'Binge-watching'

The association of compensatory health beliefs with binge-watching, physical activity and body mass index in young adults

Marieke Prinsen

S1598929

Bachelor thesis

Psychology, Faculty of Social and Behavioral Sciences

University of Twente

June 28th 2017, Enschede

Supervisor: Dr. P.M. Ten Klooster

Co-reader: Dr. M.E. Pieterse

Table of contexts

Introduction	. 4
Method	.9
2.1 Participants	.9
2.2 Materials	10
2.3 Design and procedure	11
2.4 Analysis	12
Results	13
Discussion	21
References	25
Appendix	28

Abstract

Introduction: Since the upcoming of television shows, people exhibit much more sedentary behavior, i.e., behavior that requires low energy expenditure and where sitting or lying is the dominant posture. When sitting for a longer period of time, this can have adverse health effects. This "watching television for a longer period of time" has recently received renewed interest in terms of so-called 'binge-watching'. Interesting is what predicts this bingewatching behavior. One possible factor for understanding binge-watching in this study is the compensatory health belief (CHB) model. CHBs are beliefs that the negative effects of an unhealthy behavior can be compensated for, or 'neutralized', by engaging in another, healthy behavior. This study aimed to get more insight in the role of CHBs in binge-watching. Method: Using a cross-sectional design, participants in the age group of 18-34 years old were invited to fill in a questionnaire, involving questions from the CHB scale, self-developed CHB items for binge-watching and self-developed items for physical activity. The response rate was 441 of which 330 participants were used for analyses. Results: The outcomes of the regression analyses showed that CHBs for binge-watching were positively related with bingewatching frequency and negatively related with physical activity. General CHBs were not related with binge-watching, nor with physical activity. The results from the moderation analysis confirmed that BMI positively moderated the positive association between CHBs for binge-watching and binge-watching, indicating that people with overweight have a higher association between CHBs for binge-watching and binge-watching, than people with underweight and normal weight. The effect of CHBs for binge-watching on physical activity was not mediated by binge-watching. Discussion: CHBs for binge-watching were a determinant for binge-watching and physical activity. Correlations between CHBs and bingewatching and physical activity were not significant for CHBs in general. The expansion of the CHB scale with CHBs for binge-watching was thus relevant in this context and can be used

for follow-up research. It is also recommended for follow-up research to use compensatory behavior (CBs), i.e., actual behavior, because actual behaviors can be more predictive of behavior than beliefs.

Introduction

Since the invention of the television and the upcoming of television shows, people exhibit much more sedentary behavior. Sedentary behavior refers to activities that require low energy expenditure and where sitting or lying is the dominant posture (Pate, O'Neill & Lobelo, 2008). Several studies have examined the possible (adverse) effects of this behavior. For example, sedentary behaviors, particularly hours of television viewing, have been consistently related to overweight in youth (Patrick, Healy, Matthews & Dunstan, 2004). In the study of Owen et al. (2010), Canadians who reported spending the majority of their day sitting had significantly poorer long-term mortality outcomes than did those who reported that they spent less time sitting. Joshi, Cole & Overton (2016^b) found that high school students who engaged in two or fewer hours of screen time a day were less likely to have smoked, bullied another person, be bullied etc., when compared to students who engaged in more than two hours a day of screen time. In addition, those who engaged in two or fewer hours of screen time a day were significantly more likely, among other things, to get higher grades and feel valued, when compared to students who engaged in more than two hours of daily screen time. Further, a strong negative correlation between television watching/screen time and sleep and academic performance is found in the results from Joshi, Cole & Overton (2016^a). Those students reporting more than five hours per day of television or screen time activities were least likely to get good sleep and with even more than seven hours a day of television or screen time activities, were most likely to obtain failing grades.

Hence, the adverse effects of sedentary behavior are clear. It is striking that most of the abovementioned articles use television watching as the most common contribution to sedentary behaviors. TV watching is not only related with sedentary behavior, but also with unhealthy eating (Lou, in Joshi et al., 2016^b), which might further contribute to obesity. In

addition, of course, more sedentary behavior means less time for physical activity, and physical inactivity is related to obesity as well (Hamilton, Hamilton & Zderic, 2007). It is therefore expected that binge-watching, which is sedentary behaviour, is negatively related with physical activity. Anderson, Bartlett & Cheskin (1998) assessed the participation in vigorous activity and television watching, and found that boys and girls who watch four or more hours television per day had more body fat and a higher body mass index (BMI) than those who watch less than two hours a day. Likewise, Vioque et al., in Wallton-Pattison, Dombrowski & Pressau (2016) state that time spent watching television is linked with obesity. In sum, the association between TV time and overweight and obesity among youth may be due to a number of factors, including unhealthy eating, the biological effects of sitting, spending less time being physically active, or some combination (Joshi et al., 2016^b).

The abovementioned effects of television watching seem to be adverse, especially when watching television for a longer period of time. Especially with the upcoming of online streaming services like Netflix, watching television for a longer period of time has received renewed interest in terms of so-called 'binge-watching'. Wallton-Pattison et al. (2016) define television binge-watching as ''viewing multiple episodes of the same television show in the same sitting.'' Davis' (2016) definition of Netflix' binge-watching is similar to the definition mentioned above, but makes 'multiple' more concrete. Namely, he defines binge-watching as ''watching two to six episodes of the same show in one sitting.'' Both definitions have the disadvantage that they do not account for the varying lengths of episodes for different shows.

In the study of Wallton-Pattison et al. (2016), 86 (100%) participants reported bingewatching a mean of 1.42 days in the previous week with a mean of 2.94 episodes and 2.51 hours in their last binge-watching session. No further reliable resources are available for the prevalence of binge-watching.

To date, little is known about what predicts this 'binge-watching phenomenon'. In a

study of the Netflix Media Center (2013), 73% of binge-watching streamers—those who watched more than one episode per occasion—had positive feelings towards this activity (Orosz, Vallerand, Bőthe, Tóth-Király, & Paskuj, 2016). Other reasons why to binge-watch, according to Orosz et al. (2016), could be the social interactions derived from watching series, having either virtual or real-life companionship instead of being lonely (i.e. social norm), being entertained by watching series, and learning new languages and skills with the help of series.

According to Bandura's social cognitive theory, applied in the study by Wallton-Pattison et al. (2016), behavior, in this case binge-watch behavior, is proximally determined by outcome expectations, self-efficacy and proximal goals. Nevertheless, in their study, Wallton-Pattison et al. mention that there are at least three additional factors that may be important to understanding binge-watching that are not included in current applications of Bandura's theory, namely: dual processing, anticipated regret and multiple goal pursuit.

Another factor, which has not been mentioned before as a possible factor to understand binge-watching in literature, but indeed might be interesting related to this phenomenon, is the compensatory health belief (CHB) model. CHBs are beliefs that the negative effects of an unhealthy behavior can be compensated for, or 'neutralized', by engaging in another, healthy behavior (Rabia, Knäuper, & Miquelon, 2006). According to this model, particularly in the health domain, humans try to strive for an equilibrium between maximizing pleasure and minimizing harm. The model proposes that with the cognitive strategy of activating these compensatory health beliefs, people try to reach this equilibrium. Although this has not been researched for binge-watching, this process has been demonstrated to play an important role in other unhealthy behavior, like binge-eating (Rabia et al., 2006). An example of a CHB in this context is when someone feels okay about eating a great amount of food in a short period of time that is definitely larger than most people would eat under

similar circumstances, because he or she thinks he/she will compensate this with exercising heavily for the specific purpose of burning excess.

People holding such beliefs are more likely to engage in health risk behaviors and have a higher BMI (De Nooijer, Puijk-Hekman, & Van Assema, 2009). It is possible that this CHB also plays a role in the development and maintenance of binge-watching. For example, students who binge-watch a lot, but also want to stay healthy (e.g., being physical active), may strive to achieve an equilibrium of maximizing pleasure (watching multiple television series for fun) and minimizing harm (minimizing time loss for physical activities). Because people who hold CHBs are more likely to engage in health risk behaviors and because they have a higher BMI, it is expected in people with a higher BMI this association between CHBs and binge-watching is stronger. To be able to research this, the CHB scale is used. General CHBs can be measured using the validated CHB scale which contains 4 scales and 17 items (Rabia et al., 2006). A scale especially for binge-watching is missing in those 4 scales, therefore a CHB scale for binge-watching in particular is added. Further insight into the association between implicit processes like CHBs and binge-watching and health outcomes including physical activity could be interesting.

To date there is a lack of research about how binge-watching affects health and wellbeing (Davis, 2016), and what factors predict binge-watching. The goal of this study is to get more insight in the role of CHBs in binge-watching, BMI and physical activity. The following hypotheses are derived from the abovementioned information:

- 1. Binge-watching is negatively related with physical activity.
- 2. CHBs in general are positively related with binge-watching.
- 3. CHBs for binge-watching are positively related with binge-watching.
- 4. CHBs in general are negatively related with physical activity.
- 5. CHBs for binge-watching are negatively related with physical activity.

- BMI positively moderates the positive association between CHBs^{BW} and bingewatching.
- 7. The effect of CHBs^{BW} on physical activity is mediated by binge-watching.



Figure 1. Schematic representation of hypotheses 1, 2, 4 and 7



Figure 2. Schematic representation of hypotheses 3, 5, 6 and 7

Method

2.1 Participants

The target population for this study were young adults between 18-34 years old. Everyone in this age category could participate regardless of their gender, ethnicity and cultural background. The only final exclusion criterion was that the participant had to agree with the informed consent to be able to participate.

The participants were recruited mainly via Sona Systems, a subjects pool from the University of Twente, where students of the studies psychology and communication sciences can sign up to participate in other student's research. By participating in surveys, first- and second year students receive points which they need to proceed to the third year. Furthermore, social media like Facebook and WhatsApp and sometimes personal face-to-face contact were used to ask acquaintances of the researchers to participate in the study.

This study recruited 417 participants from whom only 331 (79.4%) participants completed the full survey. 92 of them were male (27.3%) and 303 were female (72.7%). From the 331 participants 298 (90.0%) were student. The remaining participants were employed (6.3%) or unemployed (3.3%). The participants were aged between 17 and 33 years old, with a mean age of M = 21.0 (SD = 2.3) years. 26 (8.1%) of the 320 participants who filled in their weight and height were underweighted (BMI < 18.5). Though a BMI too low may distort the findings, these participants were included in the analyses anyway. Their BMI was between 16.6 and 18.4 with a mean of 17.8 (SD = 0.5), implying that this BMI is relatively healthy.

2.2 Materials

Demographics

Participants completed a battery of questionnaires including the CHB scale. All questions were in English. For the current study, questions for binge-watching, compensatory health beliefs for binge-watching in particular and physical activity have been added.

General CHBs

General CHBs were measured using a validated CHB scale which contains 17 items (Rabia et al., 2006). This scale assesses four different subscales, namely 'substance use, eating/sleeping habits, stress, and weight regulation'. The CHB scale has been adapted for European countries like The Netherlands (De Nooijer et al., 2009) and Germany (Radtke et al., 2013). Cronbach's alpha for CHBs in general was 0,88, consisting of 17 items.

CHBs for binge-watching

Doing preliminarily research about CHBs and binge-watching with young adults, questions about CHBs related to binge watching were formulated and then added. Based on the existing CHB scale, an example of a self-developed question is: 'After a good work-out I deserve to watch multiple episodes of a series.' The answer possibilities were based on a five-point Likert scale (not at all – a little – somewhat – quite a bit – very much). For the CHBs^{BW} Cronbach's alpha was 0.78, consisting of 8 items.

Binge-watching

Binge-watching behavior was measured asking the participants on how many days, in the past seven days, they watched more than two episodes of the same TV series in the same sitting

(one immediately after the other). This question was derived from the study of Wallton-Pattison et al. (2016).

Physical activity

Physical activity was measured by asking how many days during the last week the participants engaged in physical activity, as well as how many hours per session they did engage in it. These two questions were self-developed, therefore not validated. The answers to these questions are multiplied with each other to calculate the total physical activity.

BMI

To be able to measure the BMI, participants were asked their weight in kilograms and length in centimetres. BMI was created as a new variable in SPSS by dividing the variable 'weight in kilograms' by the variable 'length in centimetres squared'. For this, the variable 'length' is first converted in meters.

2.3 Design and procedure

The study was approved by the local ethics committee of the faculty of BMS and used a cross-sectional design. Participants were invited through social media and Sona Systems to fill in the questionnaire, which was made in Qualtrics, an online survey software that makes it elementary to design and administer questionnaires. The participants were asked to honestly fill in the questionnaire, consisting of 94 items. The estimated time maximum to complete the questionnaire was 30 minutes. In practice it took the participants a median time of 15 minutes to complete.

Participants were given background information about the goal of the study as well as instructions how to answer the questions. Participants received an explanation about the study. When they continued to fill in the survey the participants automatically gave informed consent, and showed that they had understood the goal of the study and were ready to start the questionnaire. The questionnaire consisted of headings with a short explanation of the kind of questions that were going to be asked, so that it was clear for the participants what was expected from them.

2.4 Analysis

First of all, it was examined whether all the variables were normally distributed by visually examining histograms.

Subsequently, the analyses for the hypotheses were executed. Hypotheses 1 through 5 were tested by a bivariate Pearson's correlation analysis. Hypothesis 1 tested the correlation with the variables binge-watching and physical activity. Hypothesis 2 with the variables CHBs^{BW} and binge-watching and hypothesis 3 with the variables CHBs^{BW} and physical activity. The same applies for hypothesis 4 and 5, but with the variable CHBs in general, instead of CHBs^{BW}.

Hypothesis 6 was tested by a regression-based moderation analysis, in which CHBs^{BW} was the predictor variable, BMI the moderator and binge-watching the dependent variable. For this analysis, BMI and CHBs^{BW} were centred to avoid multicollinearity. These two new variables were multiplied to compute the new variable 'CHBs^{BW}BMI'. Then a linear regression analysis was executed using binge-watching as the dependent variable, and the centred BMI, centred CHBs^{BW} and interaction term of CHBs^{BW} and BMI as independent variables. The moderator hypothesis is then supported if the interaction term of CHBs^{BW} and

BMI is significant (Baron & Kenny, 1986).

Lastly, hypothesis 7 was tested by a mediation analysis, with CHBs^{BW} as independent variable, physical activity the dependent variable and binge-watching the mediator. Four regression analyses were executed to test this hypothesis. First with dependent variable CHBs^{BW} and independent variable physical activity, subsequently with CHBs^{BW} and binge-watching, then physical activity and binge-watching, and lastly physical activity with two independent variables: CHBs^{BW} and binge-watching. Mediation exists when a) variations in levels of CHBs^{BW} significantly account for variations in binge-watching, b) variations binge-watching significantly account for variations in physical activity, and c) when the path from CHBs^{BW} to binge-watching and the path from binge-watching to physical activity is no longer significant, with the strongest demonstration of mediation occurring when the path from CHBs^{BW} to physical activity is zero (Baron & Kenny, 1986).

Results

The calculated BMI for the 320 used participants (11 participants did not fill in their height and/or weight), was between 16.56 and 41.40, with M = 22.38 (SD = 3.24). There were 52 (18.4%) participants with a BMI higher than 25.0, which means they have overweight. Among the overweight subjects, the BMI was between 25.06 and 41.40, with M = 27.72 (SD = 3.02).

Table 1 shows the frequencies of binge-watching. Only 26.1% of the participants said not once to have binge-watched in the past week. 73.9% binge-watched minimal once a week. 4.2% said to have binge-watched all 7 days of the week. The mean of binge-watching among all 330 participants was 3.02 days.

Days	Frequency	%
0	86	26.1
1	77	23.3
2	50	15.2
2		14.0
3	47	14.2
Λ	24	10.2
4	34	10.5
5	18	5.5
	-	
6	4	1.2
7	14	4.2

Table 1: Frequencies of binge-watching (N=330)

The frequencies of the amount of hours of physical activity are showed in table 2. One participant was removed from the analysis because of an unreliable answer. Most participants (23.6%) were physical active for 1.5 hours in the past week and 10.3% of the participants were not physical active in the past week. The mean of physical activity was 4.05 (SD = 3.56) hours in the past week.

Hours of physical activity	Frequency	0⁄0
0	34	10.3
1.5	78	23.6
3	52	15.8
3.5	65	19.7
4.5	3	.9
5.5	19	5.8
7	52	15.8
10.5	7	2.1
11	9	2.7
14	5	1.5
16.5	2	.6
17.5	2	.6
22	2	.6

 Table 2: Frequencies of the amount of hours of physical activity (N=330)

Bivariate associations between CHBs^{BW}, CHBs^{general}, physical activity, binge-watching and BMI

Table 3: Pearson correlations between CHBs^{BW}, CHBs^{general}, physical activity, bingewatching and BMI (N=330)

			Physical		
	CHBs ^{BW}	CHBs ^{general}	activity	Binge- watching	BMI (N=320)
CHBs ^{BW}	1				
CHBs ^{general}	402**	1			
Physical activity	126*	058	1		
Binge-watching	.217**	.087	.043	1	
BMI (N=320)	.003	.102	.020	060	1
* <i>p</i> <.05 ** <i>p</i> <.01					

Hypothesis 1 stated that binge-watching would be negatively related with physical activity. The result of the bivariate Pearson's correlation analysis however shows no significant correlation (r = .043, p = .435) between the two variables.

CHBs in general were not related with binge-watching (r = .087, p = .155), nor related with physical activity (r = -.058, p = .292), therefore rejecting hypothesis 2 and 4. The results of hypothesis 3 did however confirm that CHBs for binge-watching are positively related with binge-watching. The results show a small, but significant positive correlation (r = .217, p < .05). The results of hypothesis 5 were confirmed as well (p < .05). A small negative correlation (r = .126) was found and thus this result confirmed that CHBs for binge-watching are negatively related with physical activity.

Moderation by BMI

Hypothesis 6 stated that BMI positively moderates the positive association between CHBs^{BW} and binge-watching.

Table 4: Testing for the moderating role of BMI between CHBs^{BW} and bingewatching (N=330)

		Unstand	ardized	Standardized		
		Coeffi	cients	Coefficients		
Mode	I	В	Std. Error	Beta	t	Sig.
1	(Constant)	2.962	.102		29.218	<.001
	BMICentr	057	.033	098	-1.708	.089
	CHBs ^{BW} Centr	.071	.017	.233	4.290	<.001
	CHBs ^{BW} *BMI	.010	.005	.116	2.029	.043
	BMICentr CHBs ^{BW} Centr CHBs ^{BW} *BMI	057 .071 .010	.033 .017 .005	098 .233 .116	-1.708 4.290 2.029	.08 <.00 .04

a. Dependent Variable: binge-watching.

(Model statistics: F(3.319) = 7.603 $R^2 = .067$ p < .001)

The results of the moderation analysis show no significant association for BMI with bingewatching (p = .089). There is a significant positive regression (p < .001) with CHBs^{BW}: the higher the CHBs for binge-watching, the higher the score on binge-watching, as the correlation analysis for testing hypothesis 3 already confirmed. There was also a significant interaction (p < .05) between CHBs^{BW} and BMI, and thus the hypothesis is confirmed: BMI positively moderates the positive association between CHBs^{BW} and binge-watching.



Figure 3. The effect of moderator BMI on the positive association between CHBs^{BW} and binge-watching.

The above figure shows a clear representation of BMI moderating the positive association between CHBs^{BW} and binge-watching. The higher the BMI, the stronger the association between CHBs^{BW} and binge-watching.

Mediation of binge watching

Table 5: Summary of Regression Analysis for predicting CHBs for binge-watching

(N=330)

		Unstandardized		Standardized		
		Coefficien	its	Coefficients		
Mod	el	В	Std. Error	β	t	Sig.
1	(Constant)	23.337	.489		47.829	<.001
	Physical activity	197	.085	126	-2.305	.022

a. Dependent Variable: CHBs for binge-watching

The regression coefficient for physical activity is significant (p < .05), which means it is possible a mediator exists.

Table 6: Summary of Regression Analysis for predicting CHBs for binge-watching

(N=330)

		Unstandardized		Standardized		
		Coefficien	its	Coefficients		
Moc	lel	В	Std. Error	β	t	Sig.
1	(Constant)	20.433	.624		32.738	<.001
	Binge-watching	.705	.175	.217	4.022	<.001

a. Dependent Variable: CHBs for binge-watching

A significant correlation between binge-watching and CHBs for binge-watching must exist if a mediator exists (p < .05).

		Unstandardized		Standardized		
	Coefficients		Coefficients			
Mod	lel	В	Std. Error	β	t	Sig.
1	(Constant)	3.876	.410		9.463	<.001
	Binge-watching	.090	.115	.043	.782	.435

 Table 7: Summary of Regression Analysis for predicting physical activity (N=330)

a. Dependent Variable: Physical activity

A mediator effect can only exists when also a significant correlation exists between bingewatching and physical activity, but it does not here (p = .435). Regardless of this, the mediation analysis has been carried out.

Table 8: Coefficients of regression analysis with CHBs^{BW}, binge-watching and physical activity (N=330)

		Unstandardized		Standardized		
		Coefficients C		Coefficients		
Mod	el	В	Std. Error	β	t	Sig.
1	(Constant)	6.305	1.037		6.082	<.001
	CHBs ^{BW}	079	.035	123	-2.230	.026
	Binge-watching	107	.204	029	525	.600

a. Dependent Variable: Physical activity

By adding the variable binge-watching, the β coefficient of the association between CHBs^{BW} and physical activity becomes -,123 instead of -,126, so binge-watching does not mediate the effect of CHBs^{BW} on physical activity, as expected (confirming lack of correlation mediator and dependent variable).

Discussion

This study was the first to research correlations between binge-watching, physical activity and BMI, as well as the first to explore compensatory health beliefs (CHBs) as a possible roleplaying factor. In a cross-sectional survey among 330 young adults, the main hypothesis was that CHBs for binge-watching are positively related with binge-watching frequency. A new subscale was added to the existing CHB 17 item construct, to test this hypothesis. 8 items related to CHBs for binge-watching were added to this new subscale.

The findings showed that CHBs for binge-watching are positively related with bingewatching and negatively related with physical activity. BMI positively moderated the positive association between CHBs for binge-watching and binge-watching, indicating that people with overweight have a higher association between CHBs for binge-watching and bingewatching, than people with underweight and normal weight. No mediation of binge-watching on the effect of CHBs for binge-watching on physical activity was found, and CHBs in general were not positively related with binge-watching, nor negatively related with physical activity.

A negative correlation between binge-watching and physical activity was expected, because of the assumption that binge-watching is sedentary behavior, and less time will be left for exercising (Joshi et al., 2016^b). Surprisingly, no significant correlation was found. It is possible that students have enough time to both engage in physical activity as well as indulge in binge-watching. Another possible explanation could be the compensatory health beliefs that play a role, i.e., people who watch much television, might exercise to compensate for their sedentary behavior, actually performing the CHB behavior. Radtke & Scholz (2016), for example, systematically examined the distinction between CHBs and compensatory behavior (CBs) in the context of alcohol assumption. They found that CBs, in contrast to CHBs, were positively predictive of the intention to drink less alcohol. Researching the CHBs are thus not necessarily predictive of behavior, and the consideration of actual behavior (CBs) when investigating health behavior can be of added value in future studies because it may be a better predictor of physical activity.

Further, CHBs in general were expected to be positively related with binge-watching and negatively related with physical activity. The same expectations applied to CHBs for binge-watching. Both the expected positive relation between CHBs in general and bingewatching, and the negative relation between CHBs in general and physical activity, were not significant. For CHBs for binge-watching, on the other hand, both correlations were significant, though the correlations were small. This suggests that CHBs for binge-watching is a better predictor of both behaviors than CHBs in general. This makes sense for bingewatching, but it does not for physical activity, because the CHBs were for binge-watching in particular and not for physical activity.

Furthermore, because people who hold CHBs are more likely to engage in health risk behaviors and because they have a higher BMI (De Nooijer et al., 2009), it was expected that BMI would positively moderate the positive association between CHBs^{BW} and bingewatching. Even though, in the group with overweighted participants, the mean BMI was 27.72 with a standard deviation of 3.02, implying that most participants were just slightly overweight, the results of the moderation analysis confirmed BMI to positively moderate the positive association between CHBs^{BW} and binge-watching, meaning: the higher the BMI, the stronger the association between CHBs^{BW} and binge-watching.

Lastly, the effect of CHBs^{BW} on physical activity was expected to be mediated by binge-watching. This mediation was not found in the analysis. Presumably, the absence of a correlation between binge-watching and physical activity in the first hypothesis is the cause of not finding any mediation here. This might be due the construct physical activity, which is a very global scale. Namely, the scale was self-developed using two items and therefore not validated. For further research it is thus recommended to use a validated scale.

A general possible reason why some expected correlations with binge-watching are not found could be the way the question used to measure binge-watching was asked. Namely, the question asks participants on how many days, in the past 7 days, they watched more than two episodes of the same TV series in the same sitting (one immediately after the other). First of all, the participants answer this question on the basis of the past 7 days. It is possible that they watched more television this particular week than they normally do or the other way around. Though, with more than 300 participants, this is expected to be less of an issue. Second, watching two episodes does not tell us how many minutes of television a person watches in total. One person can watch one episode of 50 minutes, while another watches two episodes of 20 minutes. The latter will watch fewer minutes, but will be considered as a binge-watcher, while the other one will watch more minutes of television, but will not be seen as a binge-watcher. A similar issue is that other TV watching is also ignored. Binge-watching may substitute for other TV watching and not be problematic, or it may come on top of regular TV watching and then be more problematic.

Thus, a lack of standardization exists in what constitutes a television binge, as Wallton-Pattison et al. (2016) mentioned as a limitation in their study. Another limitation of the study, although the effect would probably be minimal due to the large sample size, is that there was no correction in the analysis for the distribution of the variables physical activity and binge-watching. A last limitation is the reliability of the construct BMI. Namely,

Stommel & Schoenborn (2009) state that self-reported BMI, i.e., self-reported height and weight, in epidemiological studies is subject to measurement error. In their study, especially younger and older than the 42-55 year old participants tend to overestimate measured BMI values at the low end of the BMI scale (BMI <22) and underestimate BMI values at the high end (BMI >28), implying that self-reported BMI in this study as well might not be highly reliable.

Recommendations for follow-up research would be to change the way of asking for the concept binge-watching and physical activity. Now both questions focus on the past seven days, but the average pattern of behavior may fluctuate from week to week. The answer could be very different when letting participants write down their hours of binge-watching and physical activity every day for multiple weeks, i.e. using a logbook. Most of the participants were students, and a week before an important test they will have less leisure time than just after a test. In addition, it is recommended to not simply ask for the participants' weight and height, but measure it as a researcher yourself, also taking into account the distribution of the muscle mass and fat mass. Another interesting point for follow-up research is to take actual behavior, along with CHBs, into consideration. Actual behavior, i.e., CBs, has been shown to be more predictive of behavior than CHBs (in general), and thus could be of great value in researching behavior.

Overall, the main finding of this study was that CHBs^{BW} are positively related with binge-watching and negatively related with physical activity, and that BMI positively moderates the positive association between CHBs^{BW} and binge-watching. When using CHBs in general for these analyses, no significant relations were found, implying that expansion of the scale with specific CHBs for binge-watching are relevant in this context and can be used for follow-up research.

References

- Anderson, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L. J., & Pratt, M. (1998). Relationship of Physical Activity and Television Watching With Body Weight and Level of Fatness Among Children. *American Medical Association, 279(12)*. Retrieved from http://jamanetwork.com/pdfaccess.ashx?url=/data/journals/jama/4553/
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173-1182. doi:10.1037/0022-3514.51.6.1173
- Davis, B.C. (2016). *The Netflix Effect and Defining Binge-Watching*. Poster session presented at the meeting of the Undergraduate Research Opportunities Program, Virginia Commonwealth University, VA.
- Hamilton, M. T., Hamilton, D. G., & Zderic, T. W. (2007). Role of Low Energy Expenditure and Sitting in Obesity, Metabolic Syndrome, Type 2 Diabetes, and Cardiovascular Disease. *Diabetes*, 56(11), 2655-2667. doi:10.2337/db07-0882
- Joshi P., Cole K., & Overton M. (2016). Impact of Sedentary Behaviors on Sleep and Academic Performance. *Journal of Physical Education and Sport*, *16*(4), 1230-1235.
 Retrieved from DOI:10.7752/jpes.2016.04195
- Joshi P., Cole K., & Overton M. (2016). Trends in sedentary behaviors among high school students: Analysis of television and other screen-time activities. *Journal of Physical Education and Sport*, 16(4), 1142-1145. Retrieved from DOI:10.7752/jpes.2016.04183
- De Nooijer, J., Puijk-Hekman, S., & Van Assema, P. (2009). The compensatory health beliefs scale: psychometric properties of a cross-culturally adapted scale for use in The Netherlands. *Health Education Research*, 24(5), 811-817. doi:10.1093/her/cyp016

- Orosz, G., Vallerand, R. J., Böthe, B., Tóth-Király, I., & Paskuj, B. (2016). On the correlates of passion for screen-based behaviors: The case of impulsivity and the problematic and non-problematic Facebook use and TV series watching. *Personality and Individual Differences, 101*, 167–176. http://doi.org/10.1016/j.paid.2016.05.368
- Owen, N., Healy, G. N., Matthews, C. E., & Dunstan, D. W. (2010). Too Much Sitting: The Population-Health Science of Sedentary Behavior. *Exercise and Sport Sciences Reviews*, 38(3), 105-113. doi:10.1097/jes.0b013e3181e373a2
- Pate, R., O'Neill, J., & Lobelo, F. (2008). The evolving definition of "sedentary". *Exercise* and sport sciences reviews, 36(4), 173-178.
- Patrick, K., Norman, G. J., Calfas, K. J., Sallis, J. F., Zabinski, M. F., Rupp, J., & Cella, J. (2004). Diet, Physical Activity, and Sedentary Behaviors as Risk Factors for Overweight in Adolescence. *Archives of Pediatrics & Adolescent Medicine*, *158*(4), 385. doi:10.1001/archpedi.158.4.385
- Sirois, F. M., & Pychyl, T. A. (2016). *Procrastination, health, and well-being*. Retrieved from https://books.google.nl/books?hl=en&lr=&id=BQbpCgAAQBAJ&oi=fnd&pg=PP1&d q=Sirois,+F.+M.,+%26+Pychyl,+T.+A.+(2016).+Procrastination,+health,+and+wellbeing.&ots=Vcl-ZbwTi&sig=NML6SrIO2z7QY5yruYdTx6p4Lok#v=onepage&q&f =false
- Stommel, M., & Schoenborn, C. A. (2009). Accuracy and usefulness of BMI measures based on self-reported weight and height: findings from the NHANES & NHIS 2001-2006. *BMC Public Health*, 9(1). doi:10.1186/1471-2458-9-421
- Rabia, M., Knäuper, B., & Miquelon, P. (2006). The eternal quest for optimal balance between maximizing pleasure and minimizing harm: The compensatory health beliefs model. *British Journal of Health Psychology*, *11*(1), 139–153. http://doi.org/10.1348/135910705X52237

Radtke, T., & Scholz, U. (2016). Beliefs are not behavior: The distinction between compensatory health beliefs and compensatory health behavior. *Zeitschrift für Gesundheitspsychologie*, *24*(3), 119-129. doi:10.1026/0943-8149/a000161

Walton-Pattison, E., Dombrowski, S. U., & Presseau, J. (2016). Just one more episode:
Frequency and theoretical correlates of television binge watching. *Journal of Health Psychology*. http://doi.org/10.1177/1359105316643379

Appendix

Q66 Dear participant, This questionnaire is carried out in the context of our bachelor thesis. It is drafted to measure the effects of binge-watching and excessive exercise on health outcomes. The details and results of the research will only be anonymous and confidential announced to third parties. There are no right or wrong answers and you reserve the right to terminate from participating in this study at any time without giving reasons. By taking part in this survey, you automatically agree with the abovementioned (informed consent). Thank you very much for your time and honest answers. Ann-Christin Klein, Kira Oberschmidt and Marieke Prinsen.

Q1 What is your age?

Q2 What is your gender? Male (1) Female (2)

```
Q3 Employment status
Student (1)
Employed (2)
Unemployed (3)
Other (4)
```

Q4 What is your height in cm? Example answer: 165

Q5 What is your weight (in kg)? Example answer: 75 or 75.5

Q77 In the following part, please state how much you agree with the statements.

	Not at all (1)	A little (2)	Somewhat (3)	Quite a bit (4)	Very much (5)
The effects of regularly drinking alcohol can be made up for by eating healthy (1)	O	0	0	O	O
It is alright to drink a lot of alcohol as long as one drinks lots of water to flush it (2)	O	0	O	O	O
Smoking from time to time is OK if one eats healthy (3)	O	0	О	O	O
The effects of drinking coffee can be balanced by drinking equal amounts of water (4)	O	0	O	O	O
The effects of drinking too much alcohol during the weekend can be made up for by not drinking during the week (5)	O	Ο	0	0	O

binoking can be compensated for by exercising (6)

	Not at all (1)	A little (2)	Somewhat (3)	Quite a bit (4)	Very much (5)
Too little sleep during the week can be compensated for by sleeping in on the weekends (1)	O	О	0	O	0
It is OK to go to bed late if one can sleep longer the next morning (only the number of hours counts) (2)	O	O	0	O	0
It is OK to skip breakfast if one eats more during lunch or dinner (3)	0	0	0	0	0
Eating whatever one wants in the evening is OK if one did not eat during the entire day (4)	0	О	0	0	0

Q78 In the following part, please state how much you agree with the statements.

	Not at all (1)	A little (3)	Somewhat (4)	Quite a bit (5)	Very much (6)
Stress during the week can be made up for by relaxing on the weekend (1)	O	O	O	O	О
A stressful day can be compensated for by relaxing in front of the TV (2)	0	O	O	O	O
The bad effects of stress can be made up for by exercising (3)	0	0	0	0	O
Sleep compensates for stress (4)	О	О	O	О	О

Q79 In the following part, please state how much you agree with the statements.

	Not at all (1)	A little (2)	Somewhat (3)	Quite a bit (4)	Very much (5)
Eating dessert can be made up for by skipping the main dish (1)	0	О	0	0	О
Using artificial sweeteners compensates for extra calories (2)	0	0	0	0	0
Breaking a diet today may be compensated for by starting a new diet tomorrow (3)	0	О	0	0	О

Q80 In the following part, please state how much you agree with the statements.

Q81 In the following part, please state how much you agree with the statements.

	Not at all (1)	A little (2)	Somewhat (3)	Quite a bit (4)	Very much (5)
It's okay to watch multiple episodes of a series if I worked hard that day (1)	O	O	0	O	О
A night/evening of watching multiple episodes of a series can be compensated by not watching television another night (2)	O	0	O	O	O
I can compensate a night of watching multiple episodes of a series if I study extra hard tomorrow (3)	O	0	O	O	O
After a good work-out I deserve to watch multiple episodes of a series (4)	0	0	0	0	O

If I eat healthy it's okay to watch multiple episodes of a series (5)	0	0	0	О	О
After I studied for a long while I can treat myself by watching multiple episodes of a series (6)	O	O	О	О	Э
A day of much television watching can be made up for by exercising more the next day (7)	0	0	О	О	O
A day of much television watching can be made up for eating less unhealthy food (8)	O	0	O	O	О

Q86 The following questions are about television watching as well as on-demand streaming websites. An example of such a website is Netflix. Please answer the questions with regards to watching series online.

Q66 In the past 7 days, on how many days did you watch more than two episodes of the same TV series in the same sitting (one immediately after the other)?

- **O** 0 days (1)
- **O** 1 day (2)
- 2 days (3)
- **O** 3 days (4)
- 4 days (5)
- 5 days (6)
- 6 days (7)
- **O** 7 days (8)

Q84 Thinking of the last time you watched more than two consecutive episodes of the same TV show in the same sitting, how many consecutive episodes of the same TV show(one after the other) did you watch?

Q85 Thinking of the last time your watched more than two consecutive episodes of the same TV show in the same sitting, how many hours did you spend watching the TV show? (in hours, rounded to nearest half hour)

Q68 How do you usually watch series?

- Always alone (1)
- **O** Mostly alone (2)
- Equally often alone as with others (3)
- **O** Mostly with others (4)
- **O** Always with others (5)

Q87 Who do you usually watch series with

- **O** I watch alone (1)
- **O** With family (2)
- **O** With friends (3)
- **O** With a partner (4)
- **O** With roommates (5)
- **O** Other (6)

Q70 What genre of series do you watch most

- **O** Action, Adventure, Western (1)
- **O** Animation, Family (2)
- O Biography, Documentary, News, Talk-show (3)
- O Comedy (4)
- **O** Crime, Thriller, Horror (5)
- O Drama (6)
- **O** Game-show, Reality-TV (7)
- **O** History, War (8)
- O Music, Musical (9)
- O Fantasy, Mystery, Sci-Fi (10)
- **O** Romance (11)
- **O** Short (12)
- **O** Sport (13)

Q72 When do you usually watch series?

- **O** During daytime (1)
- Equally often during daytime and nighttime (2)
- **O** During nighttime (between 12 and 8am) (3)

Q74 How many different series do you watch regularly?

Q83 The following questions will give you an opportunity to tell us more about your physical activity.

Q6 When I do not exercise, I feel regret and guilty.

totally disagree (1)

disagree (2)

neutral (3)

agree (4)

totally agree (5)

Q7 I feel so energetic and happy after one set of exercising.

```
O totally disagree (1)
```

- O disagree (2)
- **O** neutral (3)
- **O** agree (4)
- O totally agree (5)

Q9 If I quit exercising, it will have some negative effects on my health.

- **O** totally disagree (1)
- O disagree (2)
- O neutral (3)
- O agree (4)
- O totally agree (5)

Q10 I believe whenever I planned for exercising, I succeeded in doing that.

- O totally disagree (1)
- O disagree (2)
- **O** neutral (3)
- O agree (4)
- **O** totally agree (5)

Q11 I exercise because of my inner desire, not anyone else's motivations.

- totally disagree (1)
- O disagree (2)
- O neutral (3)
- O agree (4)
- O totally agree (5)

Q12 I feel proud of myself because I have regular exercising compared to my peers.

- **O** totally disagree (1)
- O disagree (2)
- **O** neutral (3)
- **O** agree (4)
- O totally agree (5)

Q13 I daydream about my fitness which is the fruit of my exercise.

- O totally disagree (1)
- O disagree (2)
- **O** neutral (3)
- O agree (4)
- O totally agree (5)

Q14 I ponder about my exercise schedule.

- O totally disagree (1)
- O disagree (2)
- **O** neutral (3)
- O agree (4)
- **O** totally agree (5)

Q15 My best friend likes exercising.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q16 Whenever I have been recommended to exercise by my doctor, friend and etc. I tried to do so.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q17 I encourage my friends to exercise.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q18 I have important people (spouse, child and friends) in my life who believe I should exercise.

- Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q19 Important people in my life (spouse, child and friends) manage their schedule in a way that matches my exercise schedule.

- Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q20 Exercising is an opportunity to hang out with my friends.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q21 I try to find a friend or a companion in sports venues.

- Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q22 I exercise every day.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q23 I exercise at least three days a week.

- **O** Strongly disagree (1)
- Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q24 If I miss one day of my exercise schedule, I try to make it up on other day.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q25 I have specified a particular time for exercising.

- Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q26 Sometimes I miss my exercise due to the lack of energy or time.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- O Strongly agree (5)

Q27 I quit exercising because of different reasons (lack of time, having a career, family issues, bad weather and insecurities).

- **O** Strongly disagree (1)
- Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q28 I miss my exercise sessions due to the daily life issues.

- **O** Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q29 I believe whenever I miss some of my exercise sessions, I experience some troubles starting a new schedule.

- **O** Strongly disagree (1)
- Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q89 How often do you engage in physical activity (fitness, soccer, tennis, etc.) per week?

- **O** 0-3 times (1)
- **O** More than 3 times (2)

Q30 Think about your level of physical activity from the last 7 days. How many times during the last week did you engage in physical activity?

- **O** 0(1)
- **O** 1-2 (2)
- **O** 3-4 (3)
- **O** 5-6 (4)
- **O** 7 times or more (5)

Q31 How many hours did you engage in physical activity per session?

- **O** 1(1)
- **O** 2 (2)
- **O** 3 (3)
- **O** 4 (4)
- **O** 5 or more hours (5)

Q33 I engage in physical activity to feel good about myself.

- Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q34 I engage in physical activity because I would like to reward myself.

```
O Strongly disagree (1)
```

- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q35 When I engage in sport then because I would like to reduce negative feelings.

- Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- O Strongly agree (5)

Q37 I engage in physical activity because I like to see how my body shape changes.

- **O** Strongly disagree (1)
- **O** Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q38 The feeling after having engaged in physical activity is a good one.

- Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q39 When the positive feeling goes away, I directly want to engage in the activity again,

- **O** Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- **O** Strongly agree (5)

Q40 I engage in physical activity because I like to socialize with others.

- **O** Strongly disagree (1)
- **O** Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q41 I simply engage in physical activity because it's a hobby of mine.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q42 I really like the feeling of having muscle ache.

- Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q43 When I quit a sport session earlier than planned, next time I engage in the activity longer to compensate for the missed time.

- **O** Strongly disagree (1)
- Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- O Strongly agree (5)

Q44 When I planned a session, but cannot realize it, I feel bad.

- Strongly disagree (1)
- Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- **O** Somewhat agree (4)
- Strongly agree (5)

Q45 When I planned a session, but I cannot realize it, I will plan the session in for another day.

- **O** Strongly disagree (1)
- O Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q46 When I planned a session, but I cannot realize it, that does not matter to me.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q47 Being physically active is like a cycle which I cannot quit.

- **O** Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- **O** Somewhat agree (4)
- O Strongly agree (5)

Q48 I engage in physical activity because it increased my discipline.

- Strongly disagree (1)
- O Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q49 Physical activity is relaxation for my mind.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q50 When I am in the gym, most of the time I talk to others instead of being physically active.

- Strongly disagree (1)
- **O** Somewhat disagree (2)
- **O** Neither agree nor disagree (3)
- O Somewhat agree (4)
- Strongly agree (5)

Q51 When I see others doing sport, I am jealous and want to do the same.

- **O** Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- O Somewhat agree (4)
- O Strongly agree (5)

Q88 The following questions are about your sleeping habits.

Q54 How long did it usually take for you to fall asleep during the past 4 weeks?

Q55 On the average, how many hours did you sleep each night during the past 4 weeks?

Q56 How often during the past 4 weeks did you feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc.) while sleeping?

Q57 How often during the past 4 weeks did you get enough sleep to feel rested upon waking in the morning?

Q58 How often during the past 4 weeks did you awaken short of breath or with a headache?

Q59 How often during the past 4 weeks did you feel drowsy or sleepy during the day?

Q60 How often during the past 4 weeks did you have trouble falling asleep?

Q61 How often during the past 4 weeks did you awaken during your sleep time and have trouble falling asleep again?

Q62 How often during the past 4 weeks did you have trouble staying awaken during the day?

Q63 How often during the past 4 weeks did you snore during your sleep?

Q64 How often during the past 4 weeks did you take naps (5 minutes or longer) during the day?

Q65 How often during the past 4 weeks did you get the amount of sleep you needed?

Q62 You've reached the end of this study. Thank you for your participation. Beneath you can enter your SONA number if you wish to receive credits for this study (University of Twente students only). You can also submit your e-mail adress if you want to be informed about the outcomes of this study. If you wish to be excluded from the study you can contact the researcher via k.oberschmidt@student.utwente.nl

Q63 NOTE: Students of University of Twente only! Enter your SONA number here to receive credits

Q65 Enter your e-mail adress here to receive more information about this study.