An Experience Sampling Study on Binge Watching and its relation to Healthy and Unhealthy snacking

Bachelor Thesis

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Abstract

Introduction: Binge watching has become increasingly popular nowadays and has also established itself as a socially accepted behavior. Nevertheless, an important consequence is the enhanced intake of unhealthy snacks that could appear simultaneously and can lead to health issues like coronary heart diseases. This study aims to investigate the relationship between binge watching and consumption of healthy versus unhealthy snacks, while also testing for a possible moderation effect of the Body Mass Index (BMI).

Methods: The Experience Sampling Method (ESM) was used as a data collection method for this study. Therefore, 45 participants filled out questions on watching behavior and intake of snacks every day over the course of 13 days using the Ethica application. The data was then analyzed using IBM SPSS Statistics 24 and Microsoft Excel by applying descriptive statistics as well as Linear Mixed Model analyses and visual analyses.

Results: General snacking, counting both healthy and unhealthy snacks, was found to be significantly associated with hours watched of video-on-demand services over time. Unhealthy snacking by itself was also significantly associated with hours that were watched. Intake of healthy snacks was not significantly associated with video-on-demand watching. Moreover, BMI was not a significant moderator of watching and unhealthy snacking.

Conclusion: The finding of a positive relationship between watching time and unhealthy snacking is in line with what has been found in other studies. Although this relationship was rather weak, it has been shown to still be of importance due to its negative health consequences. Moreover, BMI does not seem to play a moderating role when it comes to consumption of unhealthy snacks while binge watching, which could mean that possible interventions might be applied to people of all BMI groups.

1. Introduction

1.1 Binge watching

Over the last few years, streaming services like Netflix, have slowly become a part of our lives. These streaming services have transformed the way we watch TV-shows forever, as they broke with the traditional appointment TV-watching where, once a week, the new episode of one's favorite TV show was watched. Nowadays, we have access to many TV-shows at once and are able to watch them whenever and wherever we want (Matrix, 2014). This is because streaming services are often publishing entire seasons at once, wherefore people now have access to all episodes of a TV show at the same time.

This makes it easy for them to watch multiple episodes or even an entire season in one viewing session, which can also be referred to as binge watching (Trouleau, Ashkan, Ding, & Eriksson, 2016). Generally, binge behavior means that a person is excessively consuming a specific item in a short time frame. This is often done in order to escape from reality or to reduce any psychological discomfort. Examples of binge behaviors are binge-drinking or binge-eating (Shim & Kim, 2018). Binge watching itself has been defined as a specific number of episodes that are watched in one sitting. This can range from two to six episodes in one viewing session (Trouleau et al., 2016).

However, defining binge watching is quite difficult. Although most literature suggests that binge watching can be defined as watching multiple episodes of the same show in one sitting (Trouleau et al., 2016; Walton-Pattison, Dombrowski & Presseau, 2018; Mikos, 2016; Flayelle et al., 2020), there may be some challenges when it comes to TV shows or events that last a longer time than it would to watch a few episodes of the same TV series (Walton-Pattison et al., 2018). Therefore, these definitions do not take the duration of one episode into account. However, it was suggested that binge watching is different from other long duration tv events, like sport or movies, as it is specifically the watching of multiple episodes of the same show in one sitting. This would mean that it should also be defined as such (Walton-Pattison et al., 2018). Nevertheless, some studies also took into account the hours that were watched continuously as a definition for binge watching. Therefore, binge watching was defined as watching for more than one hour (Panda & Pandey, 2017) or for more than 3 hours (Horvath, Horton, Lodge & Hattie, 2017 as cited in Flayelle et al., 2020). Hence, ambiguity regarding the best definition for binge watching remains.

Interestingly, a person who indulges in binge watching shows to have comparable symptoms as people who have substance dependence issues. However, binge watching is more socially acceptable than other binge behaviors (Shim & Kim, 2018). This is because binge watching has become a normal behavior for many, especially young, people nowadays. This behavior is already starting with toddlers, who begin to watch kid-friendly shows on demand. As 40% of households with children under seven years of age possess one or two tablets, these kids are often watching videos and shows on a tablet as a first choice. Whereas adolescents and adults often only use a tablet as their second screen for watching shows. Therefore, binge watching becomes more socially accepted and a normal behavior for many people, as they now prefer video on demand watching (Matrix, 2014). A German online study also showed that binge watching is an increasing trend among younger people especially. In 2015, among participants of all ages, 65% would occasionally watch videos on the internet. This figure rises among the 14-29-year-old to 98% of the participants watching videos on the internet occasionally (Mikos, 2016). This increasing trend of binge watching is also displayed in the media. More and more websites and blogs are publishing articles about recommendations which series to binge-watch or which series are binge-worthy. As the attention span of people is now shorter, streaming services tend to produce shows with fewer episodes (Matrix, 2014). Consequently, the media is also promoting the best shows to binge watch in less than nine hours, or similar headlines. Furthermore, streaming services are also rather interested in releasing shows that have binge potential than those that do not. The kids and teenagers nowadays also show to have expectations that every episode of every show is always available to them, as they do not know what it is like to have to wait for a specific episode (Matrix, 2014). In a survey that was conducted by Netflix, 48.6% of participants, who were all 18 years or older, stated that they would stream TV shows at least once a week. Out of these participants, 61% said that they are engaging in binge watching regularly. In this survey, Netflix defined binge watching as watching two to three episodes in one sitting (Netflix as cited in Trouleau et al., 2016). In another survey, that was conducted by TiVo, 91% of participants saw binge watching as a common behavior, with 40% and 69% stating that they would at least have a binge watching session once a week (TiVo as cited in Trouleau et al., 2016).

Accordingly, binge watching seems to be a socially accepted behavior nowadays that already starts with toddlers and children. Thus, they now also have expectations to always have their favorite tv show ready-to-go. Binge watching has also established itself as a trend in the media, as they give out recommendations for binge-worthy shows. Furthermore, the prevalence of binge watching is quite high, which also suggests that it is a common behavior nowadays.

1.2 Causes of binge watching

There are several causes of binge watching that have been identified. One of these relates to psychological differences among people. For instance, sensation seekers and people with a higher need for cognition are more likely to engage in binge watching (Shim & Kim, 2018). Furthermore, general boredom has also been associated with binge watching. This is also common among college students whose reason to binge watch is often boredom during their summer break (Devasagayam, 2014 as cited in Dandamudi & Sathiyaseelan, 2018).

Another cause for binge watching could be stress. It has been proven that TV watching has a relaxing effect on people. This leads them to forget about their stress and become relaxed. However, as soon as they stop watching a show, this effect is discontinued. Therefore, engaging in binge watching can serve as a medium to escape from stressful situations like studying or work. Furthermore, this effect may also reinforce an addiction, which could lead to withdrawal symptoms like becoming irritated (Kubey & Csikszentmihalyi, 2002).

Moreover, watching TV shows may reduce the feeling of loneliness among people. In addition to that, a sense of belonging may be established by turning to one's favorite TV show. This may also be due to identification with the characters of the show. People can even develop a special relationship with characters of the show, which is also called parasocial interaction (PSI) (Greenwood & Long, 2009).

Another factor that may relate to binge watching is social interaction. Especially, among young people binge watching is widely accepted and thus, often part of their conversations (Matrix, 2014. Furthermore, fear of missing out may also play a role as many people do not want to be excluded from these conversation (Panda & Pandey, 2017).

Accordingly, there are several different factors that relate to binge watching. There are psychological individual differences like sensation seeking and high need for cognition, which lead some people to be more prone to binge watching. Other causes seem to be more situational, like stress and boredom. Furthermore, social factors like fear of missing out and relationships with characters to reduce the feeling of loneliness also play a role. The variety of causes suggests that it is hard to pin down a specific one and thus, binge watching may be hard to restrict.

1.3 Consequences of binge watching

Besides predictors of binge-watching, there are several, potentially negative, consequences of binge watching that should be listed. Thus, binge watching can result in decreased concentration and attention span (Kubey & Csikszentmihalyi, 2002). Furthermore, after having had a binge watching session, people report feelings of emptiness. This relates to higher levels of anxiety, fatigue, loneliness and depression among regular binge watchers (Devasagayam, 2014 as cited in Dandamudi & Sathiyaseelan, 2018). Regarding the social impact of binge watching, it may be that binge watchers replace social activities with watching a TV show as they go out less often (Van den Bulck, 2000). However, as found by Mikos (2016), watching a TV show may also be a social event that takes place on the weekends with a group of friends or with a person's partner. Other psychological consequences may be that binge watchers feel regret and a conflict of binge watching with the achievement of their goals (Walton-Pattison et al., 2018).

In addition to that, binge watching may also have consequences for physical health. As watching TV shows is a sedentary activity, it has been associated with physical inactivity. It is even suggested that such sedentary behaviour may replace more active behaviour, such as sports. Therefore, the more TV shows a person watches and thus, spends time sitting, the less this person would engage in physical activities (Meyer et al., 2008). Furthermore, difficulties with sleeping have also been found among heavy TV viewers. Consequently, they have troubles falling asleep after having watched TV shows late at night or due to watching scary or exciting movies. This leads to them having a lack of sleep or general sleeping problems because of watching TV shows (Van den Bulck, 2000).

1.3.1 Binge watching and snacking

Additionally, heavy TV watching can be associated with an extra calorie intake. These people tend to consume about one-half less serving of vegetables and fruits per day and, at the same time, seemed to have a higher fat intake than people who watch less TV shows. Therefore, heavy TV viewers also eat more salty snacks and candy, and drink more soft drinks while watching (Meyer et al., 2008). Generally, snack foods can be defined as food items that are energy-dense and nutrition-poor. Furthermore, they are usually high in sodium, sugar and fat, wherefore examples would be cookies, soft drinks, chips and cakes (Hess, Jonnalagadda & Slavin, 2016). Another study by Van den Bulck (2000) showed similar results. 39.8% of participants in this study, stated that they eat candy or snacks routinely while watching TV.

With an increase in TV watching, the intake of snacks and drinks also became more frequent. 57.2% of participants reported to drink nearly every time when watching a tv show, of which most drinks were soft drinks and some consisted of alcohol. Thus, it was found that the heavy watching of TV correlates with the intake of snack foods and soft drinks (Van den Bulck, 2000). In a study by Bowman (2006), the association between daily energy intake and watching TV was examined. The results showed that people who watched more than 2 hours of TV every day, had 61 calories more of their energy intake from snacks like cookies and potato chips than people who watched less than 1 hour of TV per day. Moreover, more of their energy intake was received from added sugars, like they can be found in soft drinks and snacks. Therefore, heavier TV watchers were shown to have a higher daily energy intake with more added sugars from snacks and soft drinks (Bowman, 2006). Another study by Thomson, Spence, Raine and Laing (2008) also came to the conclusion that TV viewing is associated with snacking frequency and with consumption of more unhealthy snacks like soft drinks, candy, salty snacks and ice cream. Snacking was defined as any consumption of food besides those that are considered a meal. Hence, medium to high TV watchers reported to snack more frequently and to consume more unhealthy snacks. One of the theories that was proposed in order to explain these results was that watching a TV show provides the viewer with an opportunity to engage in snacking behavior (Thomson et al., 2008). These studies suggest that binge watching may be associated with more snacking behavior and a higher intake of unhealthy snacks.

Furthermore, distracted eating may also lead to more snacking, which would also relate to binge watching or watching TV shows in general. When eating a meal while watching TV and thus, being distracted, more snacks may be eaten later (Robinson et al., 2013). Furthermore, it is more likely for people to eat snack foods when the TV show that is watched is rather a boring, non-engaging one than when it is really exciting (Chapman et al., 2014). Snacking behavior itself has been associated with healthy weight maintenance but also with weight gain (Hampl, Heaton & Taylor, 2003; Chapelot, 2011). Therefore, the relationship between snacking and obesity remains ambiguous. The health status of a person and choice of snack may influence whether weight is gained or not. Consequently, overweight people tend to eat more unhealthy snacks like chips and cookies and normal-weight people would eat more nuts as a snack instead (O'Connor, Brage, Griffin, Wareham & Forouhi, 2015).

Moreover, it was found that snacking is related to substituting nutrient-rich foods for nutrient-poor foods. In addition to that, people who eat a lot of nutrition-poor foods like unhealthy snacks also showed to have lower serum vitamin concentrations and consumed less micronutrients. Furthermore, the more of these foods are consumed, the higher the risk for

coronary heart diseases may be (Kant, 2000). Additionally, it has been shown that the risk of getting breast cancer is higher amongst women who consume energy-dense foods and fast foods (Chandran et al., 2014).

Accordingly, several studies showed associations between heavy TV watching and eating unhealthy snacks. In general, consuming energy-dense and nutrient-poor snacks has many health implications like lack of micronutrients and vitamins and a possibly higher risk for coronary heart diseases.

1.4 Research Questions

As it has been suggested above, snacking has been associated with binge watching in several studies (Van den Bulck, 2000; Bowman, 2006; Thomson et al., 2008). However, these studies used interviews, 24-hours dietary recalls or online surveys in order to obtain their data (Van den Bulck, 2000; Bowman, 2006; Thomson et al., 2008). Therefore, Thomson et al. (2008) also state as a limitation that by using retrospective self-reported measures, a recall bias may have occurred among their sample. In the present study, the Experience Sampling Method (ESM) will be used. This method is a real-time data collection technique, wherefore the behavior of a participant is assessed more immediate. Hence, recall biases could be decreased by using the ESM instead of retrospective data collection methods (Trull & Ebner-Priemer, 2009). Furthermore, Thomson et al. (2008) acknowledge that they used a cross-sectional design, wherefore only correlations and group differences could be explored but not causality or the temporal nature of associations. By using a short-term longitudinal study, like the ESM, it can be examined whether a variable is related to a change in the outcome variable over time. Therefore, it can be seen if two variables move up and down together during a particular time period. In addition to that, by applying a measure like the ESM, it can not only be assessed whether one variable is related to (changes in) the other but also if it does so during everyday life situations (Moore, Diener & Tan, 2018).Thus, it would be of interest to investigate if there is an association between binge watching and snacking by using the ESM, as this may decrease recall biases and could explore relationships over time between (changes in) variables.

RQ1: *To what extend are binge watching and snacking correlated with each other over time?*

Additionally, it would be of interest to explore whether binge watching particularly predicts the consumption of more unhealthy snacks, rather than more healthy snacks. As it has been shown by O'Connor et al. (2015), the choice of snacks is related to the health status and weight of a person. Therefore, it would be important to investigate if binge watching is stronger related with unhealthy snacking or with healthy snacking in this sample and what these associations may be like. In addition to that, it would then also be of interest to assess if BMI is a moderator of binge watching and snacking. As studies have shown, binge watching could be associated with intake of more unhealthy snacks (Thomson et al., 2008; Bowman, 2006) and choice of snack is then related to the BMI of a person (O'Connor et al., 2015). However, studies on weight gain and snacking have been quite ambiguous (Hampl, Heaton & Taylor, 2003; Chapelot, 2011). Nevertheless, an ESM study by Schüz, Revell, Hills, Schüz and Ferguson (2017) assessed the effect of social cues on snacking, also including BMI as a moderator. Results showed that being alone leads to a higher consumption of unhealthy snacks among people with high BMI than among people with lower BMI. Therefore, it would be interesting to examine whether a higher BMI leads to a stronger relationship between binge watching and unhealthy snacking, as, to the knowledge of the researcher, this has not been assessed before.

RQ3: *What are the associations between binge watching and consumption of unhealthy snacks?*

RQ4: *What are the associations between binge watching and consumption of healthy snacks?*

RQ4: *Is BMI a moderator of the relationship between binge watching and unhealthy snacking?*

2. Methods

2.1 Design

In the present study, the method that was used to answer the stated research questions related to binge watching and snacking is the Experience Sampling Method (ESM). This method of data collection is similar to the concept of a diary study. It assesses the thoughts, feelings and behavior of participants during their everyday-life. Therefore, participants are receiving some kind of reminder or notification during their day and then have to fill out a

questionnaire. These notifications can be particularly adjusted to the situations or events that a researcher is investigating. ESM is getting easier to implement nowadays due to the possession of mobile devices, wherefore the researcher may also be able to take a look at the data while it is being collected. Moreover, this method provides the researcher with more insight into daily experiences and behavior of participants, as data collection takes place for several days in multiple participants. Thus, participants are asked to respond to a questionnaire one or multiple times a day during the course of the study. Another advantage is that participants are examined in their natural environment, instead of a laboratory, which might result in more natural behavior (Van Berkel, Ferreira & Kostakos, 2017).

The data collection took place from the 07.04.2020 until the 20.04.2020, which results in a total of 14 days. The first day was used for the baseline questionnaire and participants had the whole day to fill it out. For the following 13 days, they received one questionnaire every morning between 9 a.m. and 11 a.m. about their watching and snacking behavior the previous day. The type of sampling was active sampling, as participants were asked to self-report their watching and snacking behavior for every day of the study (Conner & Lehman, 2012). They had 24 hours to fill it out and got a first reminder after 1 hour and a second reminder after 6 hours.

2.2 Participants

Originally, there were 45 participants involved in this study. However, 2 participants were excluded during the analysis because they filled out less than 50% of the questionnaires (Conner & Lehman, 2012). Therefore, 43 participants were left in this study, aged between 20 and 56 years (M = 24.61; SD = 7.20). Further characteristics can be viewed in Table 1. They were recruited using convenience sampling, wherefore each of the three researchers asked about 15 people in their social environment to participate in this study. Later the data of all participants could be used by every researcher. There were no restrictions regarding gender, nationality, occupation or age. However, participants needed to have a smartphone in order to be included in this study, have access to video-on-demand content and possess sufficient English skills in order to understand and answer the questionnaires. Participation in the study was on a voluntary basis.

Table 1. Characteristics of participants.

	Frequency	Percentage
Gender		
Female	32	74.4%
Male	11	25.6%
Occupation		
Pupil	1	2.3%
Student	24	55.8%
Full-time-worker	18	41.9%
Nationality		
German	36	83.7%
Turkish	2	4.7%
German-Turkish	2	4.7%
Mexican	2	4.7%
American	1	2.3%

2.3 Materials

As this study was a joint research between three researchers investigating the topic of binge watching for their bachelor theses, there were also other questionnaires involved. The other bachelor theses focus on introversion and mood and on physical activity, in regard to binge watching. Therefore, surveys concerning these topics were also included in the app and were filled out by the participants.

In order to enable the experience sampling study, the Ethica app was used. Ethica is an application for smartphones, which allows researchers to send out context-dependent surveys, while making participating in these as easy as possible for participants. Therefore, closer and more accurate observations can be done. Furthermore, the app provides the possibility to include the informed consent directly. Thus, physical meetings with participants is not necessary, which is useful when including participants from different countries (About, n.d.).

For the baseline measurements, participants first had to fill out demographic questions regarding their gender, age, nationality, height and weight. Furthermore, they were asked to indicate their occupation and which video-on-demand streaming services they used (Netflix, Amazon Prime, YouTube, Sky or Other) (See Appendix A).

In addition to that, participants were asked about their general snacking behavior in order to get an overall impression. This was done by asking about the frequency of snack intake during one week, while dividing into healthy snacks and unhealthy snacks. The division into healthy and unhealthy snacks was based on a study by Thomson et al. (2008), who set up the categories of energy-dense snacks like baked goods or candy and healthy snacks like fruits and nuts. As there were no questionnaires about baseline snacking available that fit with this study, it was decided to set up a quick survey about snack intake, similar to other general food frequency questionnaires (Cartwright et al., 2003). Thus, participants were asked on how many days per week they usually eat unhealthy snacks and on how many days per week they usually eat healthy snacks. Response options then ranged from 0 days to 7 days (see Appendix A). Accordingly, these responses were then coded as 0 for 0 days up to 7 for 7 days.

In order to develop the questions that participants were asked to fill out every day, it was important to set up a definition for binge watching. As already stated, there is a lot of ambiguity regarding a suitable definition. Therefore, in this study, binge watching is defined as both, watching more than 3 hours in one sitting (Horvath, Horton, Lodge & Hattie, 2017 as cited in Flayelle et al., 2020) and watching more than 3 episodes, as this cut off was used in most studies, according to Flayelle et al. (2020). In order to assess binge watching, participants got a notification every morning between 9 a.m. and 11 a.m., which asked them to answer the following questions (see also Appendix B). First, it was asked if they watched video-on-demand content yesterday at all. The response options were either Yes or No. Next, participants were asked at what time they started watching and they could then indicate a number that corresponds with this. If they did not watch video-on-demand content, they were able to just leave it blank. The next question asked the participants how many episodes they watched yesterday. If they did not watch any, they could choose the option “I did not watch”. Moreover, they could also choose “I watched a movie”. Both of these options were then coded as 0. Further options were then “Less than 1 episode”, which was coded as 0.5. Then, the answer options ranged from 1 episode to 7 episodes, which corresponded to a coding of 1 to 7. The last response option was “More than 7 episodes”, which was coded as 8. The next question asked participants how many hours of video-on-demand content they watched yesterday. The first response option was also

"I did not watch", which was coded as 0. The next option was "Less than one hour", which was coded as 0.5. Then the response options ranged from 1 hour to 7 hours, where 1 hour was coded as 1 and 7 hours as 7. The last response option was "More than 7 hours", which was coded as 8.

In order to explore snacking behavior of participants, it was decided to ask two questions about what snacks they ate the evening before. These questions appeared on their phone between 9 a.m. and 11 a.m. the next morning. This time was set because at the same time the question about binge watching behavior was asked and thus, the participants could fill everything out at once. Furthermore, it is hard to determine when a person would likely go to sleep and therefore, it makes more sense to ask about binge watching and snacking behavior the following day. Thus, participants are asked if they ate snacks after dinnertime the day before. It was decided to ask whether they ate snacks specifically after dinnertime because a study by De Feijter, Khan and van Gisbergen (2016), showed that the most preferable time to watch series is in the evening as most people have other responsibilities and activities during the day. Therefore, it made most sense to ask for snacking behavior after dinnertime, as it was then more likely that participants would also engage in binge watching at the same time.

The answer options were divided into healthy snacks and unhealthy snacks, based on the study done by Thomson et al. (2008), just like in the baseline questionnaire. Moreover, the number of snacks should also be quantified by the participants in order to assess how much they actually ate. In an experience sampling study by Wouters, Jacobs, Duif, Lechner and Thewissen (2018) about snacking, grams, pieces or household measures like cups or bowls were used to determine the quantity of snacks that were eaten. In the present study, it was decided to use servings as a measure, whereby examples were given of what a serving could look like. Based on the study by Wouters et al. (2018), cups were used as an example for nuts, a bowl as an example for one serving of potato chips, while one serving of fruits, vegetables or cakes, were presented as one piece. Furthermore, in order to enhance estimation of participants, the researcher created pictures to show what one serving could approximately look like. These pictures were included in the questions that participants answered every day. Thus, the first question related to how many servings of unhealthy snacks the participant ate after dinnertime yesterday, while the second question was on how many servings of healthy snacks the participant ate after dinnertime yesterday. Participants could then choose any number by themselves, starting from 0, in case they did not eat any healthy or unhealthy snacks, up to a set maximum at 50 servings (see Appendix B). The responses were then coded according to the

number of servings that were indicated by the participants. Hence, 0 servings were coded as 0 and 1 serving was coded as 1, up to 50 servings.

2.4 Procedure

Participants were sent an E-mail one day before the start of the study with information regarding the procedure, their tasks and instructions on how to download and register for the app (see Appendix C). When registering in the Ethica app, they were asked to fill out the informed consent. If a person did not agree with the informed consent or wanted to withdraw from the study, their participation ended immediately and any data that may already have been collected, was excluded. Starting on day 1 of the study, participants were instructed to fill out the baseline questionnaire. Thus, participants got a notification between 9 a.m. and 11 a.m. to respond to the baseline survey within this day. Additionally, they got a second reminder after 6 hours. Therefore, they had to indicate their gender, age, nationality, occupation, height, weight, occupation and the streaming platforms they used. Height and weight data were used to calculate the BMI of each person. Furthermore, two questions about their general snacking behavior were asked. The baseline questionnaire took participants around 20 minutes. The baseline survey was the only survey that participants were asked to fill out on day 1. Thus, it expired after 24 hours. From the next day on, the participants received a notification of the app every morning between 9 a.m. and 11 a.m., asking them to fill out a few questions about binge watching and snacking. Responding to these questions took the participant about 5 minutes each time. They had a total of 24 hours to respond to the daily questionnaire. After this time, the questionnaire for that day expired and the next questionnaire immediately appeared. In order to remind participants of filling out the questionnaire before it disappeared, they received a first reminder from the app after 1 hour which let them know how much time they have left to fill out the short survey. A second reminder then appeared after 6 hours. If any questions about the study arose, the participants were free to contact one of the researchers, who tried to answer their questions the best they could. After the 2 weeks of data collection, the researchers got into contact with the participants and thanked them for their participation.

2.5 Data Analysis

Data analyses were performed using IBM SPSS Statistics 24 and Microsoft Excel. As a first step, the data from the daily questionnaire and the baseline questionnaire were downloaded

into Excel from the Ethica website. Then, the Excel files were put into separate SPSS datasets. Afterwards, the variables had to be recoded from string variables into numeric variables. This was done for the baseline questionnaire, as well as for the daily questionnaire. In addition to that, a variable called "days" was created by using the day and time wizard in SPSS. This variable was used to represent the days from 0 to 12, instead of having the dates listed. Furthermore, the BMI of each participant was calculated using their height and weight. This allowed the researcher to categorize the participants into underweight, normal weight, pre-obesity, obesity class I, obesity class II or obesity class III as defined by the World Health Organization (Body mass index – BMI, 2020).Thus, a new variable was created with BMI as category in order to enhance overview of what category each participant was in. Therefore, 1 was set as underweight, 2 as normal weight, 3 as pre-obesity, 4 as obesity class I, 5 as obesity class II and 6 as obesity class III. Furthermore, a variable representing daily snacking in general was also created in order to answer the first research question. Thus, the number of unhealthy snacks and healthy snacks was summed for each person and every day for this variable to represent general snacking. Moreover, the variable that represented how many episodes were watched was recoded into a different one that also took watching a movie into account. Therefore, the first episodes variables had coded watching a movie as 0, while the additional variable coded watching a movie as 2.5, in order to check if this factor would make any difference in analyses. Additionally, the files of the baseline questionnaire and the daily questionnaire were then merged into one dataset for subsequent analysis.

As a next step, descriptive statistics were used in order to obtain a general picture of the characteristics of participants. Therefore, frequencies and percentages of nationality, gender, occupation, number of streaming platforms used and BMI category were displayed. Moreover, mean and standard deviation were calculated for age. In addition to that, the baseline questionnaire about general snacking behavior was also further investigated. This was done by, firstly, taking a closer look at descriptive statistics and calculating the means and standard deviations of unhealthy snacking and healthy snacking in general.

Next, a series of Linear Mixed Models was applied with the subjects being users and repeated measures being days. Depending on the analysis, snacking in general, unhealthy snacking or healthy snacking was set as the dependent variable with each having watching time in hours or watching time in episodes as fixed covariates. In order to execute the moderation analysis, the Linear Mixed Model was applied as well. Hence, unhealthy snacking was set as dependent variable and calculated, and therefore, continuous BMI and episodes watched or

hours watched as independent fixed covariates. Moreover, the interaction term of the calculated BMI variable and episodes watched or hours watched was added as fixed covariate. Furthermore, the median of the calculated BMI was investigated in order to use it as a cut-off point for high and low BMI within this sample. Thus, another variable was created that represented BMI lower than median and BMI equal to and higher than median. This was then used in order to visualize the potential interaction. Additionally, graphs were created using the estimated marginal means from the Linear Mixed Model and inserting those into Excel to generate graphs that show development of the estimated marginal means over time or per participant.

3. Results

3.1 Descriptive statistics

The response rate of the 43 participants was 100% for the baseline questionnaire and 97.13% for the daily questionnaires.

By using the results of the baseline questionnaire, the BMI category for each participant could be calculated, as well as the amount of streaming services that were used and on how many days per week unhealthy and healthy snacks were generally eaten. Most of the participants displayed normal weight (see table 2), while slightly more participants were in the pre-obesity class than in the underweight class. No participant was categorized in any of the further obesity classes as pre-obesity was the highest BMI category within this sample.

Table 2. BMI categories of participants.

	Frequency	Percentage
Underweight	4	9.5%
Normal weight	32	76.2%
Pre-obesity	6	14.3%

Regarding the amount of streaming services watched, most participants used 2 streaming services (53.5%). In addition to that, 3 kinds of streaming services were the second

most used option among this sample (30.2%), while using 4 streaming services were used by 14% of respondents. Only 2.3% of the participants used one streaming service. Therefore, the minimum of streaming services used was 1 and the maximum was 4 (M = 2.56; SD = 0.77). Moreover, participants revealed to eat unhealthy snacks on minimum 1 day per week and maximum 7 days per week (M = 4.21; SD = 1.93) and healthy snacks on minimum 0 days per week and maximum 7 days per week (M = 5.67; SD = 1.73).

Watching behavior of participants was measured in episodes and hours over a period of 13 days. The overall mean for hours watched per day was 1.64 (SD = 2.09) among the sample and during the whole course of the study. Additionally, the overall mean for episodes watched per day over time and among this sample was 1.75 (SD = 1.62). The mean watching time and mean episodes that were watched within the sample group over this time period per day can be seen in figure 1. It becomes apparent that both episodes watched and hours watched show the same course over time. However, episodes watched seems to show more fluctuations than hours watched. Furthermore, it can be seen that most episodes were watched on day 12 (M = 2.17) and the fewest episodes were watched on day 5 (M = 1.10). Nevertheless, the day with the most hours watched was day 6 (M = 1.94) and the day with the fewest hours watched was day 9 (M = 1.17).

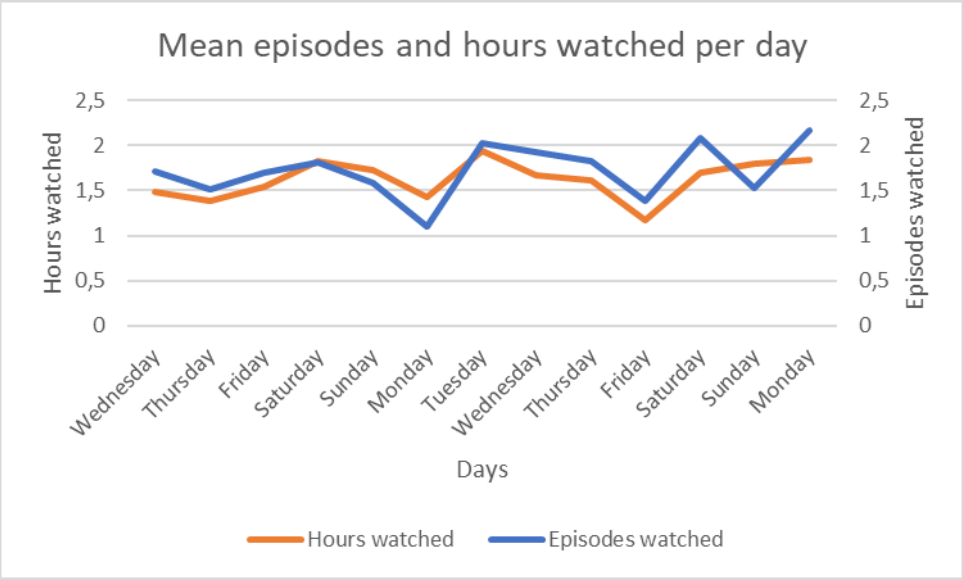

Figure 1: The mean episodes watched and mean hours watched per day over the course of 13 days among the sample group.

Furthermore, as displayed in figure 2, it can be seen how many hours on average were watched per participant over the course of the study. Participant 11 watched the most hours of video-on-demand services over the course of the study (M = 5.06), with about 5 hours on

average. The lowest mean watching time of streaming services was reached by participant 20 ($M = 0.15$).

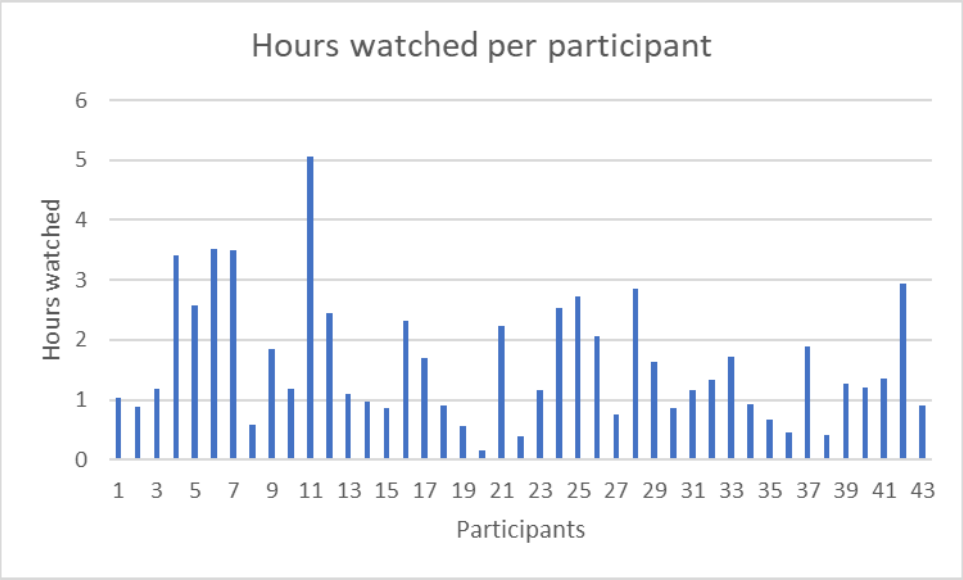

Figure 2: The mean hours watched over the course of 13 days per participant.

As it becomes apparent in figure 3, participant 7 seemed to watch the most episodes on average ($M = 6.42$), followed by participant 11 ($M = 5.48$), who also showed to watch the most hours (see figure 2). Participant 20 did not indicate to watch any episodes at all during the course of the study and participant 22 watched the fewest episodes compared to the rest of the respondents ($M = 0.18$). Nevertheless, participant 20 indicated to have watched a few minutes of video-on-demand services (see figure 2), which could mean that he or she may have watched a movie instead of a series and did not finish it.

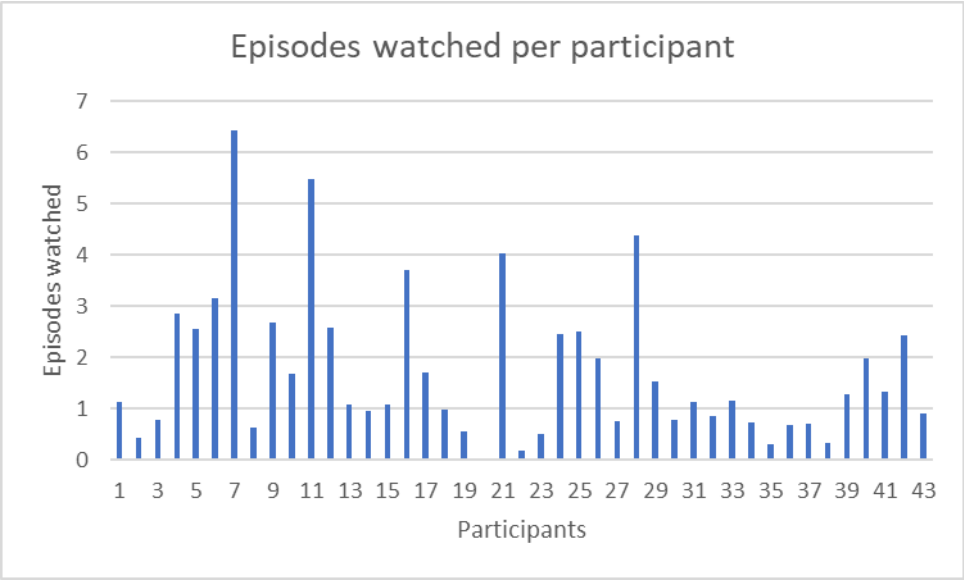

Figure 3: The mean episodes watched over the course of 13 days per participant.

Intakes of healthy and unhealthy snacks were measured on 13 days in total, starting on day 0 until day 12. An overview of mean intake of snacks in general (both unhealthy and healthy summed together) and healthy und unhealthy snacks for this time period is displayed in figure 4. Eating of healthy snacks seems to stay at a lower level than intake of unhealthy snacks and further, eating healthy snacks seems to stay within the same range over time. Intake of unhealthy snacks seems to be higher than that of healthy snacks and also shows to increase especially on day 2 and from day 4 to day 6.

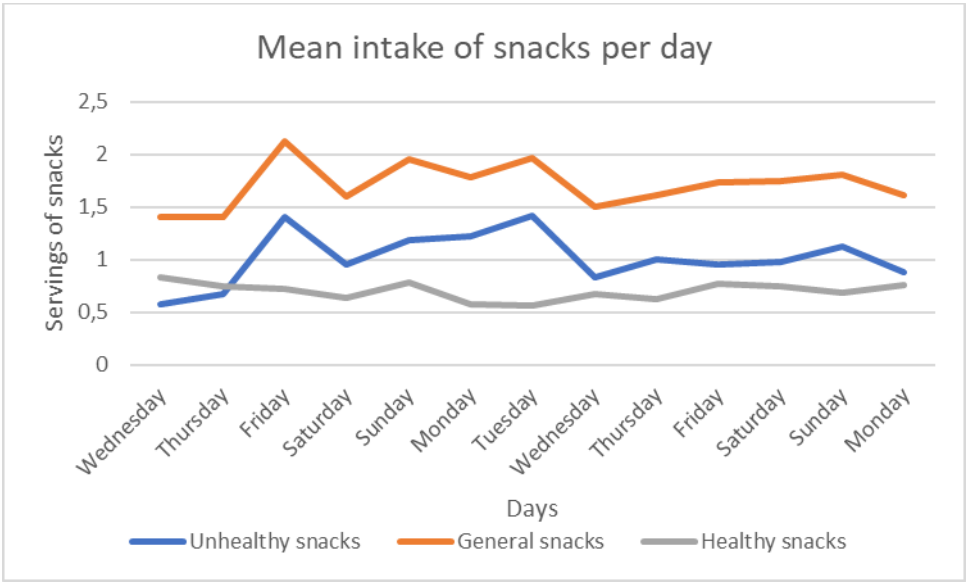

Figure 4: The mean intake of unhealthy snacks, general snacks, and healthy snacks over the course of 13 days among the sample group.

Furthermore, figure 5 shows the mean intake of unhealthy and healthy snacks over the course of the study per participant. As it can be seen, participant 19 consumed most servings of unhealthy snacks during this study (M = 2.43), with participant 42 being the second most consumer of unhealthy snacks (M = 1.99). Moreover, it becomes apparent that none of the participants consumed no unhealthy snacks during the 13 days. However, participant 39 (M = 0.08) and participant 22 (M = 0.13) consumed the fewest servings of unhealthy snacks on average. Moreover, as it can be seen in figure 5, most healthy snacks over the course of the study were consumed by participant 16 (M = 2.91), followed by participant 20 (M = 2.06). Nevertheless, participant 3, participant 33 and participant 39, did not consume any healthy snacks after dinnertime over the time period of 13 days.

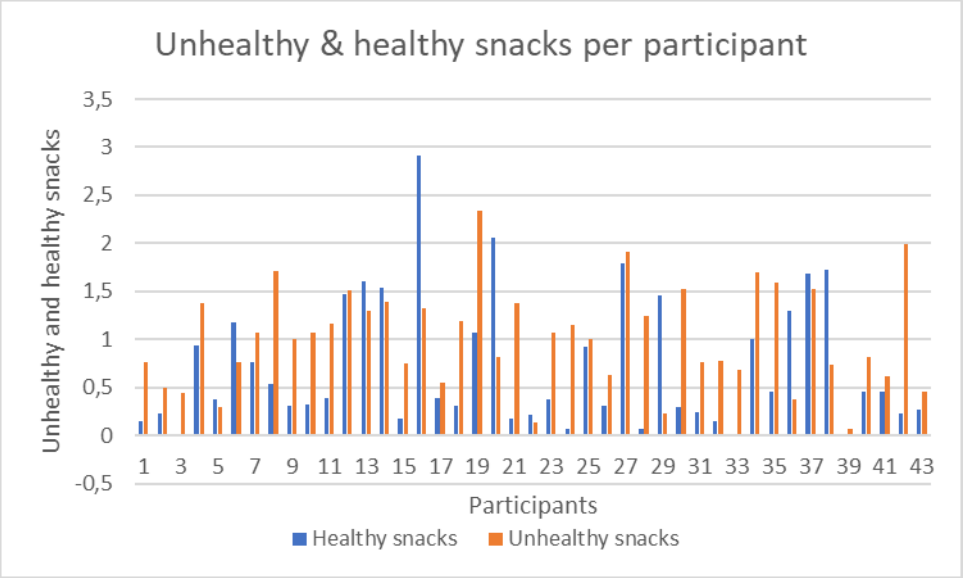

Figure 5: The means of intake of unhealthy and healthy snacks per participant over the course of 13 days.

3.2 Linear Mixed Model Analyses

3.2.1 Binge watching and general snacking over time

In order to answer the first research question, the association between watching time in hours and watching time in episodes with general snacking over time was tested using a Linear Mixed Model. The results revealed a non-significant correlation between episodes watched and general snacking (estimate .05, F (527.43) = 2.41, p = .12). Nevertheless, when taking watching a movie into account by coding it as 2.5 instead of 0, the relationship showed to be significant (estimate .07, F (526.07) = 4.49, p = .04). Moreover, a significant association was found between hours watched and general snacking (estimate .09, F (530.95) = 5.39, p = .02). The estimate of .09 indicates that the more hours are watched, the more intake of general snacking takes place. This association was plotted in a graph in order to view the development of both variables over time (see figure 6). Generally, most snacks were consumed on day 2 (*M* = 2.12) and the fewest snacks were consumed on day 0 (*M* = 1.4). As it can be seen, general snacking and hours watched of video-on-demand services, follow roughly the same course over time. Nevertheless, on day 2 and day 9, intake of snacks shows to be a lot higher while watching time stays the same or decreases.

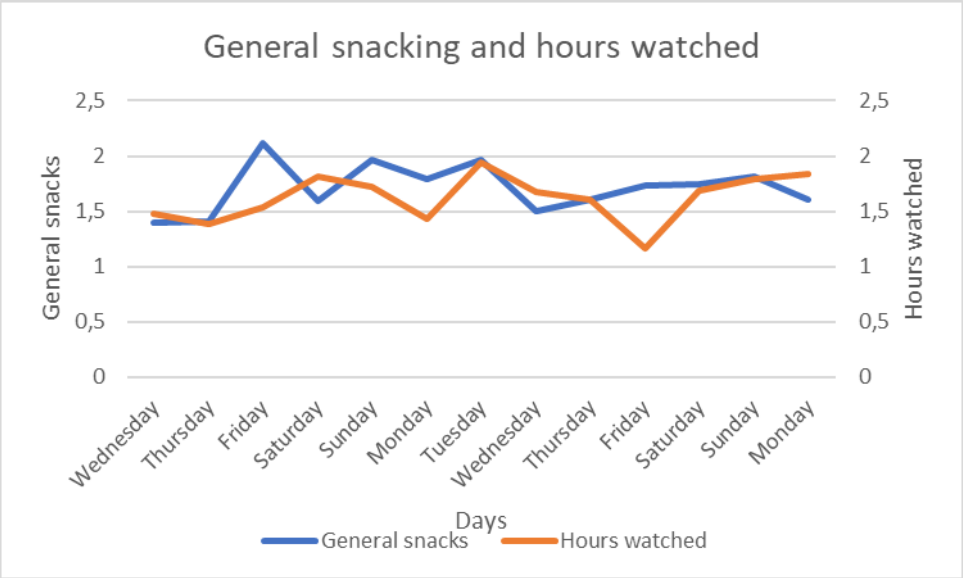

Figure 6: General snacking (mean) and hours watched (mean) over the course of 13 days among the sample group.

3.2.2 Binge watching and unhealthy snacking

In order to address the second research question, the association between episodes watched and hours watched with unhealthy snacking was tested using a Linear Mixed Model. The number of episodes watched and intake of unhealthy snacks revealed no significant correlation (estimate .04, F (469.31) = 2.07, p = .15). Additionally, using the episodes variable that includes watching a movie coded as 2.5, there also showed to be no significant relationship with unhealthy snacking (estimate .04, F (466.38) = 2.76, p = .10). In contrast, the number of hours watched and unhealthy snacking resulted in a significant association (estimate .07, F (490.23) = 4.30, p = .04). This means that with more hours watched, more intake of unhealthy snacks appeared. As it can be seen in figure 7, especially on day 6, both hours watched and unhealthy snacking increases, while then decreasing on day 7. In general, participants seemed to have consumed most unhealthy snacks on day 6 (M = 1.42) and the least on day 0 (M = .58). Moreover, the day when the most hours of video-on-demand services were watched revealed to also be day 6 (M = 1.94).

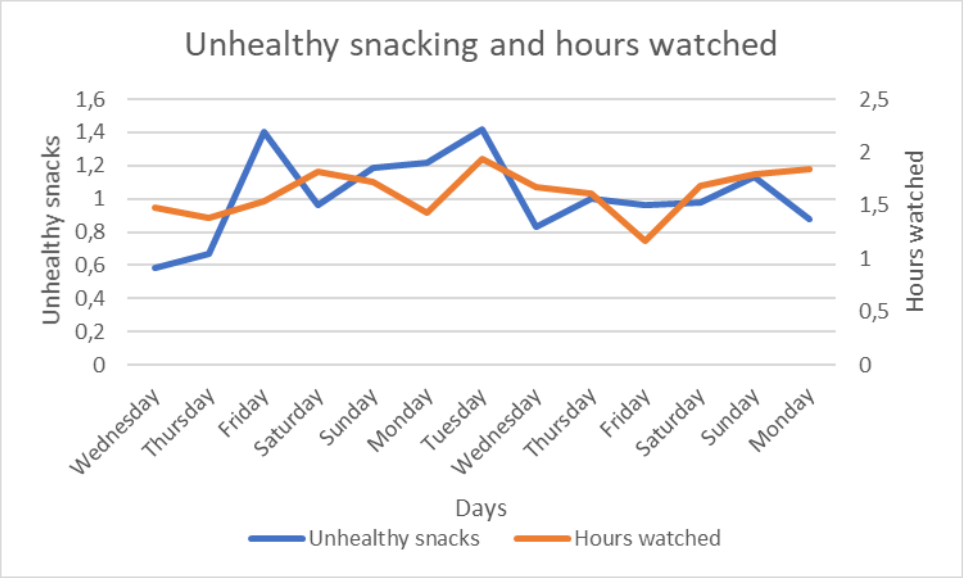

Figure 7: Unhealthy snacking (mean) and hours watched (mean) over the course of 13 days among the sample group.

3.2.3 Binge watching and healthy snacking

A Linear Mixed Model was also applied in order to investigate associations between watching time and intake of healthy snacks. Thus, when executing the analysis for episodes

watched and healthy snacking, no significant association was found (estimate .03, F (523.71) = 2.53, p = .11). However, when taking watching a movie into account as watching behavior, the relationship with healthy snacking showed to be significant (estimate .04, F (525.08) = 4.42, p = .04). Moreover, the amount of hours watched and intake of healthy snacks revealed no significant relationship (estimate .04, F (515.26) = 2.86, p = .09). This also becomes apparent when taking a look at figure 8. While the intake of healthy snacks stays at about the same mean across the group over time, hours watched of video-on-demand services shows greater fluctuation. Therefore, consumption of healthy snacks seems to be rather independent of watching behavior. Generally, most healthy snacks were consumed on day 0 of the study (*M* = 0.83), while the fewest healthy snacks were consumed on day 6 (*M* = 0.56). However, on day 6, when the fewest healthy snacks were consumed, the most hours were watched (*M* = 1.94).

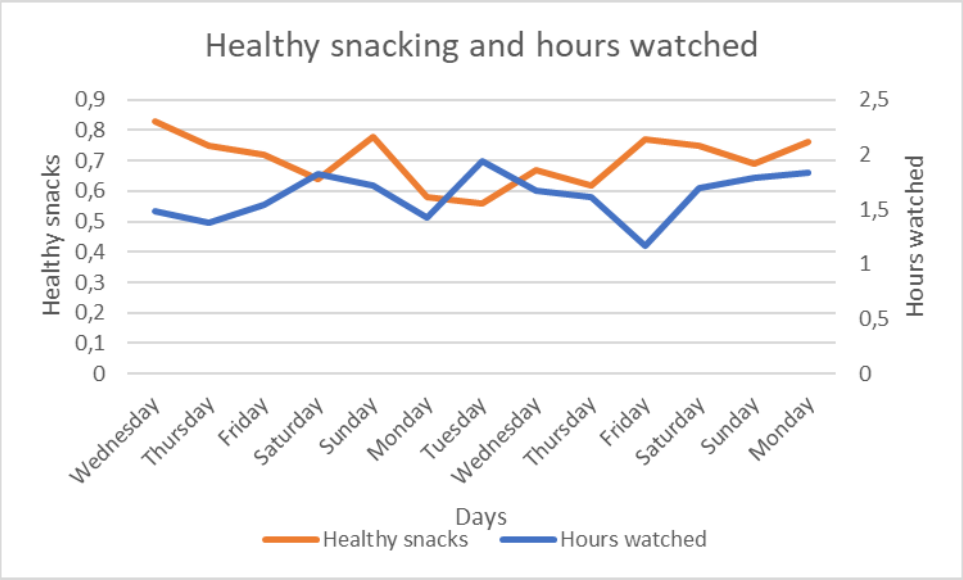

Figure 8: Healthy snacking (mean) and hours watched (mean) over the course of 13 days among the sample group.

3.2.4 Binge watching, unhealthy snacking and BMI

The moderation effect of BMI on unhealthy snacking and hours or episodes watched was investigated. The main effect of the calculated continuous BMI on unhealthy snacking revealed to be significant for both, the model including episodes watched (estimate .12, F (213.60) = 14.44, p = .01 and the model that includes hours watched (estimate .12, F (244.99) = 12.66, p = .01). Thus, the estimate shows that with a rising BMI, in both models, more servings of unhealthy snacks are consumed generally. When executing a median split of BMI,

the median showed to lay at 22.22 within this sample. When testing for the association between BMI and unhealthy snacking only, using the median BMI variable split, that separates the participants into the group with a BMI below the median and into the group with a BMI equal to or above the median, there also shows to be a significant relationship with unhealthy snacking (F (149.31) = 6.81, p = .01). This association is displayed in figure 9 which shows that the group with a BMI equal to and above the median consumed more unhealthy snacks on average (*M* = 1.16) than the group with a BMI below the median did (*M* = .83).

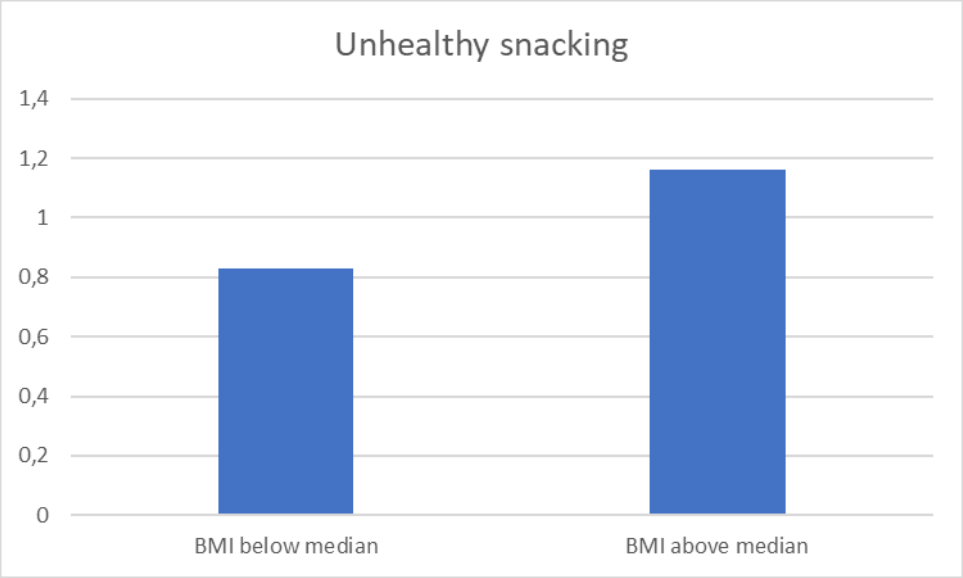

Figure 9: The mean of unhealthy snacking over the course of 13 days for the group with a BMI below the median and for the group with a BMI equal to and above the median.

However, the moderation effect of the calculated and continuous BMI variable on episodes watched and unhealthy snacking was not significant (estimate -.02, F (426.46) = 2.98, p = .09). By taking into account watching a movie, the moderation effect of BMI on this relationship was also not significant (estimate -.02, F (444.90) = 3.26, p = .07). Moreover, the direct influence of hours watched on unhealthy snacking with calculated BMI as a moderation effect also revealed to be not significant (estimate -.02, F (405.62) = 2.34, p = .13). Furthermore, in order to visualize these results in graphs, another Linear Mixed Model analysis was executed using the episodes variable that includes watching a movie as watching behavior, unhealthy snacking and the BMI variable that was divided into high and low median as a moderation effect. This analysis also resulted in a non-significant moderation effect (F (500.97) = 1.53, p = .13). As it can be seen in figure 10, for the group that had a BMI below median, most snacks were consumed when watching more than 7 episodes (*M* = 1.48). However, watching 5 episodes (*M* = 1.41), 1 episode (*M* = 1.07) or 7 episodes (*M* = 1.07) also led to more unhealthy snacking

among this group. For the group with a BMI above the median (see figure 11), most unhealthy snacks were consumed when watching 6 episodes (M = 1.83). Furthermore, watching 3 episodes also shows more unhealthy snacking behavior among this group (M = 1.34). Nevertheless, watching a movie also resulted in a higher intake of unhealthy snacks within this group (M = 1.28), while not watching any video-on-demand services also showed to lead to more unhealthy snacking (M = 1.31). Therefore, the non-significant moderation effect of BMI on binge watching and unhealthy snacking also becomes clear in the displayed graphs. This means, that BMI does not have a significant influence on the relationship between episodes watched or hours watched and unhealthy snacking.

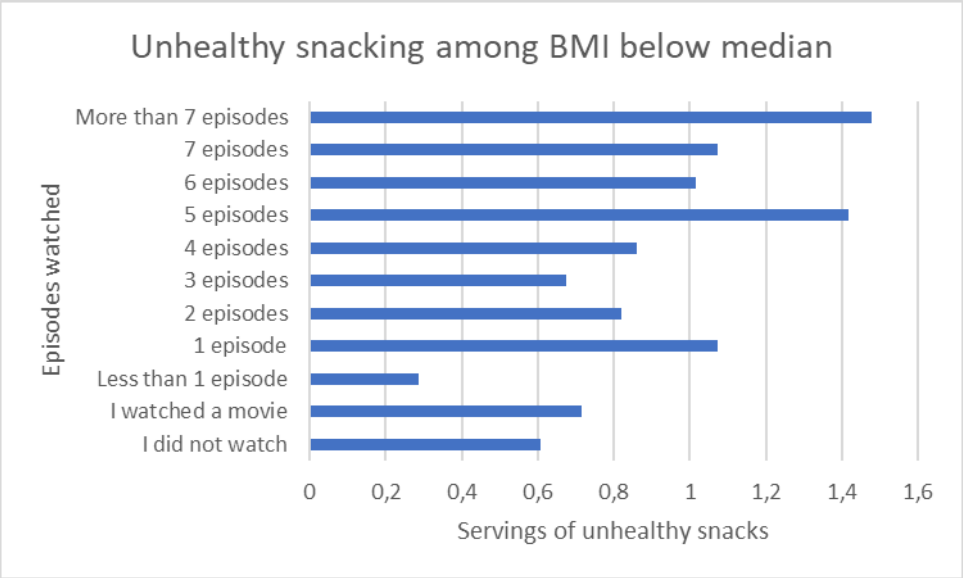

Figure 10: Unhealthy snacking (means) among the group with a BMI below the median per episodes watched.

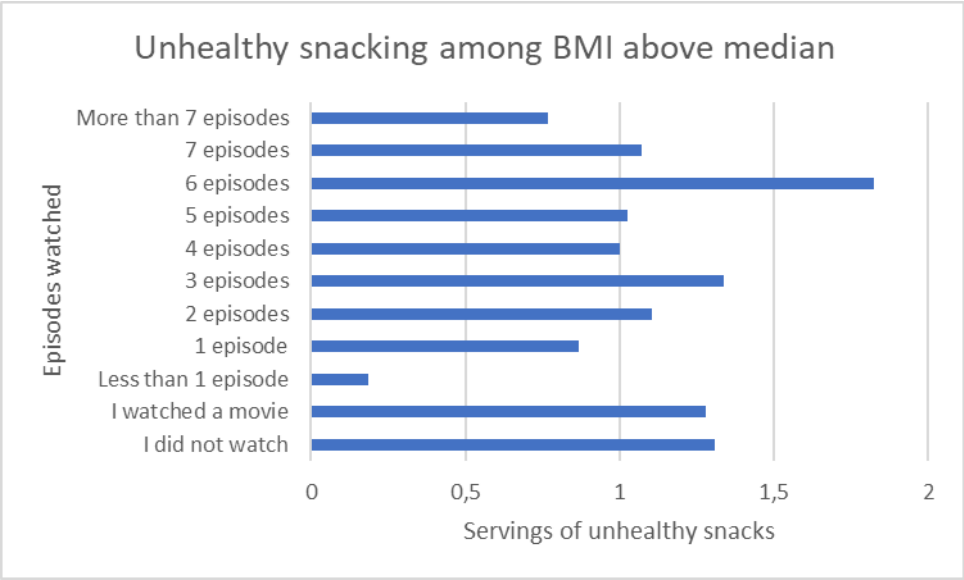

Figure 11: Unhealthy snacking (means) among the group with a BMI above the median per episodes watched.

4. Discussion

4.1 Conclusion

The aim of this study was to identify the relationships between watching of video-on-demand services and different types of snacking over a set time period. Furthermore, the effect that BMI takes on this association was also investigated. The results indicate that, generally, participants consumed more unhealthy snacks than healthy snacks on almost every day of the study. Moreover, general snacking behavior significantly rose with more hours that were watched. In addition to that, the more hours were watched, the more servings of unhealthy snacks were also eaten. For healthy snacks, only non-significant relationships were found with both hours watched and episodes watched. Additionally, it was found that a higher BMI significantly lead to more unhealthy snacking. However, there was no moderation effect found of BMI on the relationship between watching of video-on-demand services and unhealthy snacking.

4.2 Discussion

Generally, it can be said that intake of snacks was slightly positively related to hours watched of video-on-demand services. As choice of snacks has an influence on the BMI and

thus, on weight gain (O'Connor et al., 2015), it was also important to assess the intake of unhealthy versus healthy snacks while watching video-on-demand services. Generally, more unhealthy snacks than healthy snacks were consumed within this sample over time, which also resulted in a significant relationship between hours watched and intake of unhealthy snacks. Intake of healthy snacks was not significantly associated with episodes watched or hours watched of video-on-demand services. However, healthy snacks seem to still play a role because general snacking, counting in unhealthy and healthy snacks, has a stronger relationship with hours watched than unhealthy snacking by itself. Nevertheless, it is apparent that unhealthy snacking plays a greater role because it revealed to have a stronger and significant relationship with watching behavior. Additionally, it has been shown that consuming unhealthy and energy-dense snacks can lead to health consequences like coronary heart diseases and breast cancer (Kant, 2000; Chandran et al., 2014). These potential health implications also highlight the importance of investigating different mechanisms for unhealthy snacking, like binge watching. Therefore, the most relevant findings of this current study were the significant association of snacking, particularly unhealthy snacking, with watching of video-on-demand services.

This is in line with the findings of Van den Bulck (2000), who found that with increasing TV watching, the intake of unhealthy snacks and soft drinks also rose. Furthermore, Bowman (2006) showed that watching more than two hours of TV a day also leads these people to have a higher energy intake from snacks and dinner. As found by the present study, most participants engaged in more unhealthy snacking than healthy snacking in the evening. However, a few of these participants still managed to consume more healthy snacks. This might be explained due to personal values and self-representations that differ within individuals. Therefore, some people may see themselves as more aware of their health or environmentally friendly, which could lead them to adopt a specific diet that focuses on healthy or organic foods (Conner & Norman, 1998 as cited in Brug, 2008). This was also confirmed by a study by Deliens, Clarys, De Bourdeaudhuij and Deforche (2014), which asked University students about their eating behaviors in focus groups. They also found that personal values and norms were quite important in determining what foods students eat and what diets they stick to. Furthermore, it was also said that factors like guilt could play a role. Thus, some people may feel guilty when eating unhealthy snacks and consequently, rather take healthy ones (Deliens et al., 2014). The factor of personal values and norms of people could also explain the non-significant relationship of binge watching with healthy snacking. Therefore, it might be the case that some people just stick to their eating norms, no matter how many episodes of a show they watch because they have a particular self-representation of themselves in their mind or because it does not fit with

their values. Thus, these more health-conscious people may have a higher self-control and keep up with their healthy diet, while not being influenced by activities like binge watching to snack more. However, these possible explanations would need further research in order to confirm or disconfirm them.

Moreover, regarding the intake of unhealthy snacks while binge watching, a study by Meyer et al. (2008) found that people who watched a lot of TV also consumed more unhealthy foods like salty snacks and candy. However, the degree of intake of unhealthy snacks was rather small. This relates to the present study because it was also found that hours watched of video-on-demand services was significantly related with unhealthy snacking. But this effect was rather small, wherefore with every hour that was watched more only a small amount of unhealthy snacks was consumed more. Nevertheless, Meyer et al. (2008) stated that if this intake of unhealthy snacks happened on a daily basis and no other dietary substitutions would be executed, even this small amount of additional unhealthy snacks would be of great importance in the long run. This would be because even a small intake of unhealthy snacks can add up to many more additional fats and calories. Therefore, even though this present study also showed a rather weak relationship between binge watching and unhealthy snacking over a course of two weeks, it is still of importance and should be addressed because every additional serving adds up. Moreover, a possible explanation for the rather small degree of intake of unhealthy snacks in relation to binge watching could be that, as it becomes apparent in this study, the consumption of unhealthy snacks varies from day to day and may be dependent on other external circumstances that have not been assessed in this study. Furthermore, Thomson et al. (2008) also found that high TV viewers consumed more energy-dense foods and snacks than people who watched less TV. Nevertheless, they also stated that this relationship can to a great amount, be accounted for by advertising. Therefore, people would engage in more snacking because they saw particular advertisements on TV. This does not relate to the current study because video-on-demand services do not show advertisements like they are on normal TV. Hence, the relationship between more watching and a higher intake of unhealthy snacks seems to have other reasons as well. As found by Thomson et al. (2008), watching TV provides people with an opportunity to engage in snacking. This might have also been a factor in the present study. When watching for more hours, more unhealthy snacks were eaten. Thus, the opportunity to snack was extended the longer video-on-demand services were watched. This would mean that participants then had a greater chance to eat unhealthy snacks as it was more convenient for them to do so while binge watching.

A general explanation for a preferred intake of unhealthy snacks compared to healthy snacks, which was also found in the current study over time (see figure 4), might be the concepts of taste-nutrient learning and taste-taste learning (Capaldi, 1996; Birch, 1999 as cited in Brug, 2008). Therefore, people tend to like foods that are rewarded by feeling saturated afterwards, which would result in taste-nutrient learning. This may consequently lead them to prefer foods that consist of high amounts of fat or sugar. Taste-taste learning means that people learn to enjoy foods that have a similar taste like foods they already enjoy. Hence, food with added sugar and salt may also be preferred then (Capaldi, 1996; Birch, 1999 as cited in Brug, 2008). Additionally, the concept of taste-environment learning might be another explanation for the significant relationship between binge watching and unhealthy snacking, that was found in the present study. According to this concept, people learn to like foods that are consumed in a pleasant environment, like being in a cozy setting or with other friends (Capaldi, 1996; Birch, 1999 as cited in Brug, 2008). Hence, when watching video-on-demand services it might be the case that people are simultaneously in an enjoyable environment and feel comfortable. Furthermore, they could have also been with friends or family during some binge watching sessions and also consumed unhealthy snacks. Therefore, participants in this current study might have learned to connect being in a pleasant environment, which could be watching some shows on streaming services at home or with friends, with the intake of unhealthy snacks. This could then explain the increase of unhealthy snacking with more hours watched. However, further research would be needed to investigate these possible connections.

Accordingly, the act of binge watching itself could have provided participants with the opportunity to engage in unhealthy snacking. Moreover, concepts like taste-nutrient learning and taste-taste learning could account for the finding of a general preference of unhealthy snacks over healthy ones. In addition to that, taste-environment learning can lead people to connect being in a pleasant environment with food intake, wherefore binge watching could be seen as a rather enjoyable surrounding and thus, lead to more unhealthy snacking. Although the relationship between binge watching and unhealthy snacking found in this study was rather small, it may be still important because every serving of unhealthy snacks might be one too much.

Regarding the last research question, a significant and positive relationship was found between BMI and unhealthy snacking, indicating that people with a higher BMI tended to eat more unhealthy snacks than people with a lower BMI. As already mentioned, research on snacking and weight gain or BMI has been quite ambiguous. For instance, Hampl et al. (2003)

found no significant association between different snack choices or frequency and BMI. Furthermore, it has also been shown that, among female adults, there was no relationship between high energy intake in the evening or at night and BMI (Kant, Ballard-Barbash & Schatzkin, 1995 as cited in Hampl et al., 2003). These findings contradict with the results of this current study, where only unhealthy snacking after dinnertime was assessed. This means that eating more unhealthy snacks after dinnertime is correlated with a higher BMI. These results fit with the suggested hypothesis that eating snacks in the evening poses a greater harm to energy balance, which might be due to a higher intake of calories or choosing rather unhealthy foods (Gallant, Lundgren & Drapeau, 2012 as cited in Barnes, French, Harnack, Mitchell & Wolfson, 2015). These findings are in line with the results of the present study as participants from the higher BMI group ate significantly more servings of unhealthy snacks, like chips and candy, in the evening than those from the lower BMI group. Therefore, this study also shows the importance of snack choices, wherefore eating unhealthy snacks is associated with a higher BMI.

Despite this relationship between unhealthy snacking and BMI, this current study found no moderation effect of BMI on the relationship between binge watching and unhealthy snacking. However, it was expected to find a significant interaction of BMI, as results of this study confirmed a significant relationship between binge watching and unhealthy snacking and further, showed that people with a higher BMI consumed significantly more unhealthy snacks than people with a lower BMI. Moreover, other studies have shown a positive association between hours of TV watched and having a higher BMI (Jeffery & French, 1998; Andersen, Crespo, Bartlett, Cheskin & Pratt, 1998). Therefore, the finding of a non-significant moderation effect of BMI does not confirm the expectation that was raised. It suggests that, when it comes to consumption of unhealthy snacks during watching of video-on-demand services, BMI does not play a role. These results could also be explained due to the sample size of the study. It might be that a bigger sample size is needed, in order to prove a moderation effect of BMI (Fairchild & MacKinnon, 2009). Hence, further research could involve a bigger sample when testing for this moderation. Nevertheless, this finding might also be exciting because it suggests that when it comes to binge watching and intake of unhealthy snacking, BMI does not matter so much. Therefore, possible interventions could be applied to people of all BMI categories, in order to reduce snacking while binge watching. Again, taste-environment learning might be an explanation for this finding (Capaldi, 1996; Birch, 1999 as cited in Brug, 2008). This mechanism might apply to people of all BMI categories, wherefore people with a lower BMI as well as with a higher BMI, could possibly learn to associate the comfortable environment of

watching video-on-demand services with consumption of unhealthy snacks. Furthermore, being distracted while watching video-on-demand services and thus, eating more snacks might also play a role (Blass et al., 2006). As Blass et al. (2006) suggests, more pizza and macaroni and cheese servings were eaten when being distracted by watching TV. Among the sample, there were participants with a higher BMI, as well as some with a normal BMI. Still, no relationship between BMI and the increase of food intake from watching TV was found. Hence, Blass et al. (2006) suggested that increased consumption of energy-dense foods while watching TV may just define eating behavior in general, without distinguishing between different types of consumers. Therefore, it might be that the mechanism of being distracted by watching video-on-demand services could also lead to more unhealthy snacking, with BMI not playing a role.

Accordingly, the current study showed no influence of BMI when it comes to eating unhealthy snacks while binge watching. Taste-environment learning might explain this as well because it could affect both people with higher and with lower BMI's. Furthermore, the distraction that comes from watching video-on-demand services might also increase intake of unhealthy snacks, without distinguishing between people with a low or high BMI.

4.3 Limitations and Strengths

There are a few limitations to this study that can be discussed. Firstly, snacking behavior after dinnertime was assessed, as it has been shown that binge watching behavior preferably takes place in the evening (De Feijter et al., 2016). Participants were consequently only asked about their snacking behavior after dinnertime in order to find associations with binge watching, while it might have also been the case that some participants on some days also watched video-on-demand services during daytime. Thus, for further studies, it would be suggested to also assess the times when video-on-demand services were watched as well as the times when snacking took place. In relation to this, it should also be acknowledged that the Corona virus pandemic 2020 took place during the time of data collection. Consequently, many countries decided to go into lockdown as a consequence. This meant that people were staying mostly at home, were not able to work or worked from home and had to keep social distance to others. A study has also shown that binge watching increased during the lockdown times of the Corona pandemic. Therefore, people especially engaged in binge watching to not be bored or to reduce stress (Dixit, Marthoenis, Arafat, Sharma & Kar, 2020). These effects could have influenced the present study as some people may have had more time and reasons to engage in binge watching, also during daytime. Moreover, in response to the Corona outbreak, many people

started stockpiling groceries (Baker, Farrokhnia, Meyer, Pagel & Yannelis, 2020). Therefore, they hoarded groceries and consequently, did not go grocery shopping as often. Furthermore, many people especially focused on stocking up on toilet paper, especially people in Europe but also in North America (Garbe, Rau & Toppe, 2020). Therefore, participants may have found it more important to stock up on toilet paper and other necessary groceries than to buy healthy or unhealthy snacks, which could have also influenced the results of this current study. Hence, it might have been that participants binge watched more due to the Corona pandemic (Dixit et al., 2020) but consumed less snacks than normally while doing so because they may have focused on buying more necessary groceries. Another limitation could be that participants were asked about their binge watching and snacking behavior the day before. Therefore, they had to remember how many snacks they ate and how much video-on-demand services they watched. It could have been the case that some people did not always remember exactly. However, as the study took place over several days and the questionnaires did not change, this could have made up for occasions when people did not remember the exact amount snacked or watched. Nevertheless, this could have also led to measurement reactivity as participants may have been more aware of how much they are watching and snacking and consequently, may have tried to adapt these behaviors.

Moreover, the strengths of this current study should also be acknowledged. One of these strengths would be the ESM design, that was applied as data collection method. By this, it was possible to assess the snacking and binge watching behavior of participants over multiple days in their natural environment. Hence, their behavior may have been represented more accurately as participants probably felt more comfortable and did not feel like they were observed. Furthermore, recall biases that may occur during retrospective data collection methods could have been reduced by applying the ESM (Trull & Ebner-Priemer, 2009). Although it was stated as a limitation that participants were only asked the next day how much they watched and snacked on the day before, the questionnaires did not change over time. Therefore, after having filled out the daily survey for the second time, participants knew what the questions for the next day would be. Hence, they might have already paid more attention during their snacking and watching behavior, in order to then accurately reply to the questionnaire that they knew would appear the next day. Another strength would be that, within the sample, there were both full-time workers and students, wherefore this study is not only focused on one of these groups. Additionally, another strength would be that most participants filled out the questionnaires. Therefore, it was only necessary to exclude two participants because all of the others filled out enough of the surveys during the duration of the study. The remaining participants in the current

study also showed to have a high response rate for the questionnaires, as response rates for ESM questionnaires usually range from about 70 percent to 90 percent (Fisher & To, 2012). This might have been because participants were acquaintances to the researchers and thus, they wanted to do their best when taking part in the study.

4.4 Future Recommendations

On the basis of the findings of this study, there are a few recommendations that can be made. The current study showed a significant relationship between watching video-on-demand services and consumption of unhealthy snacks. Future research could focus on investigating the different mechanisms that lead people to engage in unhealthy snacking while binge watching. This could be done by qualitative studies involving interviews or focus groups. The ESM could also be applied by having participants note down the reasons why they engaged in unhealthy snacking over a set period of time. Furthermore, it would then be interesting to also take BMI into account. Therefore, it might be that people with high or low BMI's could have different reasons as to why they consume unhealthy snacks while binge watching. According to the results of the present study, it could only be said that BMI does not seem to play a role in unhealthy snacking while watching video-on-demand services. Nevertheless, people with high or low BMI could still have different reasons why they engage or do not engage in unhealthy snacking when binge watching. Finding these reasons would then, in turn, be important for the development of possible interventions that focus in particular on unhealthy snacking while binge watching. As found by the results of this study, possible interventions might then also be applied to both people with a higher and lower BMI, as according to the findings, BMI does not have an influence on the relationship between watching video-on-demand services and consuming unhealthy snacks.

All in all, the present study was able to show a significant, though weak, relationship between watching time of video-on-demand services and unhealthy snacking. Moreover, it was found that the BMI of a person does not seem to influence this relationship. The possible explanations that were given within this discussion based on earlier studies could account for the relationship between binge watching and consumption of unhealthy snacks. However, further qualitative research is needed to clarify these possible connections as it was beyond the scope of this study to also take these into account. Moreover, investigating the reasons for binge watching and unhealthy snacking might then, in turn, lead to possible interventions that could help to resolve this issue.

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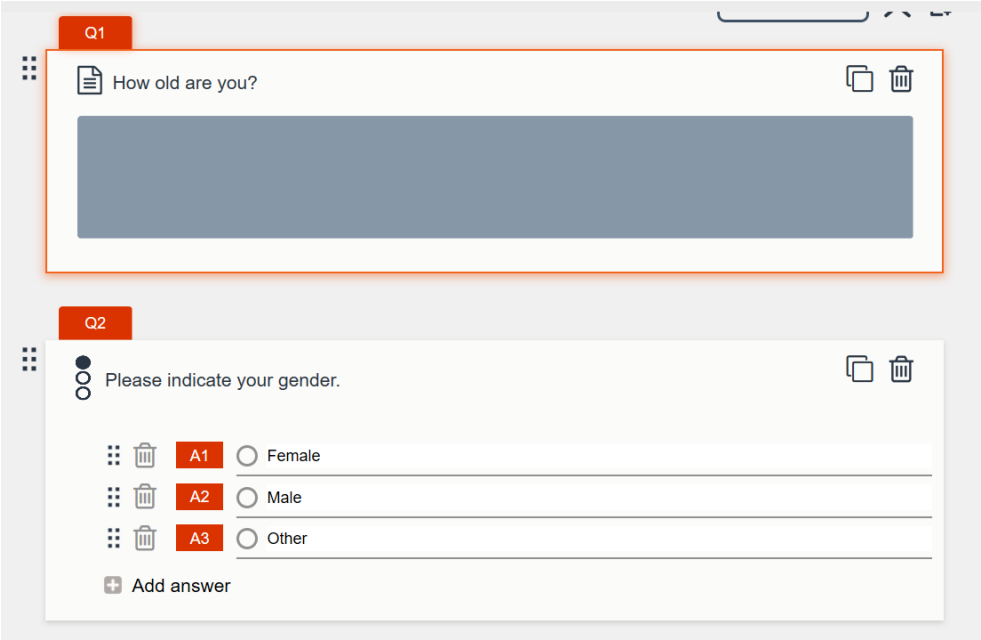
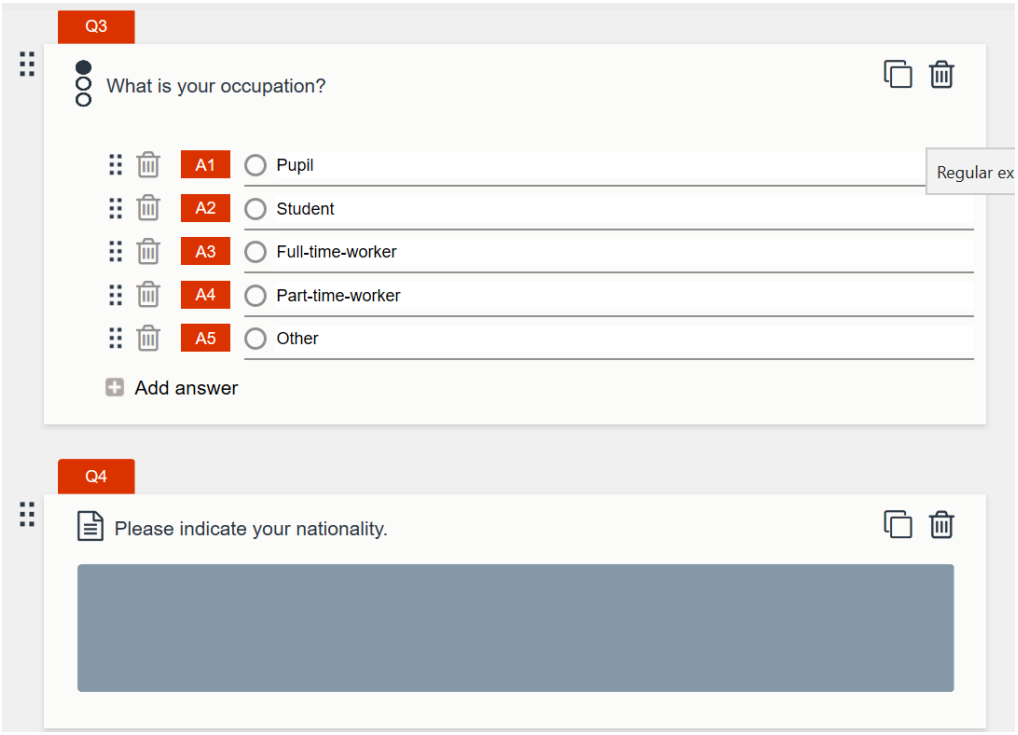
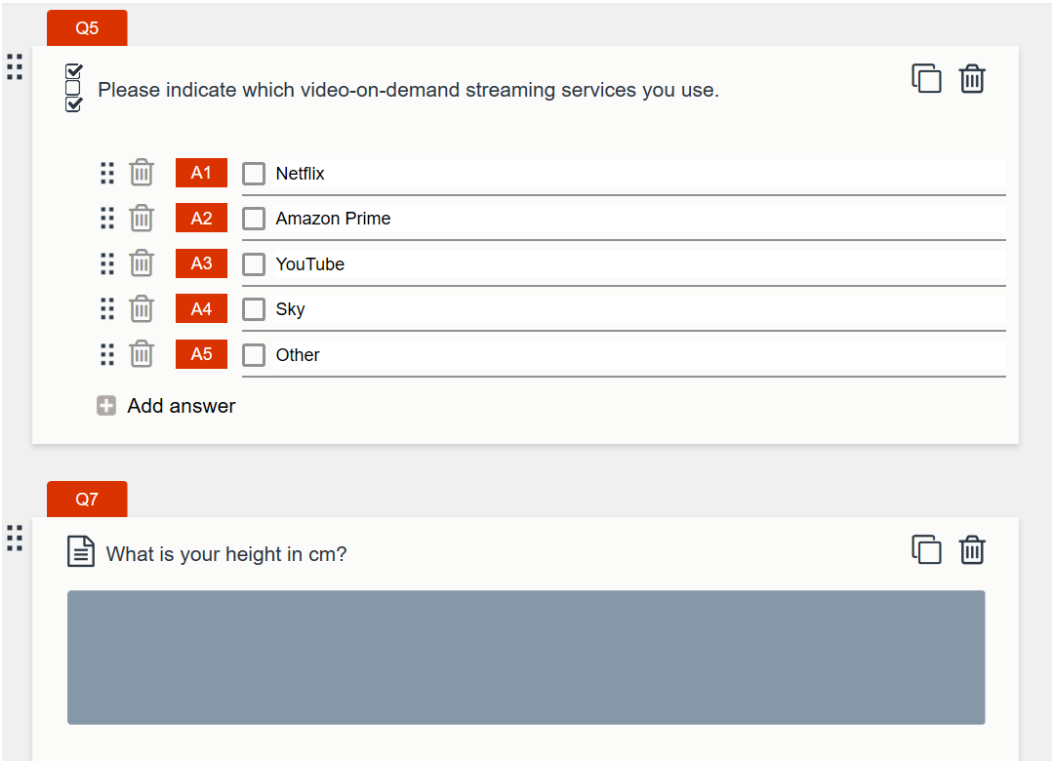
Appendix

Appendix A

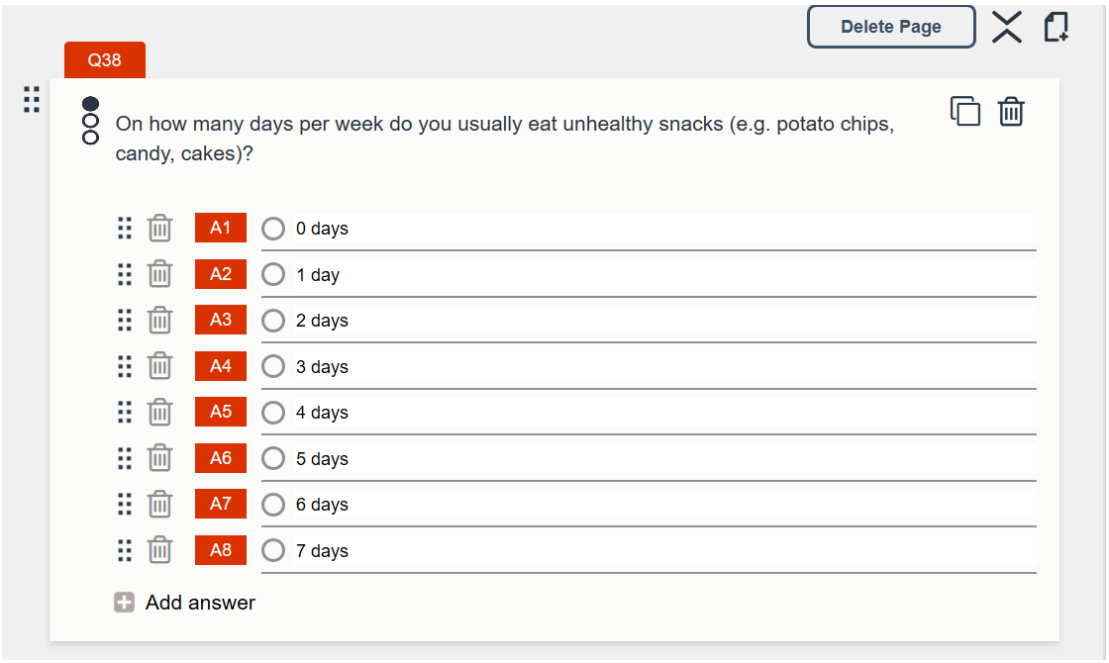
Baseline Questionnaire

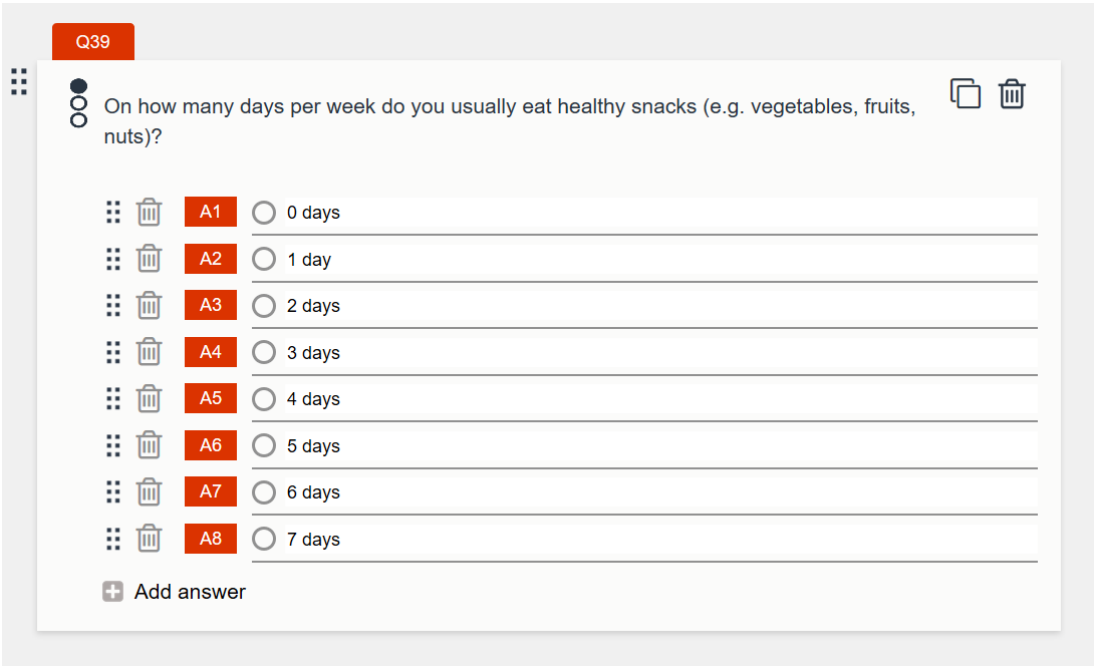



Q3
What is your occupation?
A1 Pupil
A2 Student
A3 Full-time-worker
A4 Part-time-worker
A5 Other
Add answer
Q4
Please indicate your nationality.


Q5
Please indicate which video-on-demand streaming services you use.
A1 Netflix
A2 Amazon Prime
A3 YouTube
A4 Sky
A5 Other
Add answer
Q7
What is your height in cm?

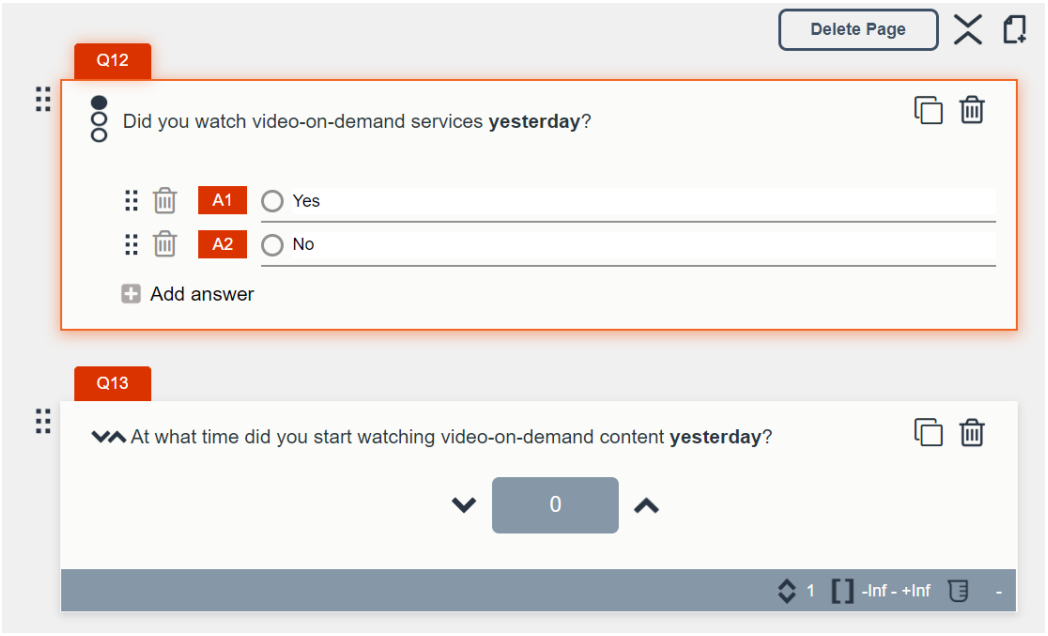

Q8
What is your weight in kg?

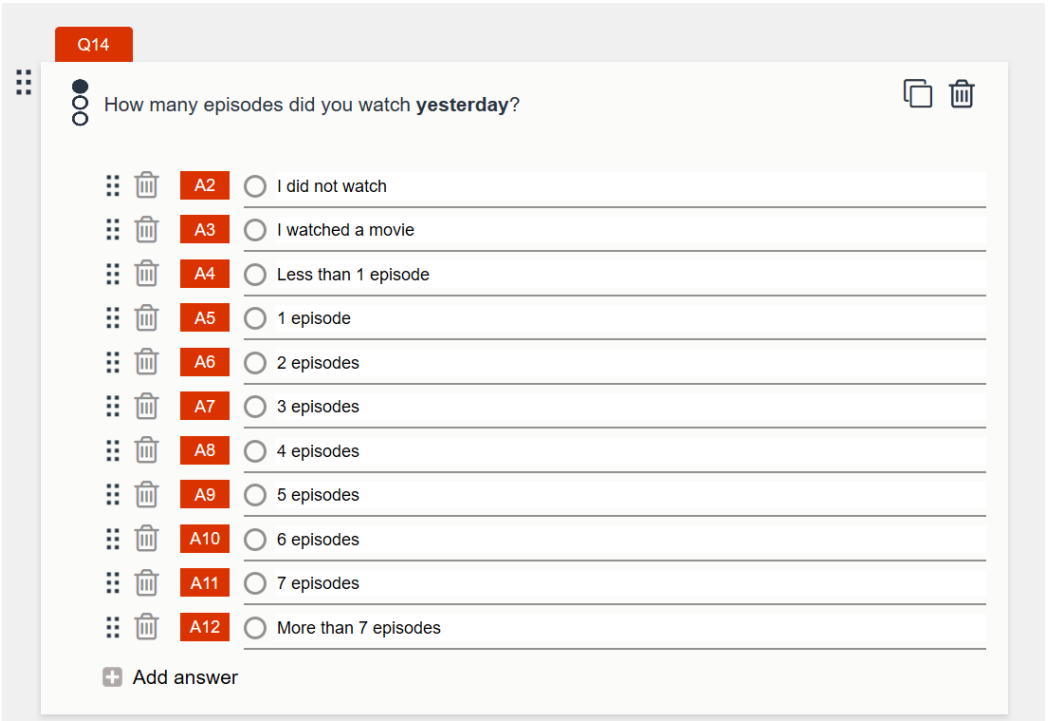

Delete Page
Q38
On how many days per week do you usually eat unhealthy snacks (e.g. potato chips, candy, cakes)?
A1 0 days
A2 1 day
A3 2 days
A4 3 days
A5 4 days
A6 5 days
A7 6 days
A8 7 days
Add answer


Q39
On how many days per week do you usually eat healthy snacks (e.g. vegetables, fruits, nuts)?
A1 0 days
A2 1 day
A3 2 days
A4 3 days
A5 4 days
A6 5 days
A7 6 days
A8 7 days
Add answer

Appendix B

Daily Questionnaire





Q16

How long did you watch video-on-demand content **yesterday**?

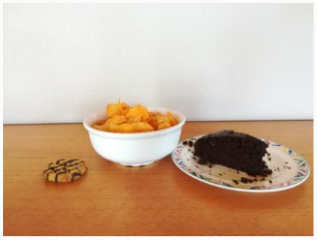
- A1 I did not watch
- A2 Less than one hour
- A3 1 hour
- A4 2 hours
- A5 3 hours
- A6 4 hours
- A7 5 hours
- A8 6 hours
- A9 7 hours
- A10 More than 7 hours

Add answer

Delete Page

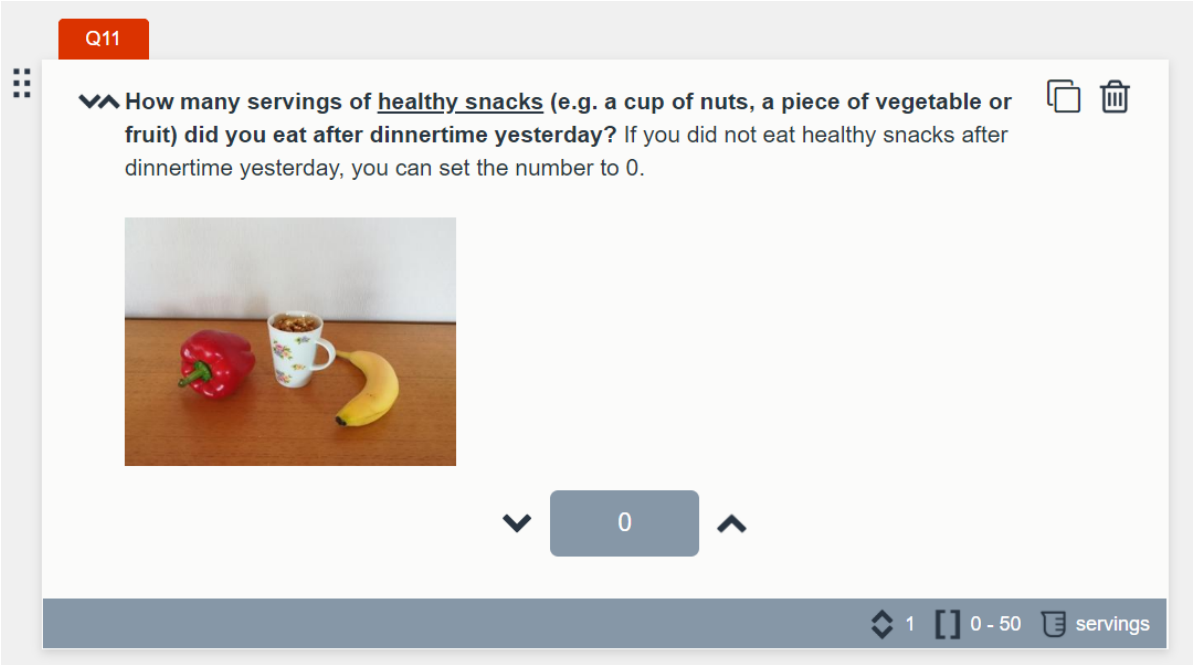
Q10

How many servings of unhealthy snacks (e.g. a bowl of potato chips or candy, a cookie or a piece of cake) did you eat after dinnertime yesterday? If you did not eat unhealthy snacks after dinnertime yesterday, you can set the number to 0.



0

1 0 - 50 servings



Appendix C

E-Mail to participants containing instructions and information for the study

Dear participant,

We would like to thank you in advance for choosing to be a participant in this study named "Binge-watching: an experience sampling study of video-on-demand watching". The aim of this study is to investigate the relatively new topic of binge-watching and its connection to eating behavior, physical activity, emotions and personality is investigated. This study starts on April 1,2020 and ends on April 15, 2020. It is emphasized that the time period of the study cannot be postponed. Thus, it is important to start exactly on the 1st of April. In the following, you will find the steps that need to be completed in order to participate in this study.

How to Start:

Within the next 2 weeks, you need to complete different questionnaires. The questionnaire on day 1 is a more detailed one, compared to the following days, and takes therefore around 20 minutes. From day 2 to day 15, the questionnaires are shorter but need to be completed multiple times a day.

- between **10 a.m.** and **12 a.m.** (max. 5 minutes)

- between **2 p.m.** and **4 p.m.** (max. 2 minutes)

- between **7 p.m.** and **9 p.m.** (max. 2 minutes)

The questionnaires are provided via the app Ethica. You are asked to click on the download-link below and download the appstore or gamestore. The app can be downloaded for free.

Step 1: Go on www.ethicadata.com or download the app (download links are listed below) to create an account. Thus, you are asked to enter your e-mail address and to choose a password.

Step 2: Downloading the app.

- Itunes App Store: https://apps.apple.com/us/app/ethica/id1137173052
- Google Play Store: https://play.google.com/store/apps/details?id=com.ethica.logger&gl=NL

Step 3: Open the app.

Step 4: Log-in with your account using your e-mail adress and password.

Step 5: Turn-on the notifications for this app since the app will send you reminders to not miss out on any questionnaires and thus, make your data useful for the study.

Please register before the 1st of April 2020 in case any problems or questions regarding the study arise. The first questionnaire should appear on April 1, 2020 at 9 a.m. If this is not the case, please contact us immediately. The questionnaires will take you max. 15 minutes daily. Please check your phone around the time frames that were mentioned above in order to successfully participate in this study.

The contact information can be found below in case problems/questions arise.

Alisa Acar – a.acar-1@student.utwente.nl

Aline Feldkamp – a.feldkamp@student.utwente.nl

Mara Wischmann – m.wischmann@student.utwente.nl

Kind regards,

Alisa Acar, Aline Feldkamp & Mara Wischmann