The Relationship between Binge-watching and perceived Stress: An Experience Sampling Study

Olivia Buschmeyer
Department of Positive Psychology and Technology, University of Twente
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First supervisor: Dr. P. M. ten Klooster
Second supervisor: Dr. M. Noordzij
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Abstract

Introduction. The numbers of video-on-demand (VoD) service subscriptions continue to rise annually. Thus, excessive watching behaviour, also known as binge-watching, tends to increase as well. In this study, binge-watching is defined as watching at least two episodes and one hour of serialised content in succession. Besides binge-watching, stress-related health issues rise as well and impact people's overall well-being negatively. Existing studies point out that some people tend to stress-watch as a coping mechanism or experience more stress after having binge-watched. Heretofore, little is known about the potential effects of binge-watching on perceived stress and vice versa. Therefore, this research examines the association between VoD watching behaviour over time, with the focus on the phenomenon of binge-watching, and perceived stress.

Method. For this study, an experience sampling method (ESM) was used. The study comprised 38 participants (M_{age} = 23.8; SD_{age} = 5.3; age range 18 to 51 years; 57.9% male, 42.1% female), who answered three short daily questionnaires via the Ethica mobile application for 14 days about their moods, feelings, and behaviours. Their watching behaviour was assessed once a day and their stress levels two times a day employing the single-item stress numerical rating scale-11 (SNRS-11). The longitudinal data were analysed by using linear mixed models (LMMs).

Results. Binge-watching was significantly associated with higher average stress levels the next day (B = .24; SE = .12; p = .043). However, the hours and episodes watched had no significant linear effect on the participants' stress levels. Stress was not a significant predictor of binge-watching or hours and episodes watched the same day.

Discussion. The results indicate that binge-watching may be a predictor of higher perceived stress the next day, but not a consequence of stress on the same day. The findings present a fruitful starting point on which future studies could build further research, especially in the form of ESM studies concerning the relationship between binge-watching and stress. However, this should be done among a more heterogeneous sample population and at a different point in time without any lockdown regulations due to a pandemic.

Contents

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Nowadays, living without digital technological devices is inconceivable in developed societies. Computers, tablets, mobile phones, and televisions have become part and parcel of people's daily lives (Goodman, 2019). Scheduled television programmes are increasingly supplemented with and sometimes even replaced by video-on-demand (VoD) platforms (Mikos, 2016; Panda & Pandey, 2017), such as Netflix or Amazon Prime (Watson, 2018) that are not solely accessible via apps on one's television, but also via mobile applications on smartphones, tablets or via personal computers. The only things needed for the usage of VoD platforms are a working device with an internet connection and a subscription to one or more of these providers. Usually, the monthly fee of one VoD service remains below ten euros ("Video Streaming Anbieter & Dienste", 2020; Wächtler, 2017), which constitutes one of the numerous reasons why the number of VoD users increased steadily over the last years (Susanno et al., 2019; Watson, 2019a) and is expected to rise further (Watson, 2019a, 2019b). The majority of VoD users predominantly constitutes young adults aged between 18 and 24 years (Watson, 2018).

The rising popularity of VoD services also entailed a more recent phenomenon called binge-watching, which is roughly defined as an excessive watching behaviour of serialised content. Young adults aged 18 to 34 years seem to engage in binge-watching behaviour the most (Matrix, 2014; Shannon-Missal, 2013). Although this behaviour is not entirely researched yet, studies showed that binge-watching may lead to stressful experiences, for example, due to the neglect of other duties (Vaterlaus et al., 2018). Moreover, stress could also induce binge-watching behaviour in the form of a coping mechanism for stress relief (Rubenking et al., 2018). Yet, little is known about the interaction of those two concepts, and therefore, the study aims to investigate the relationship between binge-watching and perceived stress.

Definition of binge-watching

Binge-watching is a term coined by the media and generally refers to an excessive watching behaviour of VoD material. The term binge-watching itself has a rather negative connotation caused by the word "binge". A binge or bingeing is usually related to diseases such as binge-drinking and binge-eating. Therefore, a binge describes some form of immoderate behaviour that does not conform to the standards (Jenner, 2017; Steiner & Xu, 2018). Binge-watching is thus an excessive consumption of serialised content that is

oftentimes actually encouraged by VoD services. Netflix, for example, promotes such behaviour by creating special categories of binge-worthy series or publishes one or more complete seasons at once, which are the reasons why researchers also often refer to the "Netflix effect" when talking about binge-watching (Matrix, 2014; Jenner, 2017; Perks, 2015). However, an accurate definition of this behaviour is still missing in research on the prevalence, antecedents, and consequences of binge-watching.

Although researchers agree that binge-watching is a form of excessive behaviour, until today no uniform definition exists (Flayelle et al., 2020; Jenner, 2017; Vaterlaus et al., 2018). Many researchers commit themselves to a rather broad definition of binge-watching, claiming that people engaging in such a behaviour watch several episodes of a show in one sitting (de Feijter et al., 2016; Flayelle et al., 2019; Pittman & Sheehan, 2015). They often do not specify any time or number of episodes that need to be watched to be identified as binge-watching behaviour. Other researchers attempted to be more precise, however, by claiming that binge-watching occurs when the person views at least two episodes of a series one after the other (Mikos, 2016; Panda & Pandey, 2017; Riddle et al., 2018; Steiner & Xu, 2018; Walton-Pattison et al., 2018). Panda and Pandey (2017) also added at least one hour of consecutive viewing to their definition. The different lengths of serial content and the individualised watching behaviour further complicate the formulation of a common definition that applies to every individual. Hence, it is difficult to determine a valid cut-off for the concept of binge-watching. To stay consistent throughout this paper, binge-watching is defined as watching at least two episodes of a series and at least one hour in succession.

Motivations for binge-watching

Irrespective of the lack of a standard definition of binge-watching, researchers found that people have many different motivations and reasons to engage in such behaviour. These motivations can be triggered extrinsically or intrinsically and may serve as predictors for binge-watching. An extrinsic trigger could be that VoD services enable their users to watch whenever and wherever wanted so that they get a sense of control, freedom, and independence by selecting their desired watching material themselves without interruptions by commercials (Gangadharbatla et al., 2019; Granow et al., 2018; Trouleau et al., 2016). Thus, VoD platforms encourage the flow of serialised content as well as binge-watching behaviour. Especially the automaticity function of several VoD providers to start the next episode after the previous episode has just ended encourages this behaviour (Feeney, 2014; Jenner, 2017; Perks, 2015). Hence, the VoD industry itself with its diversity of content, and

endeavours to affect the users' watching behaviours plays a huge role in respect of the emergence of binge-watching.

A further external motivation of binge-watching may be the social environment of users. First of all, binge-watching seems to be a socially accepted behaviour (Jenner, 2017), which decreases the attention to potentially negative effects. Additionally, family or/and friends often recommend some favourite movies or series to their loved ones, which could influence or increase one's watching behaviour (Shim & Kim, 2018). Although binge-watching is often referred to as a lone activity (de Feijter et al., 2016), it can also be executed in groups and thus serve as a social activity (Pittman & Sheehan, 2015; Shannon-Missal, 2013; Vaterlaus et al., 2018). Moreover, keeping oneself updated on the most popular serialised content that is also watched by peers or/and family members may facilitate social contact in general (Panda & Pandey, 2017; Rubenking et al., 2018; Susanno et al., 2019). Therefore, people may be motivated extrinsically to engage in excessive watching behaviour due to the demands of their social environment.

Apart from external factors that might trigger binge-watching, numerous internal factors drive people to engage in this behaviour. Psychological factors such as different states of mood or personality characteristics constitute intrinsic motivations. For instance, in Rubenking and Bracken's (2018) online survey study and in Rubenking et al.'s (2018) focus groups, many participants self-reported to engage in binge-watching to better manage their emotions, such as experienced stress, the desire to escape from reality or the desire to solely relax. Furthermore, people strive for satisfying their needs, such as enjoyment, entertainment or simply passing time by doing so (Merrill & Rubenking, 2019; Shim & Kim, 2018; Starosta et al., 2019). Others make use of binge-watching to reward themselves (Merrill & Rubenking, 2019; Vaterlaus et al., 2018). This action towards meeting certain personal needs via media channels accords with the uses and gratification theory (UGT; Katz et al., 1973). These intentions make binge-watching seem a pleasurable and calming activity.

Consequences of binge-watching

Besides these internal intentions and their supposed positive effects, some people report to utilise binge-watching as a means of procrastination by postponing other responsibilities (Gangadharbatla et al., 2019; Rubenking et al., 2018; Vaterlaus et al., 2018). This turned out to have rather negative consequences, such as feelings of blame or regretful thoughts afterwards concerning the wasted time that could have been invested in more useful activities. These emotions could in turn result in stress due to the unfinished duty (Granow et

al., 2018; Perks, 2015; Vaterlaus et al., 2018). Therefore, binge-watching may also bring about unpleasant effects that could restrict people's daily lives. Even though binge-watching may increase social interaction, it may also evoke the contrary. The resulting social aloofness could again produce feelings of guilt (Perks, 2015; Vaterlaus et al., 2018). According to Vaterlaus et al. (2018), who also investigated binge-watching in an online survey study, binge-watching could have further negative consequences on general well-being, including, for example, the circadian rhythm (Exelmans & van den Bulck, 2017), a healthy diet, or physical activity, and academic performance. Even if people have a negative attitude towards binge-watching, they are nevertheless prone to engage in this behaviour because it is difficult to withstand (Shim et al., 2018). Due to the stressful nature of feelings binge-watching can potentially bring about, this study will focus on the relationship between these two concepts.

Binge-watching and stress

Every person experiences certain stressors in daily life from time to time. Stress may elicit feelings of tension, unease, agitation, or anxiety or problems with insomnia due to overthinking that causes worry (Elo et al., 2003). Stress may be associated with binge-watching in different ways, both as a predictor and as a consequence of binge-watching. Sometimes perceived stress may stem from work-related (Elo et al., 2003), study-related (Matrix, 2014), or other issues that occurred in one's life and are experienced as stressful such as the concept of binge-watching. As aforementioned, binge-watching behaviour may lead to a neglect of important duties. This may result in negative feelings, such as guilt (Granow et al., 2018; Perks, 2015), and therefore in perceived stress (Vaterlaus et al., 2018) as reported by some participants. However, stress and binge-watching could also be associated with each other reversely. That means that daily stressors could lead people to watch serialised content excessively to reduce their stress. This is inter alia self-reported by some students as stress watching (Matrix, 2014; Susanno et al., 2019).

Experience sampling method

At present, the body of research concerning the relationship between stress and binge-watching remains inconclusive as to what extent stress and binge-watching are associated and in what kind of context stress and binge-watching take on the role of a predictor or of a consequence. Additionally, studies about binge-watching so far have often been either qualitative or used a cross-sectional retrospective survey design. The results of these methods are liable to be distorted due to their reliance on participants' memories of past experiences

and their inability to study temporal associations (van Berkel et al., 2017). Hence, the relationship between binge-watching and stress is explored utilising the experience sampling method (ESM) in this study.

The ESM is applied to circumvent some of the limitations of previous studies. It is an explorative, longitudinal, and a recurring self-report study type for which a duration of one to three weeks is recommended to represent frequently occurring events properly (van Berkel et al., 2017), generally in relatively small samples of participants (Conner & Lehman, 2012). Compared to survey studies, the power of ESM studies does not come from a large sample, but from multiple daily self-report assessments over a certain period. Moreover, this method does not rely on recollections from the past, but on the assessment of current behaviours, feelings, or events. Hereby, the ESM prevents potential recall biases due to its almost real-time assessment (Trull & Ebner-Priemer, 2009). Recall biases are errors in people's thinking patterns when they reproduce past events at a later point in time. This time between past experiences and recalling them may impact the responses' accuracy. Thus, it may result in under- or overestimation of past actions, mood states, or events that might distort the results of the research (Conner & Barrett, 2012; Wonneberger & Irazoqui, 2016).

Since most of the previous research concerning binge-watching is based on self-reported retrospective memories, the ESM is a promising procedure to obtain more accurate insight into both the prevalence of binge-watching and its temporal association with stress. The previous research provides a great deal of information about the topics of binge-watching and stress. However, the potential temporal nature between the two has not been studied in detail. While people may engage in binge-watching behaviour to decrease their levels of stress (Sussano et al., 2018), binge-watching itself may as well produce stress in the form of feelings of guilt and regret because of not accomplishing one's responsibilities (Vaterlaus et al., 2018). With the ESM the interaction of both constructs is studied from a different perspective to provide additional insight into binge-watching and its association with stress within individuals over time. Stress is a crucial topic to investigate especially because of increasing cases of stress-related negative repercussions of people's general health (Kristiansen et al., 2019).

Research questions

This research aims to explore the effects stress may have on binge-watching and vice versa by answering the following research questions:

1. How much of the participants' variation in stress levels the next day is related to their binge-watching behaviour the day before?

This question aims at investigating whether binge-watching behaviour predicts perceived stress in the participant. Here, stress is assumed to be a potential consequence of binge-watching. A further question that examines the contrary, namely whether higher levels of stress drive people to binge-watch or not, is:

2. How much of the participants' variation in their binge-watching behaviour is related to higher levels of stress during that same day?

Here, stress is supposed to be a potential predictor of binge-watching behaviour.

Method

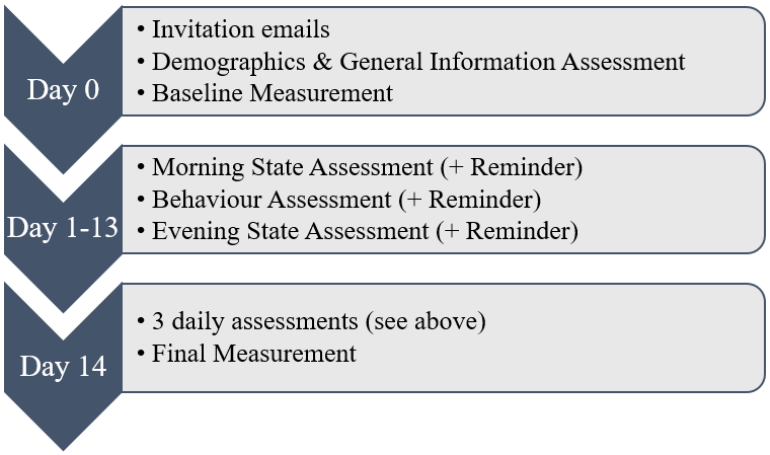
Design

The present study was a joint research concerning participant recruitment and data collection that resulted in four individual bachelor theses. This research was approved (200366) by the Ethics Committee of the Faculty of Behavioural Sciences (ECBMS) at the University of Twente. In this study, the ESM was applied to measure the daily VoD watching behaviour and potentially related moods and feelings of participants over time. All participants received daily short questionnaires on their mobile devices via a mobile application called Ethica for 14 days (starting on April 8, 2020, and ending on April 22, 2020). Ethica is a platform that enables researchers to create their studies with various questionnaire possibilities. Conveniently, only a mobile device is needed to download the app and to register, which is explained in a self-generated email by Ethica beforehand (Appendix A). The app includes all needed information such as the informed consent form (Appendix B), contact details of the researchers, and the study-related questionnaires ("Ethica…", n.d.; Appendix C). Via notifications of the app, the respondents were reminded regularly to fill in the daily measurements.

For the daily assessments, an interval contingent sampling design was used, which means that the respondents received the daily assessments at predetermined times and regular intervals (Palmier-Claus et al., 2019). This enabled the researchers to compare the results of different days with each other. Since too many questionnaires per day could cause an increased burden for the respondents to engage regularly in those assessments and thus could result in losing data (Palmier-Claus et al., 2019), only three short questionnaires per day were sent to the participants. Exceptions were the starting day, on which two further measures were sent to them, and the last day, on which they received one final short questionnaire (Figure 1).

Figure 1

Flow-chart of the Study and Measurement Design



Participants

Convenience sampling was used to gather participants for this study. They were recruited from the researchers' networks. The sample size of this study was chosen to be rather small based on van Berkel et al.'s (2017) and Caine's (2016) research results that showed that the mean number of participants in previous ESM studies was 53 and the median number was 19. Therefore, a sample size between 30 and 40 was seen as sufficient to obtain reliable and valid measures in ESM studies. In total, 42 participants started with the study, whereof 38 respondents fulfilled the completion rate of at least 50% of assessments (Conner & Lehman, 2012) and were thus selected for analyses. All respondents participated voluntarily and were able to withdraw from this study without giving a reason. Before participation, all participants gave informed consent conforming with the guidelines of the ECBMS.

Materials

Due to the usage of the same sample, the participants also responded to questions that were not relevant for this particular research. For this study, the questionnaires that were used were the demographics and general information, morning state assessment (primarily stress), evening state assessment (primarily stress), and the once-daily behaviour assessment to be able to investigate a potential relationship between binge-watching and stress. Appendix C represents all created questionnaires.

Demographics and general information

The day preceding the daily three questionnaires, the participants were asked to report demographic information concerning their age, gender, nationality, and current occupation. Moreover, general information about the VoD service usage was investigated by asking which streaming services were used and whether the participants utilised such VoD service(s) at least once a week.

Morning state assessment

This questionnaire included the Stress Numerical Rating Scale-11 (SNRS-11; Karvounides et al., 2016), which is a validated one-item stress scale that measures current perceived stress in participants, instead of relying on retrospective self-reports of stress as most of the common stress scales do. Here, the current stress level was rated on a slider scale ranging from 0 to 10, with 0 being no stress and 10 being the worst stress possible (Karvounides et al., 2016). The morning state assessment additionally included five further single-item questions concerning moods and feelings, as, for example, "feelings of guilt" that were answered along a five-point Likert scale (i.e., not at all, slightly, moderately, strongly, extremely). These scales were specifically developed for this study.

Evening state assessment

This assessment contained two different existing questionnaires and eight further questions that were created by one of the bachelor students. First, again the SNRS-11 (Karvounides et al., 2016) was displayed. Second, four of the five items from the morning state assessment, regarding the respondents' moods and feelings, were posed again in the evening and were rated on a five-point Likert scale. Thereafter, four further items about feelings and thoughts (e.g., "Today, how often have you felt nervous, anxious or on edge?") were rated on a four-point Likert scale (i.e., not at all, several times, more than half of the day, nearly all day). These four items are a slight adaptation and a combination of the items used in the GAD-7 (Spitzer et al., 2006) and PHQ-9 (Spitzer et al., 2000). Lastly, the Satisfaction With Life Scale (SWLS; Diener et al., 1985) was used and was answered along a seven-point Likert scale (i.e., strongly disagree, disagree, slightly disagree, neither agree nor disagree, slightly agree, agree, strongly agree). This assessment included a total of fourteen items.

Behaviour assessment

In this assessment, the participants were first asked to indicate whether they used a VoD service the day before (i.e., "Did you watch a series on a video-on-demand platform such as Netflix or Amazon Prime Video **yesterday**?"). If the answer to this question was "No", no further questions were posed. However, if it was "Yes", eight or eleven further

questions were asked. After having responded “Yes” to the first question, the time frame(s) (i.e., “Morning (6 a.m.-12 p.m.)”, “Afternoon (12 p.m.-6 p.m.)”, “Evening (6 p.m.-11 p.m.)”, “Night (11 p.m.-6 a.m.)”), in which a VoD service was used, was indicated. After that the question “Did you watch for more than 1 hour?” was answered with either “Yes” or “No”. Subsequently, the number of hours and the number of episodes watched were reported in decimals. Thereafter, the type of content watched was indicated. Various options were possible such as “Comedy”, “Thriller”, or/and “Documentary”. This question was followed by the item “What was your reason for watching?” and had multiple answer possibilities such as “Stress” and “Procrastination/ Avoidance of other responsibilities”. Next, the context, in which the VoD content was watched, and whether guilty feelings about watching were present were indicated.

Procedure

Following the approval and the participant recruitment, all participants were informed about the longitudinal nature of the research and received instruction on how to participate in the study via two emails (Appendix A). After the download procedure of the mobile application and the registration, the participants received the informed consent form (Appendix B) and were asked to accept it to participate in the study.

On the first day after signing up, all participants received the first questionnaires in the Ethica app. In the next 14 days, they received three daily short questionnaires. The morning and evening state assessments assessed the participants’ moods and feelings whereas the behaviour assessment served as an evaluation of the participants’ VoD watching behaviour of the previous day and its potential predictors and consequences. The notifications of the state questionnaires randomly appeared on the participants’ mobile phone in the morning between 11 a.m. and 1 p.m. and in the evening between 7 p.m. and 9 p.m. to prevent anticipation of the upcoming questionnaire and self-portrayal on the part of the participants (Conner & Lehman, 2012). After half an hour, the participants received a second notification, if they had not filled in the state measures yet and they expired after three hours. The behaviour measurement’s notification randomly appeared between 10 a.m. and 10.30 a.m. once and was available for ten hours in total. After finalising the data collection, the participants were informed about the individual aims of each researcher.

Data Analysis

The gathered data via the Ethica app were first edited in the Microsoft Office Excel (2016) programme and then analysed by the IBM SPSS Statistics 25 programme. Those participants who did not meet the inclusion criteria (Appendix B) were deleted from the datasets. Several variables were transformed, recoded, and created. The participants' demographics and general information were analysed by descriptive statistics to obtain means, standard deviations, and percentages. With the variables total stress, reasons for watching, and binge-watching frequency tables were created to explore the distribution of those data.

Next, a series of Linear Mixed Models (LMMs) analyses with a first-order autoregressive covariance (AR1) structure with homogeneous variances was used to analyse the nested structure of the longitudinal data. Thus, the different patterns of the participants' VoD watching behaviours and stress levels were aimed to be analysed to answer the research questions. In the LMM analyses, marginal mean values for the variables of interest over time and persons can be estimated taking into account missing data. For each LMM the time point was set as the repeated measurement, the participant IDs as the subjects, and both as fixed independent factors to visualise the marginal mean values for every dependent variable (DV) over time and participants.

To answer the first research question of how much of the participants' variation in stress levels the next day is related to their binge-watching behaviour the day before, the daily average stress levels were set as the DV whereas binge-watching was set as a fixed covariate in a new LMM. Thereafter, hours and episodes watched were also set as covariates in separate LMMs to not restrict the analyses to the binge-watching variable. To answer the second research question of how much of the participants' variation in their binge-watching behaviour was related to higher levels of stress during that same day, a new variable of total stress was computed. This was done by using the Lag(1) function in SPSS. Next, LMM analyses were executed by setting the binge-watching variable as the DV and the new variable for total stress as the independent variable (IV). Further, the number of hours and the number of episodes were also set as the DV in two additional LMMs. The resulting parameter estimates remained unstandardized.

The individual consistency of the ESM measurements is limited because it is not expected that people are entirely consistent in their utterances about behaviours, feelings, and thoughts (Csikszentmihalyi & Larson, 2014). For this study, the NSRS-11 (Karvounides et al., 2016) was used to measure current stress levels. Although this single-item questionnaire

does not allow to calculate traditional internal consistency estimates, such single-item scales have been proven to be as useful as multi-item scales if formulated unambiguously (Bergkvist, 2014; Bergkvist & Rossiter, 2007; Diamantopoulos et al., 2014). Thus, to compensate for the inability to compute internal consistency, the test-retest reliability that measures a test's stability over time by comparing measurements of two different points in time among the same participants, was computed by using Cronbach's Alpha. For the one-item stress scale's reliability, the average morning and evening measures were compared with each other. Satisfactory reliability was assumed if the Cronbach's Alpha of the scale was .7 or higher (Taber, 2018). Results showed that the associated test-retest reliability of the morning and evening stress measurements was excellent ($\alpha = .94$).

Results

Characteristics of the sample population

A total number of 42 participants completed the daily questionnaires via the Ethica app for 14 days. Every participant fulfilled the requirements of being at least 18 years old and of being proficient in English to participate in the study. Four participants were excluded from the data sets due to their low completion rates. On average, the included participants responded to 88% of the daily questionnaires during the two weeks. The majority of the participants consisted of young adults aged 18 to 30 years (97.4%). Table 1 illustrates the respondents' answers to the demographics and general information questionnaire.

Table 1

Characteristics of the Sample Population (N = 38)

Characteristics		n (%)	M (SD)
Age in years	18-51	38 (100)	23.8 (5.3)
	18-30	37 (97.4)	
	51	1 (2.6)	
Gender	Male	22 (57.9)	
	Female	16 (42.1)	
Nationality	German	35 (92.1)	
	Dutch	1 (2.6)	
	Other European	2 (5.3)	
Occupation	Pupil	1 (1.9)	
	Apprentice	3 (5.7)	
	Student	22 (41.5)	
	Employed full-time	9 (17)	
	Employed part-time	1 (1.9)	
	Other	2 (3.8)	

Note. The lowercase n represents respective numbers of the sample, M and SD indicate mean and standard deviation, respectively.

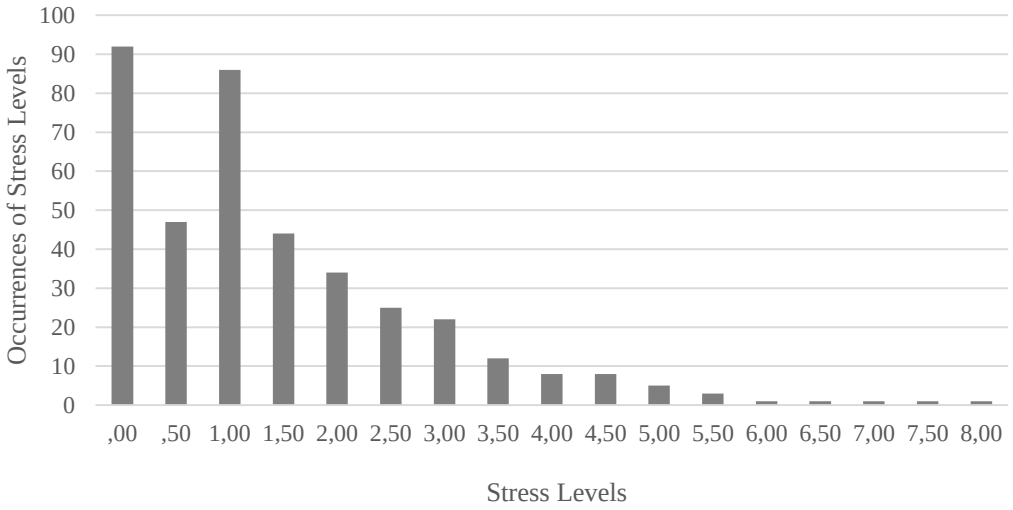
Watching behaviour and stress levels over the two weeks

During the study period, the participants' responses to the question whether they watched VoD yesterday or not indicated that they used one or more VoD service(s) for 7.7 (55.3%) days during the study period. More than one third (38%) of this VoD watching behaviour was determined as binge-watching whereas a little less than two-thirds (62%) of their VoD watching behaviour was not counted among binge-watching behaviour. The main reasons for the participants to engage in VoD watching behaviour were entertainment (42%), relaxation (17.3%), and boredom (17%). Procrastination (0.2%), stress (0.9%), information seeking (2.4%), and escape from reality (2.5%) were the least mentioned reasons to use a VoD service.

The respondents' total stress level comprised the mean of the morning and evening stress levels. The majority of all responses, namely 89.5%, to the questions concerning stress ranged between stress levels of 0 to 3 that represent low levels of stress. Only 9.2% of those responses ranged from 3.5 to 5.5 and only 1.3% ranged between stress levels of 6 to 8. The stress levels of 8.5 up to 10, representing the highest experienced stress possible, were not observed at all. Therefore, on average, the stress levels of all participants over the two weeks were low ($M_{totalstress}$ = 1.43; $SD_{totalstress}$ = 1.42), suggesting that most of the participants experienced rather little stress during the study period. Figure 2 portrays the frequencies of stress levels of all 14 days in total.

Figure 2

Total Occurrences of Stress Levels During the Study Period of all Participants



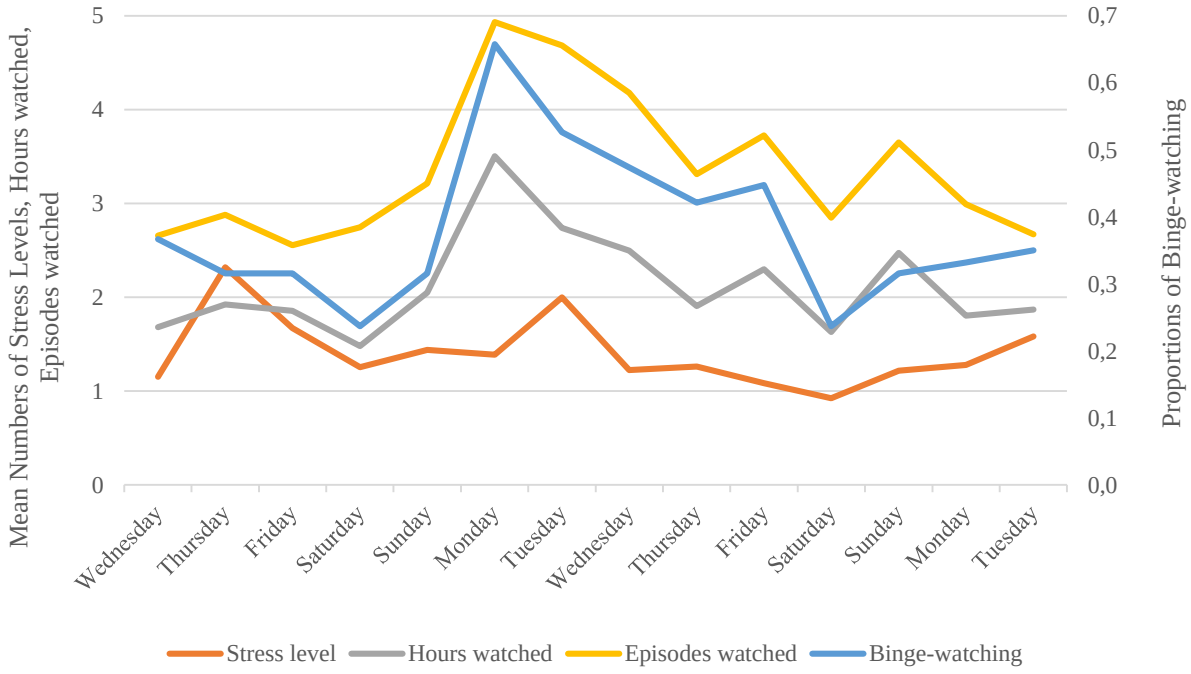
Linear Mixed Model analyses

Multiple linear mixed model analyses were executed to get an overview of the participants' variation in VoD watching behaviour and their stress levels. The analyses with time point as a fixed independent factor revealed a significant relationship between time point and the DVs "binge-watching", "hours watched", and "total stress". This indicated significant differences over the 14 days regarding these variables. "Episodes watched" was the only variable that had no significant association with time point indicating more stable answers concerning this variable during the study period. Figure 3 shows the distribution of the DVs per time point over the 14 days. The graph starts on Wednesday instead of on Thursday due to the retrospective manner the questions about the watching behaviour were asked. Notably,

there was a peak of watching behaviour variables on Monday in the first week of the study and a slight peak of stress levels the day after.

Figure 3

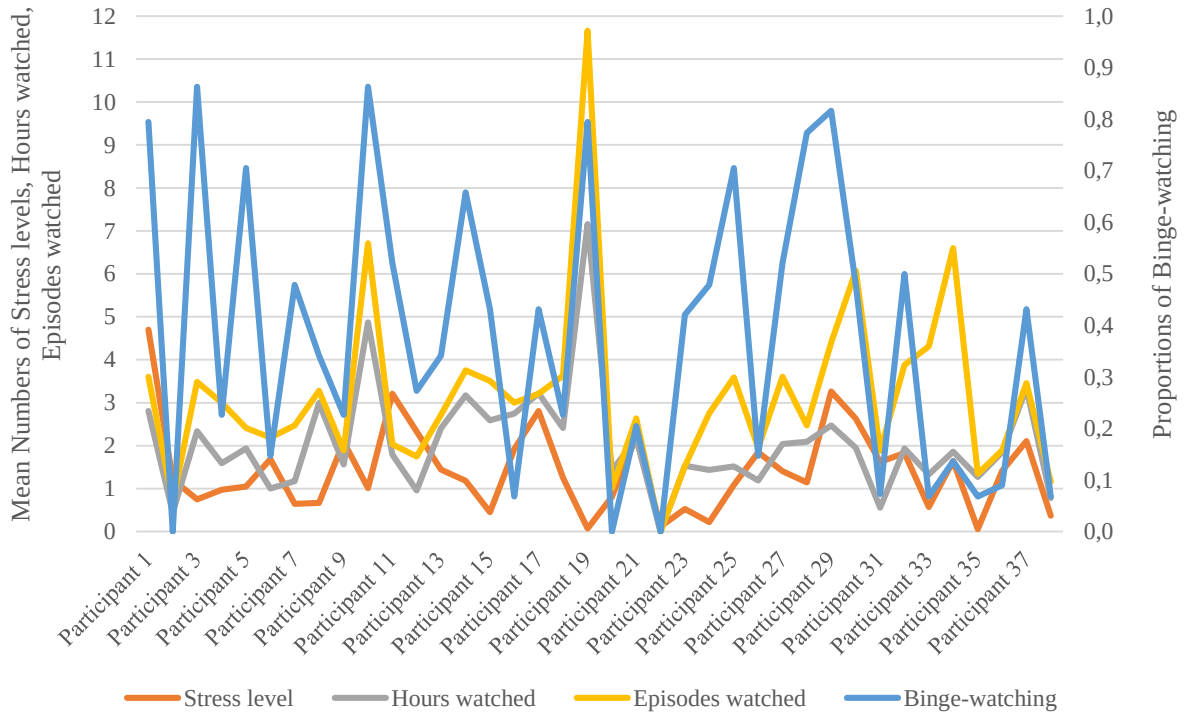
Proportions of Binge-watching, and Mean Numbers of Stress Levels, Hours Watched, and Episodes Watched per Day



Moreover, all analyses including participant ID as a fixed independent factor resulted in a significant relation to each of the DVs, indicating significant differences between respondents regarding those variables. Figure 4 shows this huge variability between the participants over the 14 days.

Figure 4

Proportions of Binge-watching, and Mean Numbers of Stress Levels, Hours Watched, and Episodes Watched per Participant



To examine associations with stress, six further LMMs were conducted. First, it was investigated how much of the participants' variation in stress levels the next day was related to their binge-watching behaviour the day before. The results showed that binge-watching had a significant effect on the participants' stress levels (F (1, 345.96) = 4.11; p = .043). The unstandardized parameter estimate was positive (B = .24; SE = .12), indicating that stress levels increased as binge-watching behaviour increased even though this effect appeared to be small. The number of hours and episodes watched that were analysed in separate models, however, did not have a significant effect on the total stress levels (table 2).

Second, the participants' variation in their binge-watching behaviour and its relation to higher levels of stress during that same day was explored. To check whether stress could be a predictor of binge-watching, the number of hours and episodes watched, the daily total stress levels were adjusted employing a lag variable to be in line with the watching behaviour of the same day. With the lag variable, three further separate LMM analyses were conducted. Total stress was not a predictor of binge-watching, the number of hours, and the number of episodes watched on the same day. Table 2 provides an overview of all six LMMs that aimed at answering the research questions.

Table 2

Linear Mixed Model Analyses With Covariates

Dependent variable	Fixed factors	Covariates	B [SE]	95% CI [LB, UB]	F [df1, df2]	p
Total stress	Participant ID Time point	Binge-watching	.24 [.12]	[.01, .48]	4.11 [1, 345.96]	.043
Total stress	Participant ID Time point	Hours watched	.04 [.05]	[-.04, .13]	0.96 [1, 212.30]	.327
Total stress	Participant ID Time point	Episodes watched	.02 [.03]	[-.04, .08]	0.54 [1, 221.42]	.464
Binge-watching	Participant ID Time point	Lag variable of total stress	.01 [.02]	[-03, .05]	0.14 [1, 338.17]	.710
Hours watched	Participant ID Time point	Lag variable of total stress	.03 [.10]	[-.16, .22]	0.08 [1, 221.69]	.782
Episodes watched	Participant ID Time point	Lag variable of total stress	.01 [.16]	[-.30, .31]	0.003 [1, 223.83]	.960

Note. B and SE indicate the B-estimate and the standard error and LB and UB represent the lower and upper bounds of the 95% confidence intervals, respectively.

Discussion

Interpretation and implications of the main findings

The aim of this study was to examine the relationship between binge-watching behaviour and perceived stress. The main finding of this research is that there is a significant positive relationship between binge-watching and higher perceived stress the next day. This first result seems to indicate that binge-watching can indeed be a predictor for higher stress levels the following day. However, the absolute strength of the significant effect appears to be rather small. The examination of the reverse relationship between binge-watching and stress results in the insight that stress levels are not predictive of binge-watching the same day.

The study's main finding that binge-watching affects perceived stress the next day suits prior expectations. This is also somewhat in line with Vaterlaus et al.'s (2018) findings, who stated that binge-watching produced stressful feelings in some of their respondents. Moreover, Panda and Pandey (2017) also made a note to negative gratifications such as stress or feelings of guilt after having binge-watched. However, several null findings concerning the effect of stress on binge-watching the same day were not anticipated. In contrast, it was expected that stress indeed would affect binge-watching behaviour aiming at relieving perceived stress, which was already suggested by Pittman and Sheehan (2015). This study could not confirm this association.

In contrast to binge-watching, the number of hours and episodes watched were not significantly associated with the participants' stress levels. In general, this supports the validity of the concept of binge-watching and indicates that there is no linear relationship between VoD watching and stress. However, if the VoD watching behaviour exceeds a certain cut off point, this appears to be associated with heightened perceived stress. Additionally, these null findings in episodes and hours watched as single variables could support the used definition that combines the hours and episodes watched to be able for binge-watching to occur (Panda & Pandey, 2017). Thus, the results could support the notion that a link between hours and episodes watched is needed when it comes to a definition of binge-watching.

Furthermore, the assumption that stress also could have an effect on the participants' VoD watching behaviour was not confirmed by this study. All results that aimed at answering the second research question showed non-significant findings. Thus, the hypothesis that participants tend to stress-watch when it comes to binge-watching intending to reduce perceived stress, as Matrix (2014) and Susanno et al. (2019) concluded in their studies, was not confirmed. These results, however, also fit the data with regard to the overall low stress levels. Thus, the participants' low levels of stress may suggest that they engaged in VoD watching behaviour for other reasons. This assumption was confirmed by the respondents' self-reports concerning their motives for utilising a VoD service, which mainly included entertainment, relaxation, and boredom, instead of stress or escape from reality.

Although binge-watching may have an escapism coping function for individuals with higher levels of stress because it might protect people from daily hassles that they want to escape (Pittman & Sheehan, 2015; Starosta et al., 2019), it could not be confirmed in this study. A potential explanation for this could be that the highly educated sample population experienced little stress during the study period. The sample population mainly consisted of

young adults who currently study and they may have been well in control of their behaviour and feelings. Although the results show that the participants used VoD services on a relatively regular basis during the study period, which is even seen as a common, every-day behaviour among young adults (Matrix, 2014; Shannon-Missal, 2013), only one-third of the VoD watching behaviour was defined as binge-watching behaviour. According to Tangney et al. (2004), high self-control can be a predictor of less pathology and proper adaptation which could be a possible reason for the renunciation of excessive VoD watching behaviour. Moreover, Oaten and Cheng (2005) postulated that decreased study-related stress may be conducive to students' self-control. Since the study was conducted during Easter holidays and lockdown regulations, it could have been the case that daily and especially academic stressors were rather low. These findings might reveal demand for prospective research in a similar sample population at a different point in time or in more at-risk samples, such as young adults, who do not have the general university entrance qualification.

Strengths

Besides these outcomes, the present research can record some strengths that mainly focus on the applied method. The ESM has potential advantages over other methods such as cross-sectional retrospective survey designs or correlational survey designs. Different from those methods that were already used to investigate the topic of binge-watching, the ESM does not fully rely on retrospective memories of the participants, the so-called remembering self (Kahnemann, 2010), but on respondents' momentary states, feelings, and behaviours (Trull & Ebner-Priemer, 2009) that represent the experiencing self (Kahnemann, 2010). Thus, the ESM's data is less threatened to be distorted by recall biases thanks to its direct self-report measure (Trull & Ebner-Priemer, 2009) and therefore, it might prevent under- or overestimation of past actions, mood states, or events that participants experienced (Conner & Barrett, 2012; Wonneberger & Irazoqui, 2016). Hereby, the self-reported data is assumed to be more accurate than retrospective measurement techniques.

A further advantage of the ESM is the opportunity to study participants' behaviours, moods, and experiences in their familiar environment. Such self-report measures are unobtrusive, easy to execute, and generally improve the construct, ecological, and external validity of the measurement (Trull & Ebner-Priemer, 2009). The respondents were able to use the Ethica app wherever they wanted and thus could integrate it into their daily lives without the need to restrict or change it enormously. Moreover, they were reminded regularly when the short questionnaires were available which further contributed to its ease of use. Finally,

the power of such an explorative method comes from the multiple and longitudinal measurements which constitute a further strength of this research. These multiple measurements result in a considerable amount of data and provide a more detailed and comprehensive representation of the participants' behaviours and moods (van Berkel et al., 2017). The extensive data facilitated the identification of differences in behavioural patterns, especially regarding the participants' VoD watching behaviour.

Additionally, the chosen stress scale, the SNRS-11, already showed good reliability and validity in previous studies (Karvounides et al., 2016). Despite the difficulty to compute the reliability of single-item measures, the average of the morning and evening stress assessments were compared to each other to explore the results' consistency over time. This measure was able to record excellent test-retest reliability for the SNRS-11, indicating high-quality and trustworthy results in this research concerning the reported stress levels.

Limitations and alternative explanations

Apart from those strengths, this study also faces some limitations that include the study method itself, the convenience sampling method, and the timing of the study. In the wake of the ESM, the researcher had to rely on the self-reported data of the participants (Csikszentmihalyi & Larson, 2014). The respondents could have had limited introspective abilities and thus, a hard time reflecting on their feelings and moods, such as stress. Furthermore, the applied interval contingent sampling could have caused expectancy effects in the participants that would have been liable to distort the data and their validity (Palmier-Claus et al., 2019). The daily recurring questionnaires that did not change their structure could have run the risk of evoking reactive response behaviours on the part of the participants. This, in turn, could have led the respondents to not think about the questions seriously anymore but to merely respond to them to give socially desirable answers (Granow et al., 2018; Tangney et al., 2004). Although the triggering logic of the daily questionnaires aimed at preventing participants' self-portrayal and the anticipation of measurements (Conner & Lehman, 2012), participants could have consciously given socially desirable answers to improve their image and conform with socially accepted norms.

A further limitation of this study is the participant recruitment strategy because it is distorted by self-selection bias. The researchers contacted people from their social environment to participate in this study. For this reason, the majority of the sample population constituted young, currently studying adults who resembled and forwarded most of the interests of those researchers who recruited them (Exelmans & van den Bulck, 2017).

Moreover, the fact that four German bachelor students were involved in the data collection process has influenced the sample population concerning nationality. Thus, German respondents are overrepresented in this study. Nevertheless, this research contributes to already existing knowledge in the emergence of binge-watching because it unintentionally investigated the group of people that usually watches VoD content or even binge-watches the most – young adults (Matrix, 2014; Shannon-Missal, 2013). This again supports the meaningfulness of the utilisation of such a sample population, although it was rather homogeneous regarding the demographics.

Lastly, the time of data collection might have influenced the overall findings of the study because it took place during the lockdown regulations due to the coronavirus pandemic. Thus, it was not expected that the participants, in general, experienced little stress because the lockdown regulations could have had negative consequences for the participants' well-being and also on their perceived stress as recent studies assumed (de Quervain et al., 2020; Patnaik & Maji, 2020). However, the results show that the overall stress levels were low and thus support the findings of a previous study that the lockdown could have also resulted in a depletion of stressors and thus, could have provided more time for recuperation (de Quervain et al., 2020). Moreover, the majority of the participants constituted students who needed to stay at home and thus probably had more free time to engage in VoD watching behaviour, which has been already reported by Merril and Rubenking's (2019) survey study. These insights could provide possible explanations for the overall low stress levels. Furthermore, these low stress levels could have, in turn, suppressed correlations with watching behaviour and lowered the significant association's explanatory power.

Contributions and future research

This work contributes to existing knowledge of binge-watching and its relationship with stress by highlighting a significant effect of binge-watching on perceived stress the next day. Therefore, this is the first study that robustly shows that binge-watching may be a predictor of stress. Nevertheless, future studies should delve deeper into how binge-watching might elicit higher levels of stress and associated negative feelings that people might experience after having binge-watched. Since higher levels of stress might lead to severe health-related consequences (Kristiansen et al., 2019), this topic requires further examination. At the same time, those negative feelings related to stress such as guilt, anxiety, or regret (Walton-Pattison et al., 2018) should also be investigated further regarding binge-watching to

get more insight into the reasons why binge-watching may cause them and to potentially prevent negative health implications.

Furthermore, future studies should try to further refine binge-watching definitions as there is still no consensus (Flayelle et al., 2020; Jenner, 2017). Therefore, there is a need to make a distinction between healthy and pathological VoD watching behaviour (Flayelle et al., 2020). Instead of using a dichotomous variable for binge-watching, prospective studies could opt for a continuous variable to be able to investigate different levels of binge-watching to gain more insight into this concept, which would also prevent the potential loss of data. Distinguishing between different levels of binge-watching could provide valuable information because someone who watches three episodes in a row within one hour might experience different consequences, either positive or negative, than a person who watches ten or more episodes in rapid succession for several hours.

Conclusion

Finally, this study aimed at getting more insight with regard to the phenomenon of binge-watching. It provides meaningful data indicating that individuals experience more stress after having engaged in binge-watching behaviour. However, the expectation that stress could also be a predictor for binge-watching behaviour as an attempt to cope with one's daily stressors was not confirmed. This inter alia could be the case due to the general low stress levels among the sample population. Therefore, it is crucial for prospective studies concerning binge-watching, to investigate this question at an alternative point in time and among a different sample. Those lockdown regulations due to the coronavirus may have influenced the results of this study, which potentially do not represent usual daily routines, behaviours, and feelings. Thus, it should be considered that more heterogeneous and especially higher levels of stress could have fundamentally different effects on binge-watching behaviours and could result in other findings. Simultaneously, it is advised to explore the effect of binge-watching on perceived stress and associated concepts even more by further ESM studies among a more at-risk sample population to illuminate potential associated negative feelings and health-related issues.

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Appendix A

Invitation emails

Invitation email written by students

Hey there!

Thank you very much for agreeing to participate in our study about Video-on-Demand (VoD) watching behaviour! This research will be conducted from April 9 until April 23 (2 weeks in total). In general, our goal is to investigate the topic of VoD watching behaviour. In order to be able to participate in this study, it is necessary that you follow the steps in the **"To-do"** section. We recommend you to mark this email as "important" in your inbox, so you can easily find it again.

To-do:

Before the daily questionnaires start, you need to fill in one questionnaire concerning your demographics and general information about your watching behaviour and one baseline questionnaire today.

In the next 2 weeks, you need to answer three different questionnaires each day:

- Morning State Assessment (3-5 minutes)
- Evening State Assessment (3-5 minutes)
- Behaviour Assessment (3-5 minutes)

After the two-week period, one final questionnaire needs to be filled in.

Conveniently enough, this will be done via the "Ethica" mobile application. In order to participate in this study, you need to download and install the Ethica app on your mobile phone in the respective app store. Further information about that will be sent to you soon via email.

It is important that you register today, April 8. If you have not registered until 11:59 p.m. today, you won't be able to participate in the study. You should receive the first notification from Ethica around 10:00 a.m. tomorrow, April 9. In case you don't get access to any questionnaires until 11:00 a.m, please contact us immediately. The questionnaires are going to take you a maximum of 15 minutes in total each day. You will receive regular notifications to remind you of the questionnaires, but it is very important that you check your phone yourself during the day, especially if you don't receive any notifications due to whatever reason. If you have any questions, comments, or doubts about the study, feel free to contact us via email (see contact details below). We will reply as soon as possible.

Thank you in advance!

Kind regards,

Johanna, Robert, Dino, and Olivia

Invitation email generated by Ethica

Hi *participant's name*,

Name of the person who sent the invitation from University of Twente has invited you to join "VoD watching study" research study. Please click on the link below to open the Ethica app and join the study:

https://ethicadata.com/study/1144/

If you don't have the Ethica app installed, the above link will ask you to download it first.

If you have any problem with the link, you can also download the Ethica app from Google Play or App Store, and after you log in, join the study using registration code 1144. Also, don't forget that your username is *participant's email*.

Thanks for helping advance the science,

The Ethica Data team

Appendix B

Informed consent form

Welcome to our study about Video-on-Demand (VoD) watching behaviour!
Thank you for your time and support! Please read the following information carefully.
The aim of this research is to investigate the use of video-on-demand (VoD) streaming services. With your participation in this research you will help to make a contribution to the scientific knowledge of VoD watching behaviour.

You can participate in this study if you are at least 18 years old and are proficient in English. This application (Ethica) is used over a two-week period to respond to daily questionnaires. For the study's purpose, it is important that you answer the questions in a given time frame. So, you should make sure that the notifications on your mobile device are switched on, since you receive notifications on that device within these time frames.

As part of the study, you will first receive a questionnaire concerning your demographics and a baseline questionnaire that need to be filled out once before the actual study starts. From tomorrow on, April 9, you will receive three short daily questionnaires consisting of 10-15 questions over a period of two weeks that will take you 3-5 minutes each. The daily assessments will focus on your behaviours, moods and feelings with regard to your VoD watching behaviour. After the two-week period you will receive a final questionnaire to fill in.

Besides the time invested and a slight disruption of your daily life, we do not expect that you will experience any disadvantages from this research. The participation in this study is voluntary. If you wish to withdraw from this research, you can do so at any time without giving a reason.

Moreover, your answers will be treated confidentially. All personal data (e.g., e-mail, age, gender, etcetera) will be anonymised and will not be published and/or given to a third party. The study has been approved by the Ethics Committee of the University of Twente, and is thus compliant with internationally recognised guidelines on ethical research.
If any questions or concerns arise before, during or after your participation, do not hesitate to contact the researchers, Johanna Lehmkühler, Robert Preißler, Dino Erker, or Olivia Buschmeyer (see contact information in your earlier received email). You can also contact us, if you are interested in the outcomes of the study.

I have fully read and understand the text above and I am willing to participate in this study.

Appendix C

Questionnaires in the Ethica mobile application

A.1 Demographics & general information

Collect basic information about the participants.

Welcome to our study about VoD watching behaviour! Thank you for your time and support! Before the daily questionnaires start, we would like to get some basic information about you.

1. Please indicate your gender.
   a. ○ Male
   b. ○ Female
   c. ○ Other (or do not wish to answer)
2. How old are you?

3. What is your nationality?
   a. ○ Dutch
   b. ○ German
   c. ○ Other, European
   d. ○ Other, non-European
4. Please indicate your current occupation.
   a. ○ Pupil
   b. ○ Student
   c. ○ Apprentice
   d. ○ Employed full-time
   e. ○ Employed part-time
   f. ○ Unemployed
   g. ○ Other

As you were informed beforehand, we would like to investigate your video-on-demand (VoD) watching behaviour. This does not mean linear television, but streaming platforms such as, for example, Netflix. The following questions are meant to explore your usage of these services to watch series, shows or/and movies.

5. Please mark the VoD streaming services that you usually use to watch series, shows, or/and movies. Multiple answers are possible.
   a. ○ Netflix
   b. ○ Amazon Prime Video
   c. ○ Hulu
   d. ○ Disney +
   e. ○ Maxdome
   f. ○ Sky Home
   g. ○ YouTube
   h. ○ Other
6. Do you use one of these services at least once a week?
   a. ○ Yes
   b. ○ No

A.2 Baseline measurement

One-time measurement at start of the study that includes the GAD-7 and PHQ-9.

Hey! We'd like you to respond to some statements that only need to be filled out once in the beginning and the end of the study**.**

1. Over the last 2 weeks, how often have you been bothered by any of the following problems?
   a. Little interest or pleasure in doing things.
      i. ○ Not at all
      ii. ○ Several days
      iii. ○ More than half the days
      iv. ○ Nearly every day
   b. Feeling down, depressed, or hopeless.
      i. ○ Not at all
      ii. …
   c. Trouble falling or staying asleep, or sleeping too much.
      i. ○ Not at all
      ii. …
   d. Feeling tired or having little energy.
      i. ○ Not at all

ii. …

e. Poor appetite or overeating.

i. ○ Not at all

ii. …

f. Trouble concentrating on things, such as reading the newspaper or watching television.

i. ○ Not at all

ii. …

g. Feeling bad about yourself or that you are a failure or have let yourself or your family down.

i. ○ Not at all

ii. …

h. Moving or speaking so slowly that other people could have noticed. Or the opposite being so figety or restless that you have been moving around a lot more than usual

i. ○ Not at all

ii. …

i. Thoughts that you would be better off dead, or of hurting yourself.

i. ○ Not at all

ii. …

2. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

a. ○ Not difficult at all

b. ○ Somewhat difficult

c. ○ Very difficult

d. ○ Extremely difficult

Thank you already for filling out those questions! Just a couple more and you'll be done!

3. Over the last 2 weeks, how often have you been bothered by any of the following problems?

a. Feeling nervous, anxious, or on edge.

i. ○ Not at all

ii. ○ Several days

iii. ○ More than half the days

iv. ○ Nearly every day

b. Not being able to stop or control worrying.

i. ○ Not at all

ii. …

c. Worrying too much about different things.

i. ○ Not at all

ii. …

d. Trouble relaxing.

i. ○ Not at all

ii. …

e. Being so restless that it's hard to sit still.

i. ○ Not at all

ii. …

f. Becoming easily annoyed or irritable.

i. ○ Not at all

ii. …

g. Feeling afraid as if something awful might happen.

i. ○ Not at all

ii. …

4. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

a. ○ Not difficult at all

b. ○ Somewhat difficult

c. ○ Very difficult

d. ○ Extremely difficult

A.3 Behaviour Assessment

When and how much VoD.

Hey there! Now we'd like you to answer some questions concerning your video-on-demand watching behaviour.

1. Did you watch a series on a video-on-demand platform such as Netflix or Amazon Prime Video **yesterday?**

a. ○ Yes

b. ○ No

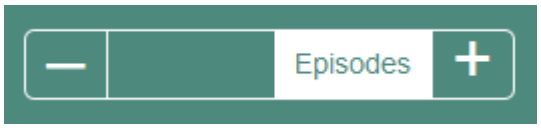
2. At what time of the day did you watch the series? Multiple answers are possible. For example: You watched from 6 p.m. until 11 p.m., mark evening and night. But: The times

only serve approximate orientation. If you started watching at 5:55 p.m., for example, you do not have to mark *afternoon.*

a. ○ Morning (6 a.m. - 12 p.m.)
b. ○ Afternoon (12 p.m. - 6 p.m.)
c. ○ Evening (6 p.m. - 11 p.m.)
d. ○ Night (11 p.m. - 5 a.m.)

3. Did you watch for more than 1 hour?
   a. ○ Yes
   b. ○ No
4. Please indicate the number of hours watched.

5. Please indicate how many episodes you watched. If you watched more than 20 episodes, choose *21*.



6. What type of content did you watch?
   a. ○ Comedy
   b. ○ Thriller
   c. ○ Documentary
   d. ○ Horror
   e. ○ Action
   f. ○ Drama
   g. ○ Romance
   h. ○ Adventure
   i. ○ Animation
   j. ○ Mystery
   k. ○ Science-Fiction
   l. ○ Fantasy
   m. ○ Other
7. What was your reason for watching?
   a. ○ Entertainment

b. ○ Boredom/nothing else to do
c. ○ Stress
d. ○ Interest/Curiosity
e. ○ Escape from reality/distraction
f. ○ Procrastination/Avoidance of other responsibilities
g. ○ Information seeking
h. ○ Peer activity (watching with friends/family)
i. ○ Relaxation/taking a break

8. In what kind of context did you watch?
   a. ○ Alone
   b. ○ With friends
   c. ○ With family
   d. ○ With partner
9. After that, did you feel guilty about watching?
   a. ○ Yes
   b. ○ Not at all
10. To what extent did you feel guilty?
   a. ○ Slightly guilty
   b. ○ Moderately guilty
   c. ○ Very guilty
   d. ○ Extremely guilty
11. Please mark the reason for your guilty feeling.
   a. ○ I watched more episodes or for a longer time than I wanted/planned to.
   b. ○ I neglected other obligations that I should have fulfilled.
   c. ○ I neglected other free-time activities that I wanted to pursue.
   d. ○ I neglected bodily needs, for example, sleep.
   e. ○ I think that I wasted time or could spent that time more wisely/useful.
   f. ○ Other.
12. Other: Please explain why you felt guilty.

Thank you for answering the questions. See you later!

A.4 Morning state assessment

Well-being, stress, guilt, depression, anxiety

Good Morning! We'd just like you to answer some questions about your recent moods and feelings. Have a nice day!

1. On a scale of 0 to 10, with 0 being no stress and 10 being the worst stress possible, what number best describes your level of stress **right now**?

2. Please indicate to what extent you experienced the following feelings within the past hour.
   a. Low/sad mood
      i. ○ Not at all
      ii. ○ Slightly
      iii. ○ Moderately
      iv. ○ Strongly
      v. ○ Extremely
   b. Low energy/fatigue
      i. ○ Not at all
      ii. …
   c. Feelings of guilt
      i. ○ Not at all
      ii. …
   d. Problems with concentration
      i. ○ Not at all
      ii. …
   e. Sleeping problems in the last night
      i. ○ Not at all
      ii. …

A.5 Evening state assessment

Well-being, stress, guilt, depression, anxiety

Hey! We'd again like you to answer a few questions concerning your current moods and feelings. Thank you!

1. On a scale of 0 to 10, with 0 being no stress and 10 being the worst stress possible, what number best describes your level of stress **right now?**

2. Please indicate to what extent you experienced the following feelings within the **past hour**.
   a. Low/sad mood
      i. ○ Not at all
      ii. ○ Slightly
      iii. ○ Moderately
      iv. ○ Strongly
      v. ○ Extremely
   b. Low energy/fatigue
      i. ○ Not at all
      ii. …
   c. Feelings of guilt
      i. ○ Not at all
      ii. …
   d. Problems with concentration
      i. ○ Not at all
      ii. …
3. Next, there are some statements about feelings and thoughts. Please tick the box that best describes your experience of each **during the day.**
   a. Today, how often have you felt nervous, anxious or on edge?
      i. ○ Not at all
      ii. ○ Several times
      iii. ○ More than half of the day
      iv. ○ Nearly all day

b. Today, how often have you not been able to stop or control worrying?
   i. ○ Not at all
   ii. …
c. Today, how often have you felt down, depressed or hopeless?
   i. ○ Not at all
   ii. …
d. Today, how often did you have little interest or pleasure in doing things?
   i. ○ Not at all
   ii. …

4. Next, there are five statements that you may agree or disagree with. Please indicate your agreement with each item by choosing the answer that suits your agreement on the statement based on your **momentary feeling** the most. That means your answer should reflect how you feel about a particular statement **right now**. Please be open and honest.
   a. In most ways my life is close to my ideal.
      i. ○ Strongly disagree
      ii. ○ Disagree
      iii. ○ Slightly disagree
      iv. ○ Neither agree nor disagree
      v. ○ Slightly agree
      vi. ○ Agree
      vii. ○ Strongly agree
   b. The conditions of my life are excellent.
      i. ○ Strongly disagree
      ii. …
   c. I am satisfied with my life.
      i. ○ Strongly disagree
      ii. …
   d. So far I have gotten the important things I want in life.
      i. ○ Strongly disagree
      ii. …
   e. If I could live my life over, I would change almost nothing.
      i. ○ Strongly disagree
      ii. …

A.6 Final Measurement

One-time measurements at the end of the study that includes the GAD-7 and the PHQ-9.

Hey! We'd like you to respond to some statements that only need to be filled out one more time at the end of the study.

1. Over the last 2 weeks, how often have you been bothered by any of the following problems?
   a. Little interest or pleasure in doing things.
      i. ○ Not at all
      ii. ○ Several days
      iii. ○ More than half the days
      iv. ○ Nearly every day
   b. Feeling down, depressed, or hopeless.
      i. ○ Not at all
      ii. …
   c. Trouble falling or staying asleep, or sleeping too much.
      i. ○ Not at all
      ii. …
   d. Feeling tired or having little energy.
      i. ○ Not at all
      ii. …
   e. Poor appetite or overeating.
      i. ○ Not at all
      ii. …
   f. Trouble concentrating on things, such as reading the newspaper or watching television.
      i. ○ Not at all
      ii. …
   g. Feeling bad about yourself or that you are a failure or have let yourself or your family down.
      i. ○ Not at all
      ii. …
   h. Moving or speaking so slowly that other people could have noticed. Or the opposite being so figety or restless that you have been moving around a lot more than usual
      i. ○ Not at all

ii. …

i. Thoughts that you would be better off dead, or of hurting yourself.

i. ○ Not at all

ii. …

2. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

a. ○ Not difficult at all

b. ○ Somewhat difficult

c. ○ Very difficult

d. ○ Extremely difficult

Thank you already for filling out those questions! Just a couple more and you'll be done!

3. Over the last 2 weeks, how often have you been bothered by any of the following problems?

a. Feeling nervous, anxious, or on edge.

i. ○ Not at all

ii. ○ Several days

iii. ○ More than half the days

iv. ○ Nearly every day

b. Not being able to stop or control worrying.

i. ○ Not at all

ii. …

c. Worrying too much about different things.

i. ○ Not at all

ii. …

d. Trouble relaxing.

i. ○ Not at all

ii. …

e. Being so restless that it’s hard to sit still.

i. ○ Not at all

ii. …

f. Becoming easily annoyed or irritable.

i. ○ Not at all

ii. …

g. Feeling afraid as if something awful might happen.

i. ○ Not at all
ii. …

4. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?
   a. ○ Not difficult at all
   b. ○ Somewhat difficult
   c. ○ Very difficult
   d. ○ Extremely difficult

A.7 Dropout

In case, a participant would like to drop out of the study, it might be useful why. The participant expresses the wish to withdraw from the study. The responsible researcher for this participant may ask him or her about the reasons for the dropout to see if the problem can be solved. Furthermore, the participant should be kindly asked to reconsider the choice. If he or she still wishes to dropout, he/she needs to be informed that all prior answers to the surveys will not be used in the data analysis. If the participant does not wish to give a reason for the dropout, he/she needn't to do so!

We are very sad that you want to withdraw from the study. All your prior answers will be deleted and not used for the analysis of the data. Now, we would like to know more about the reasons, why you would like to stop your participation in the survey.

Please explain why you would like to withdraw from this study. If you do not wish to give a reason, you can only write " - " in this field.