of going to the gym to work out, they watch a movie at home instead, because this may be the easier not exhausting activity. This behavior can become problematic if it conflicts with their health and activity goals.

When being exposed to an unhealthy temptation, like the one mentioned above, a conflict arises between one's own health goals and the easier tempting activity. This can create a motivational conflict or feelings of guilt (Giner-Sorolla, 2001), which motivates the individual to seek and implement a strategy to alleviate this unpleasant state (Rabiau et al., 2006). Rabiau et al. (2006) describe in their "Compensatory Health Beliefs Model" the three major strategies to deal with these unpleasant states. The first strategy is to decide to resist the desire, in this specific case it would be not watching the movie, but leaving the house to work out. This is a behavioral strategy, whereas the following two are cognitive strategies. The second strategy is the adaption of perception of the degree of risk caused by the behavior that is not in line with one´s own health goals. An example would be that the individual convinces himself that watching a movie instead of training at the gym does not have a major disadvantage for their own health goals. The third strategy is creating or activating compensatory health beliefs (CHBs). CHBs are beliefs that the negative consequences of an unhealthy behavior can be compensated by engaging in another volitional healthy behavior (Knäuper, Rabiau, Cohen, & Patriciu, 2004). An example for this third strategy can be that the individual convinces himself that not training today is alright, because he will do some housework after watching the movie instead.

Using CHBs is a strategy used by individuals when they fail to resist temptations. It is caused by an automatic motivated process, which tries to reduce the cognitive dissonance that builds up by engaging in unhealthy behavior instead of the healthy behavior (Knäuper et al., 2004). Using CHBs does not necessarily result in negative effects on health. First, it will not affect a person´s health negatively if the compensatory behavior indeed neutralizes the effects of the unhealthy behavior. Also, if the person indeed follows through with the compensatory behavior, the negative effect can be neutralized. However, not all effects of negative behaviors can be compensated effectively by compensatory health behaviors. Overusing compensatory health behaviors, because of mistakenly thinking they make up for the unhealthy behavior, can lead to illness in the long run. Furthermore, people do not always follow their own planned compensatory behaviors, instead they procrastinate and wait until

the initially felt need to compensate for the unhealthy behavior fades away on its own (Knäuper et al., 2004).

Relating to eating habits, previous research has dealt with the difference between trait CHBs and state CHBs regarding high-calorie snack consumption. Trait CHBs are stable individual differences, such as personality traits that do not change over time. State CHBs are activated in a tempting situation, such as a delicious cake or an attractive snack being offered (Radtke, Inauen, Rennie, Orbell, & Scholz, 2014). The researchers tried to find out whether trait or state CHBs are predictive for future unhealthy behavior regarding snack consumption. Against their hypothesis, results showed that trait CHBs are more relevant for the prediction of high-calorie snack consumption than state CHBs (Radtke et al., 2014). Knowing that trait CHBs, stable traits like the personality of an individual, play a role in predicting unhealthy eating habits, it can be assumed that trait CHBs are predictive for physical activity and exercising habits as well.

Literature shows that other personality traits also are related to health and health-related exercises. Every individual has its own unique personality. Personality nowadays is often seen as a mixture of five traits. These five factors are (1) extraversion, (2) agreeableness, (3) conscientiousness, (4) neuroticism and (5) openness (McCrae & Costa, 1987). Extraversion can be described in terms of sociable, affectionate, spontaneous and talkative. Adjectives for agreeableness are sympathetic, forgiving and trusting. People who score high on the factor conscientiousness are given adjectives like well organized, self-disciplined and ambitious. Neuroticism is linked to more negative expressions like temperamental, impatient or nervous. The last factor openness is described as creative, analytical and imaginative (McCrae & Costa, 1987). New studies of adult sitting behavior have shown that low levels of conscientiousness, extraversion and openness and high levels of neuroticism predict a greater occurrence of "leisure-time sitting-time" (Allen & Laborde, 2014). In contrast, high levels of extraversion and conscientiousness and low levels of neuroticism relate to high levels of being physically active (Rhodes & Smith, 2006). In addition it has been found that industriousness (a component of conscientiousness) and activity (a component of extraversion) are often identified as important positive physical-activity indicators (Rhodes & Pfaeffli, 2012).

In line with the literature reviewed above, it can be assumed that personality has an impact on being physically active. In addition literature shows that CHBs predict compensatory health behavior. Up to this moment no study examined whether the relation between personality and health behavior is influenced via CHBs and vice versa. CHBs could

be functioning as a mediator between personality and health behavior (see Figure 1), which means the relation between personality and physical activity could be (partly) explained by CHBs.

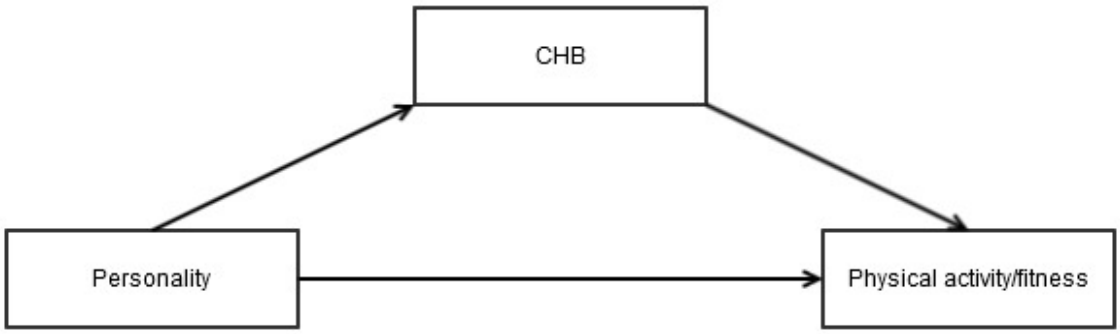

Figure 1. Mediation Model with Compensatory Health Belief functioning as mediator

A second possibility is that personality functions as a moderator between CHB and health behavior, in this example physical activity/fitness (see Figure 2). This means that the relation between CHB and physical activity can be dependent on personality.

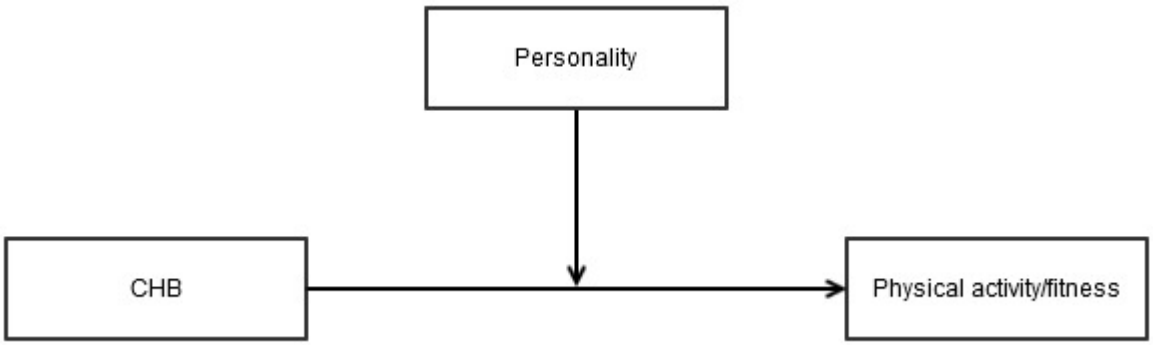

Figure 2. Moderation Model with Compensatory Health Belief functioning as moderator

Therefore the main research question was (1) if particular personality traits have a correlation with developing or holding CHBs concerning physical activity. Furthermore, it was questioned if (2) CHBs regarding physical activity will be positively correlated with the actual compensatory health behavior. In addition, it was questioned if (3) individuals scoring high on the personality traits extraversion and conscientiousness will hold less CHBs. The next thing to examine was whether (4) being physically fit can be explained more through the personality traits extraversion and conscientiousness or through CHBs and CH Behavior.

Lastly, it was questioned (5) if the relation between personality and physical activity can (partly) be explained by CHB, and (6) if the relation between CHB and physical activity is dependent on personality.

2. Method

2.1 Procedure and Participants

Data for this study were collected via an online questionnaire. This online study was carried out as a cross-sectional study, meaning that it was conducted to estimate the prevalence of the outcome of interest for a given population at one given time point (Levin, 2006). Therefore only one measurement is necessary. Additionally we made use of a convenience sample. There were two ways to participate in the online survey: first, through the test-persons system of the university (Sona), second via social media and personal contacts. People participating via the test-persons system of the university were credited with 0.5 test-person credit points for taking part in the online survey. All participants were taking part in the survey voluntarily and were able to stop the survey at any given time, without mentioning any reason. Furthermore they had the option to review or retract their responses at any time, also without giving reasons. The online survey was approved by the Ethics Committee Faculty of Behavioral Sciences of the University of Twente, Enschede, on the 23rd of March, 2015. Participants were able to take part in the online survey from 25th of March, 2015, up to and including 30th of April, 2015.

2.2 Materials

Collecting data to answer the research questions was done by using several questionnaires in English, which were combined in the online survey. First, questions about the demographic situation were asked, related to the age, gender, profession, country of origin and the height and weight of the participant in order to calculate the body mass index (BMI). This was followed by questions about compensatory health beliefs, compensatory health behavior, personality and physical activity as well as physical fitness.

2.2.1 Compensatory Health Beliefs

The nine items that were used to measure compensatory health beliefs were translated into English on the basic work done by Zottmann in her thesis (2014). Zottmann generated her items by taking the first version of the Compensatory Health Belief Scale by Knäuper et al. (2004), which was especially focused on physical activity, and added further adapted items of the compensatory questionnaire by Nannings (2013), also dealing with physical activity. Again, the answers were scored on a five-point Likert scale, ranging from 1 = “strongly disagree” to 5 = “strongly agree”. The average score of all nine items was the final score of

the compensatory health beliefs, with a high score representing a lot of compensatory health beliefs and a low score representing few compensatory health beliefs. The internal consistency of the items in Zottmann´s research was sufficient with an average Cronbach´s alpha of .74. Furthermore the test-retest reliability was good with a coefficient of r = .81, which shows that the results of the measure were stable over time. In this study, Cronbach´s alpha for the internal consistency was α = .66.

2.2.2 Compensatory Health Behavior

The scale to measure compensatory health behavior consisted of nine items. These items dealt with compensatory behavior of the last two weeks. "How often in the last two weeks did you skip physical training, because you were active in your everyday life?" is one of the questions. The participants could answer these questions by picking one of the five possible answers that fits their activity the most. The answers ranged from 1 = "never" to 5 = "very often" on a Likert scale. The total score was the average score of all nine items, with a low score representing little compensatory health behavior and a high score representing a high level of compensatory health behavior. The items were generated and translated into English on the basis of work done by Zottmann in her thesis (2014), dealing with compensatory health behavior. Zottmann developed her items based on the recommendations of Kakalamanou, because up to that point there was no questionnaire dealing with compensatory health behavior measuring physical activity in particular. During her measures, Zottmann´s scale achieved a good intern consistency, with an average Cronbach´s alpha of .82. In this study, Cronbach´s alpha was .79 for the internal consistency, which shows a good reliability and supports Zottmann´s findings.

2.2.3 Personality

To measure personality, the Big Five Inventory (BFI-10) was used. This short version of the BFI-44, which consists of 44 items measuring the main five personality traits extraversion, agreeableness, conscientiousness, neuroticism and openness, was reduced to 10 items to provide a reliable measure for contexts in which participants time is severely limited (Rammstedt & John, 2007). Each personality trait is measured by two items. The items all started with the statement "I see myself as someone who …" and continued with a statement to measure one personality trait, for example "… is reserved". The answers are rated on a five-step Likert scale, ranging from 1 = "disagree strongly" to 5 = "agree strongly". The average score of the two items belonging together measuring one personality trait is the final

score, with a high score standing for a high level of this particular personality trait. Compared to the longer BFI-44, the BFI-10 scales on average capture 70% of the full BFI variance and retained 85% of the retest reliability (Rammstedt & John, 2007). In this study Cronbach´s alpha was not convincing with an alpha α = .58 for extraversion, α = .15 for agreeableness, α = .42 for conscientiousness, α = .70 for neuroticism and α = .07 for openness. Especially the alpha values examined in this survey for the traits agreeableness and openness were very poor.

2.2.4 Physical activity and physical fitness

To assess the level of physical activity of the participants, the "Nederlandse Norm Gezond Bewegen" (NNGB) was used. This validated questionnaire is developed to measure if people meet the recommended standards of an active, healthy lifestyle and physical activity (Hildebrandt, Ooijendijk, & Hopman-Rock, 2005). The Dutch norm of healthy movements only needs three questions to estimate the level of physical activity and further three questions to estimate the level of physical fitness. Given that the NNGB was only available in Dutch, it was translated to English to use it for the online survey. An example of the questions measuring physical activity is "How many days a week have you done at least 30 minutes a day of such exercises (walking or cycling, gardening, sporting, and other bodily movements at school/work, at home or in your spare time)? The question deals with the average number of days of a normal week in the past month." The participants had to choose an answer ranging from 0 – 7, respectively standing for the days in the week they were physically active in the past month. The first three questions refer to the level of physical activity (NNGB), whereas the other three questions were aiming at physical fitness (fitness norm). To get the total score of physical activity and physical fitness, the average of the three particular questions was estimated and compared to the norm. Cronbach´s alpha in this survey for physical activity was α = .85 and for physical fitness it was α = .91, which stands for a high internal consistency and therefore for a high reliability.

2.3 Analysis

To analyze the dataset the statistic program SPSS 22 was used. For all statistical analyses an alpha of 0.05 was used to determine the significance of the results. Before the hypotheses were tested, box plots were used to examine the standard distribution of the data. Also, the internal consistency of all constructs was determined by calculating at the Cronbach´s alpha.

Starting with the main analyses, first, descriptive statistics were conducted. The ranges of the age, gender, nationality, profession and BMI were estimated as well as their means and standard deviations. Following up, a univariate correlation table was made by correlating all constructs with each other. This was done in order to find significant connections between constructs that may be useful for further analysis. Having the scores on the physical activity and physical fitness questions, the average scores were compared to the Dutch norm of healthy movement and the fitness norm in order to get information about the distribution of the respondents. Furthermore, based on the height and weight of the respondents, the BMI was estimated and compared to the BMI norm, with the categories underweight, normal weight, overweight and obese.

In order to answer the research questions, for the first three questions Spearman correlation analyses were done. Correlations can range from 0, no correlation at all, to 1, perfect correlation. Correlations ranging from 0 to 0.3 are seen as weak, from 0.3 to 0.5 as moderate and correlations above 0.5 are seen as strong correlations (Cohen, 1988). For the fourth research question a multiple hierarchical regression analysis was done. Using the enter method, for the first model conscientiousness and extraversion and for the second model CHB and CH Behavior were added. It was tested whether being physically fit can be explained more through the personality trait extraversion and conscientiousness or through CHBs and CH behavior. With this analysis the predictive value of the four variables was checked.

At last, mediation and moderation analyses were conducted using multiple regression analysis, as described by Baron and Kenny (1986), to answer the fifth and sixth research question. With the mediation analyses it was tested whether CHBs are functioning as a mediator between CH behavior and physical fitness. The moderator analysis was used to test if the relation between CHBs and physical fitness was dependent on certain personality traits.

3. Results

3.1 Descriptive Statistics

The respondents had to answer every question of the online survey in order to be included in the analyses. After deleting all the unfinished datasets (n = 187 participants started the survey), the total number of respondents was n = 139. This is a dropout rate of 25.7%. The respondent's ages ranged from 18 to 52 years of age (M = 21.8, SD = 3.7). 36% (n = 50) of the participants were male, 64% (n = 89) were female. 92.8% (n = 129) of the respondents were students, 5.8% (n = 8) were employed and the rest (1.4%, n = 2) reported neither being a student nor employed. In addition 66.9% (n = 93) were from German descent, 31.7% (n = 44) from Dutch descent and 1.4% (n = 2) from another country. The average participant had a body mass index (BMI) of 22.2 (SD = 3.2), which is considered a normal value for adults (Cdc, 2011).

Table 1 gives an overview of the means and standard deviations of the body mass index (BMI), compensatory health belief scale (CHB), compensatory health behavior (CH Behavior), the five personality traits, and the days per week (continuous) of being physically active and physically fit measured by the questions of the Dutch norm of healthy movement.

Table 1. *Descriptive Statistics of the participants. (N = 139)*

	Range	Minimum	Maximum	Mean	Standard deviation
BMI	/	17	40	22.19	3.18
CHB	1-5	1.56	4.11	2.67	0.47
CH Behavior	1-5	1.00	3.78	2.05	0.66
Extraversion	1-5	1.50	5.00	3.47	0.74
Agreeableness	1-5	2.00	5.00	3.50	0.64
Conscientiousness	1-5	1.50	5.00	3.30	0.77
Neuroticism	1-5	1.00	5.00	2.87	0.89
Openness	1-5	1.50	5.00	3.46	0.72
Physical activity	0-7	0.33	7.00	3.59	1.57
Physical fitness	0-7	0.00	7.00	2.76	1.57

3.2 Correlations between the constructs

A correlation analysis was done between the different variables and constructs (see Table 2), therefore the same continuous values that can be seen in Table 1 were used. The first noticeable significant correlation can be seen between the constructs of CH behavior and

CHBs (r = .514, p < .001). Out of the five personality traits only agreeableness (r = .176, p = .038) and neuroticism (p = .285, p = .001) correlated significantly, but weakly with CHBs. CHB correlated moderately negative with physical fitness (r = -.318, p < .001). Physical fitness tended to correlate more with most of the other variables and constructs than physical activity. Beside the interesting correlation of physical fitness and the construct of CHBs, there also is a weak negative correlation between physical fitness and CH Behavior (r = -.202, p = .017). Furthermore, physical fitness correlated positively with two of the five personality dimensions, namely extraversion (r = .181, p = .033) and conscientiousness (r = .239, p = .005). As expected, a strong positive correlation was seen between physical fitness and physical activity (r = .617, p < .001).

Table 2. *Correlations between the variables and constructs*

	BMI	CHB	CH Behavior	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness	Physical activity	Physical fitness
BMI	-									
CHB	-,08	-								
CH Behavior	-,06	,51**	-							
Extraversion	,16	-,11	,07	-						
Agreeableness	,12	,18*	,01	,18*	-					
Conscientiousness	,02	-,13	-,12	,13	,10	-				
Neuroticism	-,12	,29**	,14	-,06	,02	-,05	-			
Openness	,03	-,03	,08	,14	,19*	,04	,15	-		
Physical activity	,14	-,12	-,07	,20*	,11	,16	-,05	,11	-	
Physical fitness	,16	-,32**	-,20*	,18*	-,06	,24**	-,09	,05	,62**	-

*p < .05, two-tailed significance.
**p < .01, two-tailed significance.

3.3 Dutch norm of healthy movement (NNGB) and the fitness norm

To find out how many of the respondents were physically active sufficiently according to the NNGB and the fitness norm, the average of their answers was compared to the norm. Physical activity was separated into three categories: inactive (0 days active), semi-active (1 – 4 days active) and norm active (5 or more days active per week). Results showed that 5.8% (N = 8) of the respondents were inactive, the majority of 69.8% (N = 97) were semi-active and only 24.5% (N = 34) were sufficiently physically active in their daily lives. There are also

three subcategories for the fitness norm: inactive (0 days active), semi-active (1 or 2 days active) and norm active (3 or more days active per week). According to the fitness norm, the frequency of inactive people rises to 10.1% (N = 14), 45.3% (N = 63) are ranked in the semi-active category and surprisingly 44.6% (N = 62) are ranked norm active, meaning that they satisfy the norms of physical fitness. 19.2 % of the respondents (N = 27) achieve the standards for both categories, physical activity and physical fitness, and can therefore call themselves sufficiently physically active and fit in their daily lives.

3.4 Body Mass Index (BMI)

The body mass index can be categorized into four categories. The first weight status is underweight, with a BMI below 18.5. The second category is normal, ranging from 18.5 to 24.9. The next category is overweight with values ranging from 25 to 29.9 and the last category is obese with a BMI value of 30 or higher. Slightly more than three-quarter of the respondents had a normal body weight according to the body mass index for adults (N = 106, average BMI = 21.7). The second largest group are the respondents with overweight (N = 18, average BMI = 27). N = 13 respondents could be classified into the category underweight (average BMI = 18), and the smallest group is the category obese with only N = 2 respondents (average BMI = 35). The distribution and percentages of the categories can be seen in Figure 3.

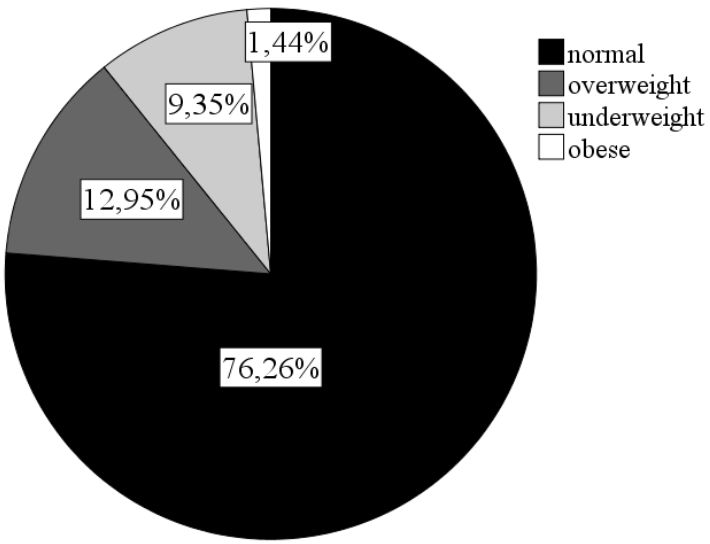

Figure 3. Pie chart of the BMI categories

3.5 Correlation analyses

In order to test whether the five personality traits correlated with CHBs concerning physical activity, Pearson correlations were done. Two significant results were found. First, CHB and the trait agreeableness correlated positively with each other ($r = .18$, $p = .038$), which means that more CHBs were associated with higher agreeableness scores. A slightly stronger positive correlation was found between CHB and the trait neuroticism ($r = .29$, $p = .001$).

To test whether CHBs regarding physical activity are positively correlated with actual CH Behavior, there also a Pearson correlation was conducted. The result showed a strong positive correlation between these two constructs with a Pearson correlation coefficient of $r = .51$ ($p = .000$), meaning that if one of the two variables increases or decreases, also the other one does.

The third research question was dealing with the correlation between respondents that were scoring high on the personality traits extraversion and conscientiousness, with high in this case meaning everyone scoring above the average values of 3.47 for extraversion and 3.30 for conscientiousness, and the possession of CHBs, which possibly leads to the amount of CH Behavior as well. At first, all cases scoring above both of these averages were selected. A correlation analysis was done showing neither a significant correlation between CHBs and extraversion ($r = .188$, $p = .182$), nor between CHBs and conscientiousness ($r = -.251$, $p = .072$). This non significant result was supported by comparing the means of the respondents scoring high on extraversion and conscientiousness (mean = 2.62, SD = 0.45, N = 52) and the respondents scoring low on both traits (mean = 2.80, SD = 0.46, N = 29).

3.6 Multiple hierarchical regression analysis

To test the fourth research question, a hierarchical multiple regression analysis was conducted to see whether conscientiousness and extraversion or CHBs and CH Behavior predicted a bigger part of the total level of physical fitness. Table 3 shows the results of the regression analysis. The data met the assumption of independent errors (Durbin-Watson value = 2.20). In the first model it was found that conscientiousness and extraversion explain an amount of the variance in the total level of physical fitness ($F = 5.91$, $p < .05$, $R^2 = .080$). This means that approximately 8 % of the variance of the level of physical fitness can be explained by the personality traits extraversion and conscientiousness. The analysis also showed that extraversion did no longer independently predict the level of physical fitness ($p = .068$),

however conscientiousness did significantly predict physical fitness ($p < .05$). Using the enter method it was found that CHB and CH Behavior also added predictive value to explain physical fitness ($F = 6.349$, $p < .001$, $R^2 = .079$). In this case this meant that CHB and CH Behavior predict 7.9 % of the variance of the level of physical activity. Again, just like for extraversion, CH Behavior did not significantly added value to predict physical fitness ($p = .505$). In total, extraversion, conscientiousness, CHB and CH Behavior predicted 15.9 % of the variance of physical fitness behavior. It has to be noted, that out of these four predictors, only conscientiousness and CHB were unique significant predictors of physical fitness.

Table 3. *Hierarchical regression analysis with Physical Fitness as dependent variable*

Model		B	SE B	ß	p	Model
Step 1						
	Constant	1.15	0.79			$R^2 = 0.080$
	Extraversion	0.33	0.18	.15	.068	$F = 5.912$
	Conscientiousness	0.45	0.17	.22	.009	$p = .003$
						$\Delta = 0.080$
Step 2						
	Constant	4.06	1.13			$R^2 = 0.159$
	Extraversion	0.29	0.17	.13	.101	$F = 6.349$
	Conscientiousness	0.38	0.17	.18	.025	$p < .001$
	CHB	-0.83	0.32	-.25	.009	$\Delta = 0.079$
	CH Behavior	-0.15	0.22	-.06	.505	

3.7 Mediator analysis

It was assumed that CHBs could be functioning as a mediator between personality and health behavior. No evidence was found to support this assumption. Either the personality traits that were correlating with physical fitness (extraversion, conscientiousness) did not correlate with CHBs, or the traits that were correlating with the CHBs (agreeableness, neuroticism) were not correlating with physical fitness. Therefore further analysis was done to find out if there was a connection between any other two constructs that could possibly be mediated through Compensatory Health Beliefs concerning physical activity or physical fitness. The results for the analysis of the relation between Compensatory Health Behavior

and physical fitness showed significant relations (see Figure 4). In the first regression analysis CH Behavior was the independent variable and physical fitness the dependent variable. CH Behavior was weakly, significantly associated with physical fitness (ß = -0.202, p = .017). The second regression was done between physical fitness and the tested mediator CHB, this relation was also significant but it was a moderate correlation (ß = -0.318, p < .001). The next tested regression was between CHB and CH Behavior, which was strongly, significantly correlated (ß = 0.514, p < .001). In the last regression, CHB and CH Behavior both were the independent variables and physical fitness the dependent variable to analyze which variable can predict the dependent variable physical fitness. The results showed that the relation between CH Behavior and physical fitness became weaker, almost reaching zero, and non-significant after adding CHB to the independent variables (ß = -0.053, r = .576). In this case, it can be presumed that there is a complete mediation. This assumption was supported by testing the regression values in an online interactive Sobel mediation test (z = -3.45, p < .001).

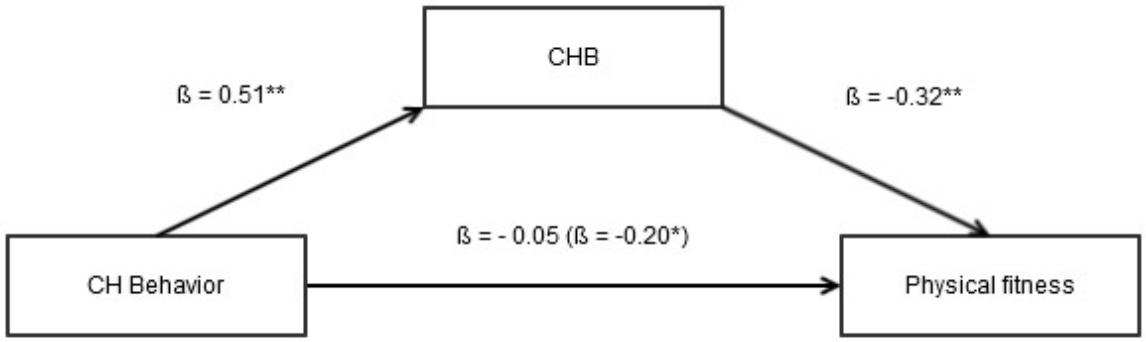

Figure 4. Mediation Model with Compensatory Health Belief functioning as mediator between CH behavior and Physical fitness

A second mediation analysis was done to analyze the mediation function of CH Behavior between the variables CHB and physical fitness. Thus, this time, in comparison to the first mediation model, CH Behavior and CHB switched places (see Figure 5). The results for the regression analyses between CHB and physical fitness (ß = -0.318, p < .001), CH Behavior and physical fitness (ß = -0.202, p = .017) and between CHB and CH Behavior stayed the same like in the first mediation (ß = 0.514, p < .001). The important regression analysis for this mediation was the fourth, with CHB and CH Behavior both being the independent variables and physical fitness being the dependent variable. The result showed that the relation between CHB and physical fitness slightly became weaker, but it still almost

reaches a moderate negative correlation value (ß = -0.290, p = .003). The new ß value (ß = -0.290) lay between zero and the original ß value (ß = -0.318), but did not come close to zero, therefore a partial mediation was supposed. The result of an interactive online Sobel test confirmed this assumption (z = -2.28, p = .02), led to the result that a partial mediation existed.

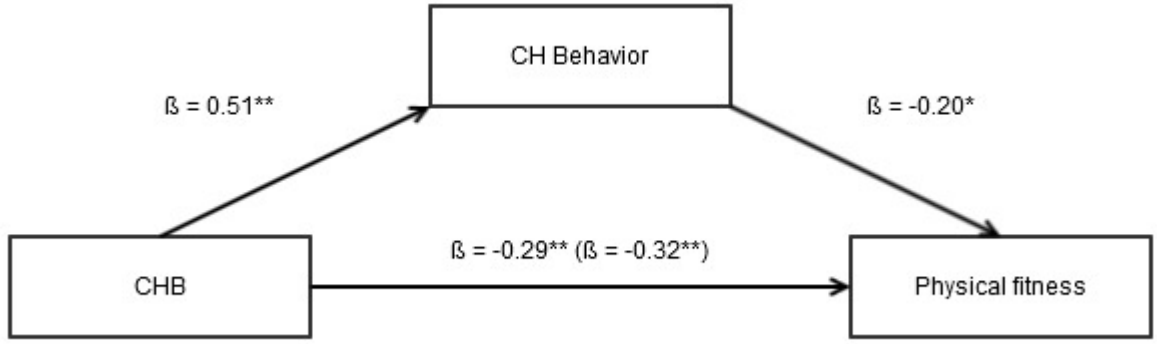

Figure 5. Mediation Model with CH behavior functioning as mediator between Compensatory Health Belief and Physical fitness

3.8 Moderator analysis

Moderator analyses were done by using multiple regression analyses to examine the interaction between CHBs and physical activity moderated by one of the five personality traits. Only for the variable neuroticism, functioning as moderator between CHBs and physical activity, a weak, significant positive interaction effect was found (ß = .183, p = .025), see Table 4.

Table 4. *Linear regression analysis with Physical Fitness as dependent variable*

Model		B	SD	ß	T	p
1	Constant	3,67	,13		28,03	,000
	Neuroticism (centered)	,05	,15	,03	,34	,733
	CHB (centered)	-1,11	,28	-,33	-3,95	,000
	N * CHB (centered)	,72	,32	,18	2,26	,025

Neuroticism showed a weak positive relation with physical fitness, but this result was not significant (ß = .029, p = .733), whereas the negative relation between CHB and physical fitness displayed a moderate, significant result (ß = -.331, p < .001). The positive interaction

effect of the two variables neuroticism and CHB on the dependent variable physical fitness means that, the lower the score of the respondents on the trait neuroticism, the higher the negative relation between CHB and physical fitness. A line graph with the categories low and high neuroticism can be seen in Figure 6. A median split was used to examine the individual effects of the subgroups low and high neuroticism.

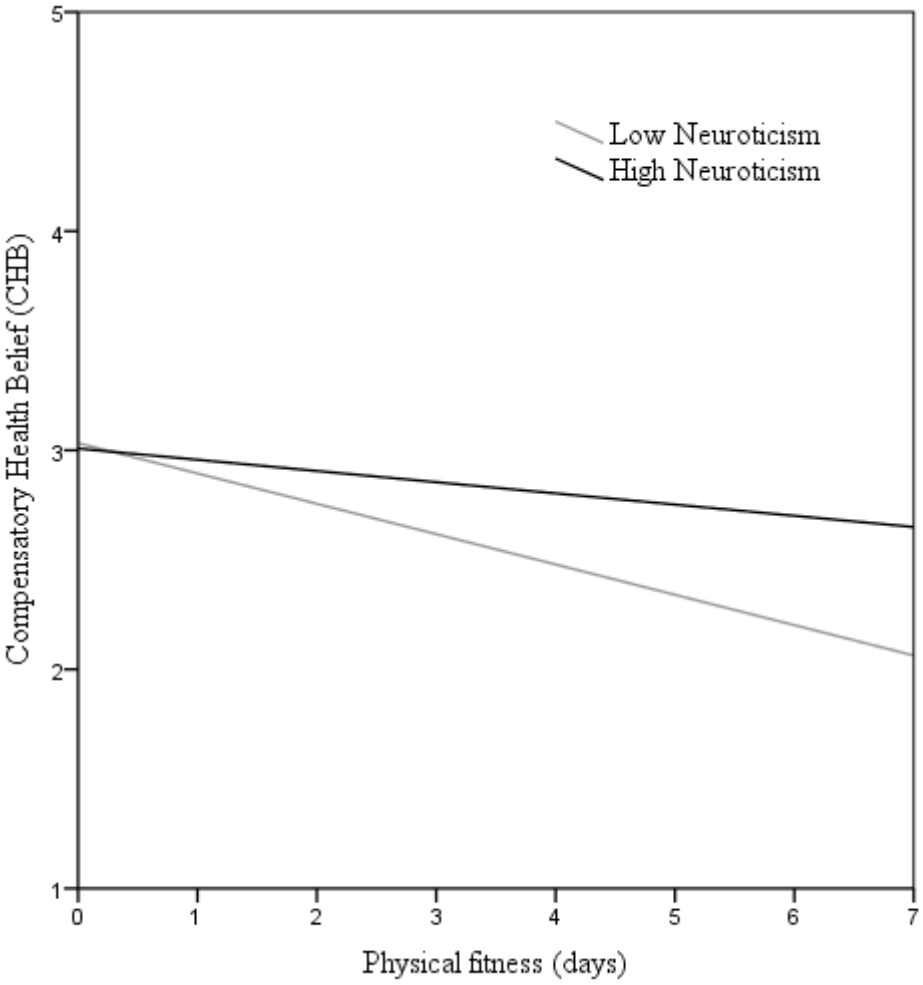

Figure 6. Level of Compensatory Health Beliefs depending on the days of physical fitness

4. Discussion

Aim of this research was to examine the relation between personality and compensatory health beliefs and behavior concerning regular physical activity. Several interesting findings were discovered. At first, there was the complete mediation effect of CHB between the constructs of CH Behavior and physical fitness. Furthermore it was discovered that the personality traits extraversion and conscientiousness predicted physical fitness to approximately the same amount as the two constructs CHBs and CH Behavior do, but it has to be mentioned that only conscientiousness and CHB were unique significant predictors of physical fitness. Moreover, high neuroticism being a protective factor for the negative effects of CHB on physical fitness is an interesting finding, too. More correlations were found between CHBs and the personality traits agreeableness and neuroticism (positive correlations), and between CHBs and physical fitness (negative correlation).

At first, the correlation between the five personality traits and CHBs concerning physical activity was estimated. Weak positive correlations between the traits agreeableness and neuroticism and CHBs were found, meaning that the higher the score on the traits agreeableness or neuroticism, the higher is the participants score on CHBs. The results also showed a moderate negative correlation between CHBs and physical fitness. Therefore it was concluded that a high score on neuroticism led to a low score on physical fitness. This finding supports the results of Allen and Laborde (2014); high levels of neuroticism lead to a greater occurrence of physical inactivity. Thus, personality traits were important in predicting physical fitness. In the domain of snack consumption, the relevance of trait CHBs, stable traits like the personality of an individual, in comparison to state CHBs which are activated in a specific tempting situation, also was revealed (Radtke et al., 2014).

To find out the relation between compensatory beliefs and compensatory behavior, the correlation of CHBs and CH Behavior concerning physical activity was estimated. Knäuper et al. (2004) state in their article that engaging in CH Behavior is the result of possessing CHBs. Therefore a strong positive correlation between these two constructs was expected. The results of the online survey supported this finding. Indeed, there was a strong positive correlation between CHBs and CH Behavior, but this correlation still was far from being perfect. Although CHBs and CH Behavior correlated strongly with each other, it was necessary to measure both constructs separately. Beside their significant, negative correlation with physical fitness, there were differences found concerning the correlation of CHBs and certain personality traits. CHB was significantly, positively correlating with agreeableness

and neuroticism, which supported the assumption of Radtke et al. (2014) that CHBs were seen as a kind of a personality trait, whereas CH Behavior only correlated negatively with the actual physical fitness behavior.

The third correlation analysis was done between respondents scoring high on the personality traits extraversion and conscientiousness and the possession of CHBs concerning physical activity. Results showed no significant relation between extraversion and conscientiousness and the amount of CHBs. This finding was not expected. Rhodes and Pfaeffli (2012) found that industriousness (a component of conscientiousness) and activity (a component of extraversion) are often identified as important physical-activity indicators. Individuals possessing a lot CHBs are expected to skip physical activities more often than individuals with less CHBs, because they often use the strategy of procrastination to get rid of their initially felt need to compensate for unhealthy behavior (Knäuper et al., 2004). Therefore it was expected that respondents scoring high on extraversion and conscientiousness, the personality traits that lead to physical activity, possess less CHBs. A reason for not confirming the findings of Rhodes and Pfaeffli (2012) could be the weak alpha values of the BFI-10 personality test ($\alpha = .58$ for extraversion and $\alpha = .42$ for conscientiousness). Each personality trait was measured by only two items, which makes it a fast, but not always reliable test.

A multiple regression analysis was done to examine whether physical fitness can be explained more through the personality traits extraversion and conscientiousness or through CHBs and CH behavior. Results showed that extraversion and conscientiousness as well as CHBs and CH Behavior predicted the level of physical fitness to a same amount of approximately 8 % each, but out of the four variables only conscientiousness and CHB were unique significant predictors. This result was partly expected. A high level of extraversion was found to relate to high levels of being physically active (Rhodes & Smith, 2006), which could not be confirmed in this study. On the other hand, trait CHBs, stable traits like the personality of an individual, were more relevant for the prediction of high-calorie snack consumption than state CHBs (Radtke et al., 2014), which was expected. Therefore the research question (4) was built on the assumption that the same is true for personality and CHBs concerning physical activity. It was assumed that CHBs function similar to personality traits in predicting physical fitness. Another assumption was that CH Behavior acted more like state CHBs. State CHBs occur in tempting situations according to Radtke et al. (2014), and it was therefore not surprising that they did not add a significant value in predicting

physical fitness, because physical fitness in this online survey was measured on the basis of past behavior.

The next finding was a complete mediation effect of CHB between CH Behavior and physical fitness. This means that engaging in compensatory health behavior affects the possession of compensatory health beliefs, which therefore has an effect on the level of physical fitness, for example by engaging in physical exercises and training. Therefore it can be assumed that the relation between engaging in compensatory behavior and participating in physical fitness activities is for that reason dependent on the possession of compensatory health beliefs. This finding is interesting, normally it would be assumed that beliefs cause actions, which then lead to a specific action, in this case engaging in physical fitness activities. Relating to high calorie snack consumption, state and trait CHBs are seen as predictive variables for unhealthy behavior (Radtke et al., 2014). Radtke et al. (2014) therefore assumed that CHBs exist first, leading to an unhealthy snack consumption. Therefore a second mediator analysis was done, this time analyzing the mediation effect of CH Behavior between CHB and physical fitness. CHBs having an effect on CH Behavior, which then has an effect on physical fitness is the model assumed by Radtke et al. (2014). The results showed a significant, but small weakening of the relation between CHB and physical fitness, thus displayed a weak partial mediation effect. Future research should further examine the relation of compensatory health beliefs and compensatory health behavior concerning physical activity. This research did not confirm Radtke et al. (2014) assumptions, actually the opposite was found.

Several moderator analyses were used to test if personality traits function as a moderator between CHB and physical fitness. The results showed a positive interaction effect of the two variables neuroticism and CHB on the dependent variable physical fitness. This means that for respondents scoring low on the trait neuroticism, the negative connection between CHB and physically fitness will be stronger. On the other side, for respondents scoring high on neuroticism, compensatory health beliefs will not have such a big impact on their physical fitness. These results were unexpected, regarding the studies of Allen and Laborde (2014) and Rhodes and Smith (2006). Allen and Laborde (2014) found that high levels of neuroticism in connection with other personality traits predict a greater occurrence of sitting time, thus the opposite of physical activity. In contrast low levels of neuroticism, amongst other requirements, relate to high levels of being physically active (Rhodes & Smith, 2006). In this case a high score on neuroticism seems to be a protective factor; high neuroticism protects the individual from the negative effects of CHBs on physical fitness,

possibly resulting in being more physically active than individuals scoring low on neuroticism. A reason for this unexpected finding could be the sample of this online survey. Nearly all respondents were students, which made the sample very one sided. A possible explanation could be that students on average score higher on neuroticism than the rest of the population, because they develop anxiety, fear and frustration due to the pressure they experience while studying. Another possibility could be that the respondents scoring high on neuroticism were afraid of possible negative consequences of not being physically active enough, leading to the hypothesis that anxiety and fear forced them into being physically active.

A reason for not finding more significant results regarding to the other personality traits could be the low, disappointing alpha values for these personality traits measured by the BFI-10. Especially the values for the traits agreeableness ($\alpha = .15$) and openness ($\alpha = .07$) were extremely low. Cronbach´s alpha measures the internal consistency of a related set of groups, thus how good the items belonging together measure the constructs they are expected to measure. Therefore Cronbach´s alpha also is considered to be a measure of reliability. A possible explanation for this lack of consistency could be the language of the items. The BFI-10 was taken in English, but none of the respondents was a native English speaker. A second possible explanation could be that respondents that were taking part via the test persons system of the university may have filled in the online survey very fast, without focusing on the questions enough. Respondents like to fill in online questionnaires, because it is an easy way for them to get their needed credit points for participating in other students studies.

The limitation of time prohibited a more precise measure of physical activity and physical fitness of the respondents. Physical activity and fitness in this study were examined by asking three questions for each construct. The participants had to choose their answers according to how many days they were active. Filling in such questions leaves space for manipulation and error. At first, the respondents can choose their answer without further examination. It is a subjective value for each respondent. Secondly, their answers could be chosen so they fit the social norms, this is called socially desirability. This bias is used to make oneself look better in comparison to the rest of society. Hildebrandt et al. (2005) came across the same problem, stating that a few questions are not suited to trace out the respondents with a low condition. For them condition is an important indicator for physical activity and health in general. Their recommendation for future research is a valid condition test, to discover someone’s risk profile. A valid condition test would be too time-consuming for this study, but could be very useful for further research.

This limitation of measuring physical activity and fitness also leads to the question of usefulness of the BMI in order to estimate physical fitness in general. The BMI is a measure of weight adjusted for height. Implications of this measures are, that it does not take factors such as age, sex, ethnicity and muscle mass into account, which can influence the relationship between the BMI and body fat (Cdc, 2011). Women, for example, have a greater amount of total body fat than men with an equivalent BMI, also highly trained individuals may have a higher BMI because of their increased muscle mass. Nevertheless, the BMI provides a good general tool to categorize the most part of the population into health categories, especially if time and money are not available for the research.

Although this research resulted in several useful results, the topic of generalization to the whole population should not be forgotten. This research was dealing with a rather small variety of people, most of the respondents were around 22 years of age and over 90 % were students at the moment of participation. A future study dealing with compensatory health beliefs- and behavior concerning physical activity for ages ranging from for example 18 – 60 could be meaningful in finding and understanding possible changes in possessing these beliefs or engaging in these kind of behaviors. Furthermore, almost all of the respondents who took part in this survey were highly educated, which is not representative for the population. Future researchers could examine the effects of compensatory health beliefs on a less highly educated population.

Summing up, it can be concluded that this research brought up interesting results, like for example the finding of the mediation effect of CHBs between CH Behavior and physical fitness, or that personality (conscientiousness) predict physical fitness to the same amount as CHBs. Furthermore, the finding of neuroticism functioning as a protective factor can be worth knowing for everyone working in the field of health care or improving physical activity and fitness.

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6. Appendix

Questionnaire 1: Compensatory Health Behavior, 9 items

How well do the following statements describe your behavior?

How often in the last two weeks did you…

… exercise less, because you were eating healthy?	Never	Rarely	Sometimes	Often	Very often
… skip physical training, because you were active in your everyday life?	Never	Rarely	Sometimes	Often	Very often
… compensate a day of not moving much, by moving twice as much on the following day?	Never	Rarely	Sometimes	Often	Very often
… compensate for not exercising, by walking more often?	Never	Rarely	Sometimes	Often	Very often
… compensate less movement by eating less food?	Never	Rarely	Sometimes	Often	Very often
… skip physical training, because you were doing exercises at home?	Never	Rarely	Sometimes	Often	Very often
… skip physical training, because you were using the stairs more often?	Never	Rarely	Sometimes	Often	Very often
… compensate for not exercising, by using the bike more often?	Never	Rarely	Sometimes	Often	Very often
… compensate for not exercising, by using diet pills?	Never	Rarely	Sometimes	Often	Very often

Questionnaire 2: Compensatory Health Belief, 9 items

How well do the following statements describe your beliefs?

I think that…

… eating healthy can compensate for being physically inactive	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… it is ok not to exercise regularly, if I am active in daily life	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… if I exercise little in one week, I can compensate that by exercising twice as much in the following week	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… I can compensate for not being physically active regularly by walking as much as possible in daily life	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… I can compensate physical activity deficiencies in the short term by eating less food	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… it is not bad to skip physical training once, if I do exercises at home instead	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… as long as I use the stairs whenever I can, it is not bad to skip physical training	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… if I use the bike today, I do not have to exercise today	Strongly disagree	Disagree	Neither	Agree	Strongly agree
… it is ok not to exercise, as long as I use diet pills	Strongly disagree	Disagree	Neither	Agree	Strongly agree