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Video on Demand (VoD) Watching Behaviour and its Association with Perceived Stress:

An Experience Sampling Study

Master Thesis

Positive Clinical Psychology and Technology

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Abstract

Background: The increasing popularity of video-on-demand (VoD) platforms like Netflix prompted many studies to investigate this new phenomenon. Several cross-sectional studies determined that VoD watching is significantly associated with adverse health indicators such as perceived stress. However, the exact nature of this association over time remains unclear. Therefore, the current study utilised intensive longitudinal data from an experience sampling method (ESM) study to gain further insights into the relation between VoD watching behaviour and stress over time. Additionally, the moderating role of gender regarding the overall associations was examined.

Objective: The current study investigated the temporal direction (considering stress as predictor and outcome) and type (between-person and within-person) of associations between daily VoD watching behaviour and momentary stress in addition to the potential moderating role of gender. This enabled the study to conduct accurate group-level analyses of the variables of interest.

Method: Using the mobile Ethica application on each participant's smartphone, intensive longitudinal data were collected in a convenience sample of 38 participants (*Mage* = 23.80 years, *SD* = 5.30 years) for 14 days in April 2020. The sample filled out a daily questionnaire in the morning and in the evening, examining the level of state stress. During the day, they were asked about their VoD watching behaviour the day before.

Results: Several linear mixed model analyses were conducted to analyse the data at the group-level. However, neither between stress as a predictor nor outcome were associations significantly related with amount of VoD watching behaviour. Moreover, analyses were not significant for both between-person and within-person associations. Finally, overall associations were not significantly moderated by gender.

Conclusion: The findings of the current ESM study were not in line with previous cross-sectional studies suggesting that the amount of VoD watching behaviour and stress is not related at the group-level. Also, results indicated that gender does not influence the overall associations. The distinct outcomes between the current ESM study and previous cross-sectional studies might be related to several factors like the diverse gathering of data and the over-pathologising connotation of VoD watching behaviour in previous cross-sectional studies.

Keywords: video-on-demand, watching behaviour, binge-watching, stress, experience sampling method, intensive longitudinal data

Video on Demand (VoD) Watching Behaviour and its Association with Perceived Stress: An Experience Sampling Study

The technological revolution in the 21st century spawned new possibilities that were unimaginable beforehand. One good example is the development and usage of video-on-demand (VoD) services like Netflix, Hulu and Amazon Prime. These services allow their customers to watch media content like series and movies whenever they want (Flayelle et al., 2020; Jenner, 2017). The increasing utilisation of VoD services is characterised and fostered by the wide accessibility of internet-connected devices and the convenient provision of personally customised suggestions of movies and series 24 hours each day of the year (Flayelle et al., 2020; Jenner, 2017; Tian et al., 2017). This wide range of offers appears especially interesting for young people since the demographics of VoD platforms display that the vast majority of customers are millennials (Matrix, 2014). Having the millennials on its side, the number of individuals who subscribed to the VoD provider Netflix increased to 148 million individuals worldwide in 2020 (Colbjørnsen, 2020). Given the increasing popularity of VoD services, the current study examines whether higher amounts of VoD watching might be related to detrimental health effects like increased stress levels and whether potential associations are moderated by gender.

Concerning the enhancing popularity of VoD services, the phenomenon of binge-watching also increased. However, until now, there is no uniform definition of the term binge-watching in research. For instance, De Feijter et al. (2016) or Flayelle et al. (2019) characterise binge-watching as watching multiple episodes of the same show in one session. Panda and Pandey (2017) offer a more specified definition in which the consumption of a particular show must be conducted in a short period. In contrast, Starosta and Izydorczyk (2020) summarise binge-watching as watching two to six episodes of one specific show in one session. The disagreement on a unified definition and the ill-defined concept of binge-watching with little consensus about how to operationalise and measure it complicates the comparisons of methodological differences between studies and their results (Flayelle et al., 2020).

Potential consequences of binge-watching

Although there is still a lack of clarity about an overarching definition of binge-watching, many cross-sectional studies have examined the issue. As the word “binge” in binge-watching already suggests that it is a self-harming behaviour (Jenner, 2017), most research on binge-watching to date has taken a rather confirmatory approach highlighting the harmful short- and long-term effects it may have concerning people’s physical and mental health (Flayelle et al., 2020; Jenner, 2017).

For instance, as stated in several cross-sectional studies, potential short-term consequences are that binge-watching is related to sleep disturbances, lack of control over daily tasks and marked irritability when interrupting the activity (Dixit et al., 2020; Starosta & Izydorczyk, 2020). Also, when people binge-watch excessively, they do it primarily alone, which can have further adverse short-term health consequences like an exacerbation of solitude which can result in feelings of loneliness and further isolation, promoting the development of depression and obesity (Panda & Pandey, 2017; Starosta & Izydorczyk, 2020). Moreover, excessive binge-watching can result in the motivation to flee briefly into an illusory digital world to escape from real-life problems and to distract users from their daily stressors (Dandamudi & Sathiyaseelan, 2018; Exelmans & Van den Bulck, 2017; Jones et al., 2018; Panda & Pandey, 2017; Pierceall & Keim, 2007; Rubenking et al., 2018). Besides that, those who escape from reality to distract themselves from daily stressors may also experience serious long-term adverse health effects regarding their physical and mental health (Flayelle et al., 2019; Granow et al., 2018).

Potential adverse long-term health effects regarding the consumption of excessive binge-watching might cause issues with pursuing one's goals in the long term as everyday tasks, sleep hygiene, and social life quality might be neglected (De Feijter et al., 2016). Further potential negative long-term effects of excessive binge-watching may be the risk of becoming addicted to VoD watching behaviour (Dandamudi & Sathiyaseelan, 2018; Flayelle et al., 2019; Govaert & Rangarajan, 2014).

Next to the danger of becoming addicted, binge-watching also seems to be related to the individual's sex. Flayelle et al. (2020) and Pittman and Sheehan (2015) noted that the female gender positively correlates with a higher engagement and a higher intensity in binge-watching behaviour. This could mean that dependency on binge-watching could be more likely to develop in women, putting them at increased risk of experiencing potential negative short- and long-term health consequences.

Potential advantages of binge-watching

Nevertheless, focusing exclusively on the potential adverse effects of binge-watching on people's health may rather be a too one-sided approach. For instance, Flayelle et al. (2019; 2020), Granow et al. (2018) and Panda and Pandey (2017) claim that watching series or movies can satisfy the need for entertainment and can also enhance individuals wellbeing just as any other leisure activity. This claim is also in line with the mood management theory (MMT), which describes the hedonistic motivation that dominates, for instance, spontaneous entertainment choices to regulate people's mood (Zillmann, 2000). In other words, the

consecutive watching of selected media content can contribute to the maximisation of positive emotional experiences (Zillmann, 2000). Like gamers seek arousal through video games and athletes through competitions, other individuals obtain the right number of stimuli through binge-watching (Flayelle et al., 2019). This suggests that binge-watching can also be an effective emotion regulation strategy (Flayelle et al., 2019).

Besides that, enhancing positive emotions captures positive upgrades in mood and status and results in restorative experiences (Panda & Pandey, 2017; Paswan et al., 2015). Further positive factors that may influence an increase of binge-watching behaviour are related to social influence, the short-term escape of reality, management of mood, and procrastination (Rubenking et al., 2018). In other words, the main potential benefits are the exchange between viewers, which can foster social relationships, the temporary escape from reality through targeted distraction, the engagement of pursuing pleasure through the satisfaction of hedonistic requirements, which can regulate one's mood, and the entertainment while relaxing.

Keeping the potential advantages of binge-watching in mind, a more exploratory research approach assessing the possible bi-directional association between the amount of VoD watching behaviour and stress over time using longitudinal instead of cross-sectional research could be advantageous. By this, new insights about the temporal associations may be gained, and the potential moderating effect of gender can be explored.

VoD watching behaviour and stress

When weighing up the advantages and disadvantages, it becomes apparent that binge-watching has both beneficial and disadvantageous characteristics. However, since there is still no uniform definition of binge-watching, the current study will instead exclusively concentrate on the amount of VoD watching behaviour participants engage in daily. Besides that, the central aspect of this study is to examine whether the amount of VoD watching behaviour might be associated with negative health effects such as stress and whether gender moderates the overall associations.

In this regard, stress can be described as the reaction to a stressful event and as a result of an imbalance between a person's demands and capabilities or from the pressure that surpasses one's resources (Durand-Bush et al., 2015; Elo et al., 2003; Johnson et al., 2008). Although most people are stressed from time to time, experiencing too much of it for a long time can have a detrimental impact on people's physical and mental health and can even cause diseases such as cancer as well as depression or anxieties (Hamaideh, 2011; Karvounides et al., 2016; Kristiansen et al., 2019).

The relationship between VoD watching behaviour and stress appears complex and bi-directional and has been examined from different angles. Some research suggests that stress works as a predictor for VoD watching behaviour to escape daily stressors, avoid further confrontation with stress, calm down, relax, and satisfy hedonistic goals (Campbell et al., 1992; Flayelle et al., 2019; Panda & Pandey, 2017; Zillmann, 2000). However, stress can also be an outcome of excessive VoD watching behaviour. For instance, when individuals neglect daily tasks due to increased VoD watching behaviour, this can increase stress (Flayelle et al., 2019; Flayelle et al., 2020; Panda & Pandey, 2017). As a result, stress could be both a predictor and a consequence of VoD watching behaviour. Moreover, Reinecke and Hofmann (2016) stated that VoD watching behaviour is a double-edged sword offering the potential to relax and regulate one's mood on the one hand but can distract people from important but unpleasant duties on the other hand.

Concerning gender, several studies have also examined potential associations with regard to VoD watching behaviour and stress. For instance, some studies have found that women more often engage in excessive VoD watching behaviour than men (Flayelle et al., 2020; Pittman & Sheehan, 2015). Next to its relation to VoD watching behaviour, gender also seems to be related to stress in general (Hamaideh, 2011). With regard to this, Durand-Bush et al. (2015) and Pierceall and Keim (2007) determined that women reported experiencing higher amounts of stress than their male counterparts. In line with these findings, one could assume that gender also influences the relationship between VoD watching behaviour and stress. However, the potential moderator effect of gender on the bi-directional associations between VoD watching behaviour and stress has not been examined until today. Therefore, this study attempts to close the existing research gap by analysing intensive longitudinal data to understand better the bi-directional associations between VoD watching behaviour and stress and the potential moderating role of gender.

Experience sampling method

To date, most research on VoD watching behaviour and its relationship with moods or feelings such as stress has been performed by retrospective cross-sectional surveys which asked participants about their behaviours and perceived stress over a certain period, such as within the past weeks (Dixit et al., 2020; Levin, 2006). However, such retrospective measurements can include several hazards, such as memory biases and errors, and potentially distorted results as participants' assessments of their previous mood can be affected by their current mood (Karvounides et al., 2016; Sato & Kawahara, 2011). Memory biases mean that a certain cognitive bias either enhances or impairs the retrieval of a memory, which can

diminish the validity of measurements and can result in under- or overestimations of previous experiences and feelings (Conner & Barrett, 2012).

Furthermore, cross-sectional studies cannot investigate the temporal nature of associations, depriving them of the possibility of exploring whether stress is a predictor or outcome of VoD watching behaviour (Curran & Bauer, 2011; Lundh & Falkenström, 2019). Moreover, they cannot deal with fluctuations in behaviours and feelings (Levin, 2006). A final limitation of cross-sectional studies is that they often draw inferences from inter-individual (between-person) measurements about assumed intra-individual (within-person) processes and associations which might be inappropriate (Hamaker, 2012; Lundh & Falkenström, 2019). Between-person associations merely indicate whether if an individual score on average higher or lower on a certain variable than the rest of the sample, the individual also score higher or lower on average on another variable. In contrast, within-person associations measure whether when an individual scores higher or lower on a specific variable than their own average, this is associated with another variable. Distinguishing between-person and within-person effects requires intensive longitudinal measurement methods, which cannot be conducted in cross-sectional studies (Curran & Bauer, 2011).

In an attempt to overcome these limitations, the experience sampling method (ESM) aims to avoid memory biases and to assess more precisely people's actual behaviours and state feelings, and their associations, over time (Conner & Barrett, 2012; Karvounides et al., 2016; Larson & Csikszentmihalyi, 2014; Palmier-Claus et al., 2011; Sato & Kawahara, 2011). ESM is characterised by collecting data in real-world environments, assessing participants' behaviours or feelings when they occur (Trull & Ebner-Priemer, 2009). ESM is an intensive longitudinal self-reported design where participants answer questions regarding their executed behaviour and mood several times a day over one to three weeks (Berkel et al., 2017; Csikszentmihalyi & Larson, 2014; Curran & Bauer, 2011). Thereby, errors and biases in the process of memory retrieval are relatively improbable due to the real-time assessment (Trull & Ebner-Priemer, 2009). Another primary advantage of ESM compared to cross-sectional studies is that it allows analyses of temporal (lagged) effects and separating between- and within-person effects (Curran & Bauer, 2011). In addition, the large number of data obtained from a smaller number of participants, compared to cross-sectional sample sizes, is also advantageous, as fewer participants are needed for the study, which facilitates the recruitment process (Verhagen et al., 2016).

The study of Buschmeyer (2020) was one of the first who examined the relationship between VoD watching behaviour and stress using ESM to analyse intensive longitudinal data

determining whether stress is a predictor and/or outcome of VoD watching behaviour. However, there is still a research gap as Buschmeyer's (2020) study did not examine potential differences concerning the type (between-person and within-person association) of temporal relations between VoD watching behaviour and stress over time. Also, her study did not focus on the potential moderating effect that gender might have on overall associations. This study attempts to fill the research gap by improving the aggregated level analyses of Buschmeyer's (2020) study by assessing the between- and within-person nature of the temporal associations and the potential moderation effect of gender on the associations between VoD watching behaviour and stress.

Research questions

This research aims to further investigate the relationship between VoD watching behaviour and stress over time by exploring the temporal nature of this association and examining potential differences in between-person and within-person associations. Moreover, gender is examined as a potential moderator variable of associations between VoD watching behaviour and stress.

1.) How is stress during the day associated with VoD watching behaviour that same day?
2.) How is VoD watching behaviour associated with stress the next day?
3.) Are temporal associations between VoD watching behaviour and stress different for between-person and within-person associations?
4.) Does gender moderate the relationship between VoD watching behaviour and stress?

Method

Design

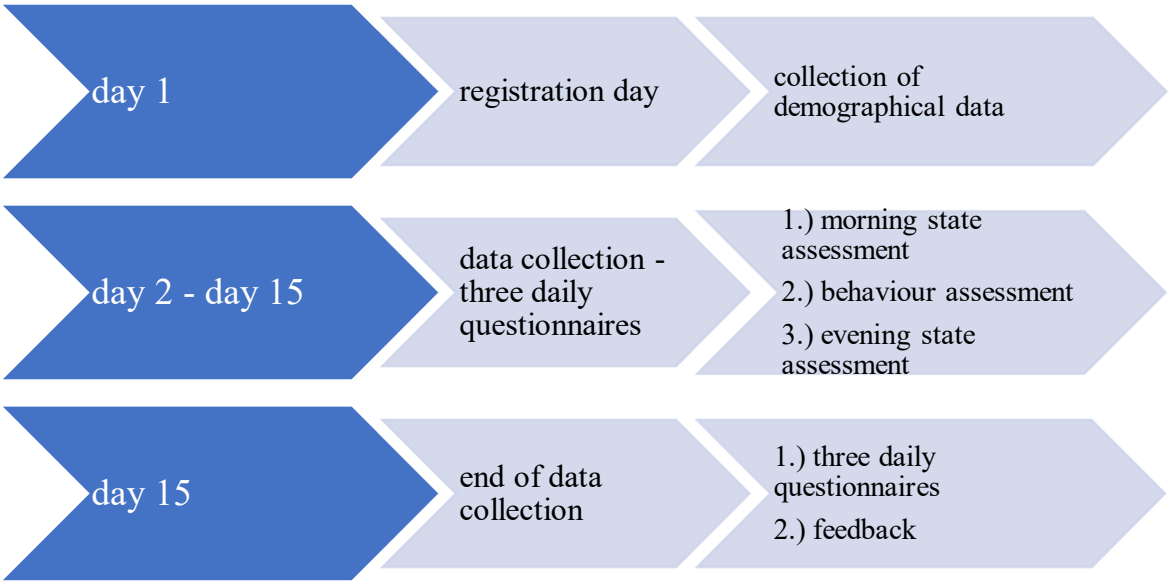
This research study is a secondary analysis of data previously collected for a bachelor thesis written at the University of Twente by Buschmeyer (2020). The original study was approved (#200366) by the Ethics Committee of the Faculty of Behavioural Sciences (ECBMS) at the University of Twente. The gathering of data was conducted in April 2020.

The data was collected based on the experience sampling method (ESM) design. Figure 1 provides an overview of the content regarding the questionnaires filled out on the respective days. For instance, the first day (starting day) was used to collect demographical information. On the second day, intensive longitudinal measurements of the main variables

VoD watching behaviour, and stress were collected for 14 days from the second to the 15th day. On the last day, participants filled out the three daily questionnaires and a feedback sheet. The daily assessments were queried based on interval contingent sampling to decrease the participant's burden (Csikszentmihalyi, 2011). Interval contingent sampling means that the participants received random notifications within fixed time schedules and regular intervals 14 days in a row to answer their short daily questionnaires. Every response was collected by the Ethica application (https://ethicadata.com/product), which had to be downloaded by the participants on their smartphones before the study began. It contained all necessary study information for the participants and provided the daily questionnaires.

Figure 1

Overview of the Installation of Time Frames and the Collection of Data



Note. Each arrow displays what was done on the particular day.

Participants

The inclusion criteria concerning this study were that participants had to have a minimum age of 18 years, needed sufficient English reading skills and had to possess a smartphone for answering the daily questionnaires within the Ethica application. Participants were recruited by convenience sampling. Based on the experiences and suggestions of Van Berkel et al. (2017), who recommended a sample size of 30 to 40 participants for ESM studies due to the intensive nature of data that is received for each participant, the study started with 42 participants. Of those 42 participants, were four excluded from further analyses since their

completion ratio was below 50%, which means that they missed more than half of the measurement requirements (Conner & Lehman, 2012). The data of the remaining 38 participants were included and analysed. Their mean age was 23.80 (*SD* = 5.30) years, ranging from 18 to 51 years. The sample consisted of 22 males and 16 females, while the nationality was mainly German (*n* = 35). The majority of participants were students (*n* = 22), full-time employees (*n* = 9) or apprentices (*n* = 3). All of the respondents participated voluntarily and could withdraw from the study at any time without any consequences. Before the study began, every participant who wanted to participate gave informed consent about their participation.

Procedure

The longitudinal online survey was shared via two emails in April 2020 with potential participants. The first email welcomed the participants and enlightened them about the process and duration of the study. The second email was an invitation email generated by Ethica, the application that was responsible for the data collection. Participants had to download and install the Ethica application on their smartphone and had to register for the study before signing the informed consent form.

After signing up, participants received the first questions within the Ethica application. In total, they had to answer 14 days in a row three questionnaires throughout the day. Each morning the participants had to fill in the *Morning State Assessment* (Appendix A) and each evening the *Evening State Assessment* (Appendix B), obtaining results about their perceived stress during that moment. Moreover, during the day, they were asked about their VoD watching behaviour the day before, which was examined with the *Behaviour Assessment* (Appendix C). These assessments held every day for 14 days in a row enabled researcher comparisons, and the detection of differences regarding participants implemented behaviour, feelings, and moods within the first and second week and helped establish reliable measurements (Conner & Lehman, 2012).

The interval contingent sample design provided fixed time frames for the individual questionnaires, which meant that the morning state assessment was asked between 11 a.m. and 1 p.m., and the evening state assessment was asked between 7 p.m. and 9 p.m. One reminder appeared on participants smartphones if they had not filled out the questionnaires after 30 minutes of appearance. The behaviour assessment notification appeared only once between 10 a.m. and 10.30 a.m. but remained available to answer for ten hours.

Materials

The questionnaires queried and analysed within this study belong to a bigger research project containing an extensive test battery. However, the current secondary study exclusively concentrated on the demographics and general information, the morning and evening state assessments of momentary stress, and the once-daily behaviour assessment of VoD watching behaviour.

Demographic and general information

Once the study began, the participants had to fill out their demographic information regarding their age, gender, nationality, and current occupation. After that, general questions were asked to determine if the participant utilised any VoD services at all and whether they used them at least once a week.

Perceived stress

The perceived stress level was measured daily in the morning and evening to calculate an average stress score for each day. Perceived stress was measured by the Stress Numerical Rating Scale – 11 (SNRS – 11; Karvounides et al., 2016). Instead of examining participants' trait level of perceived stress retrospectively, this scale measured momentary state stress on a well-validated one-item scale. The question that was asked was, ", what number best describes your level of stress right now?". Participants could indicate with a slider scale ranging from 0 (no stress) to 10 (worst stress possible) how stressed they were (Karvounides et al., 2016; Littman et al., 2006; Von Baeyer et al., 2009). The SNRS – 11 showed good reliability and validity in previous studies (Karvounides et al., 2016) and certified, because of the two times a day assessment, an excellent test-retest reliability ($\alpha = .94$) concerning state stress in the current sample (Buschmeyer, 2020).

VoD watching behaviour

The behaviour assessment aimed at measuring the daily VoD watching behaviour of the participants. There, participants were first asked to indicate if they used VoD services the day before. Depending on the response, they received no further questions (if responded with "No") or further questions (if responded with "Yes"). If participants replied with "Yes", the time frame (morning, afternoon, evening, or during the night) in which participants watched VoD content was inquired about. After that, it was asked whether participants watched for more than one hour. If the response was again "Yes", several questions followed. For instance, it was asked for the number of hours, and episodes watched in decimals. The type of content, the reason for watching, and the context in which the VoD watching occurred were also asked.

Data analysis

The data collected by the Ethica application was analysed using the statistical programme of IBM SPSS Statistics 25. After computing the demographic statistics, all four research questions within this study were answered by performing a series of linear mixed model (LMM) analyses. All LMM's included a first-order autoregressive covariance (AR1) structure with homogeneous variances for the nested structure of the repeated measurements. This procedure was selected since it was assumed that measurements of VoD watching behaviour and stress that took place shortly after each other correlate more strongly than measurements of these variables that took place at a distance from each other (Kincaid, 2005). Linear mixed model analyses were considered suitable for this study since, besides adequately handling repeated measurement data, they can handle missing values of participants who forgot to answer a measurement, which is quite common in ESM studies (Verhagen et al., 2016). The sample succeeded in creating a response rate of 92.10% of the daily measurements concerning missing measurement points. The p-value for all analyses was considered significant when $p < .05$.

Across all models, both standardised and unstandardised regression estimates were computed. The computation of standardised regression estimates by transforming the observed variables into z-scores aided comparisons between the strength of the effect of each individual independent variable (IV) to the dependent variable (DV) (Nieminen et al., 2013).

With respect to the analysis of the longitudinal data, measurement days were set as repeated measurements while participants were considered subjects in all LMMs. In the first series of LMMs, both were set as fixed independent factors to obtain estimated marginal mean scores on the variables of interest across participants and time points.

To examine the first research question, "How is stress during the day associated with VoD watching behaviour that same day?" a new variable of total stress for each day was computed. Then, new lagged (lag1) variables for VoD watching behaviour of hours watched and episodes watched were created as the questionnaire always asked about the VoD watching behaviour the day before. After that, LMM's analyses were conducted for which total stress was set as DV and the new lagged variables of hours watched, and episodes watched were separately included as fixed covariates. Two LMM's were conducted for obtaining unstandardised and two for standardised scores.

For the second research question, "How is VoD watching behaviour during the day associated with stress the next day?" the average levels of daily stress the next day were considered as the DV and amount of VoD watching the previous day as the fixed covariate in

LMM analysis. Both the number of hours and episodes watched were used as fixed covariates in two separate LMMs.

The third research question was “Are those associations between VoD watching behaviour and stress different for between-person and within-person associations?”. Curran and Bauer (2011) suggest applying the person-mean centring technique of the time-varying covariates to statistically distinguish between-person and the within-person associations. For this purpose, daily mean scores (person-mean) of VoD watching behaviour were computed for each participant, representing the between-person associations. For the illustration of the within-person associations, the person mean centred scores were computed. They were computed by subtracting person mean scores from every participant’s time-specific total score. Both the person means and the person mean centred scores of either VoD watching behaviour hours watched or episodes watched were simultaneously entered as fixed covariates in a LMM.

The fourth research question examined if “gender moderates the relationship between VoD watching behaviour and stress”. Therefore, another LMM analysis was performed. This time, average state stress the next day was used as DV. The number of hours watched, and episodes watched were set as fixed covariates in separate LMM’s, and gender x VoD watching behaviour was set as a fixed factor interaction term. Moreover, a simple slope analysis was conducted to represent how much the DV changes when the IV score increases by 1 point in females and males separately to illustrate potential interaction effects.

Results

Characteristics of the sample

Through the responses of the 38 participants within this study were 545 assessments over 14 days collected (*response rate* = 92.10%).

The state stress scale score that ranged from 0 (no stress) to 10 (worst stress possible) was on average 1.35 (*SD* = 1.39) over all assessments, which indicates that the sample experienced rather little stress during the assessment period. This trend is also shown in Figure 2 when assessing the distribution of between-person responses, whereby the majority of responses scored on the stress scale between 0 and 3 (90.4%) which is displayed by the yellow line. Moreover, the lowest average number of hours watched across all individuals over all days was 0.42, and the highest average number of hours watched was 7.18, shown by

the green line. The minimum number of episodes watched across all individuals over all days was 0.70 and the maximum 12.27, displayed by the blue line (Figure 2).

Concerning the distribution of within-person associations, Figure 3 shows that participants watched on average 2.16 hours a day (*SD* = 1.26; green line) or 3.44 episodes (*SD* = 2.10; blue line) of VoD media content each day over all days. The yellow line in Figure 3 displays that the experienced stress level within participants increased compared to the remaining days on the fifth day. However, the stress level still remained rather little.

Figure 2

Line Graph Displaying Between-person Associations of Stress and VoD Watching Behaviour

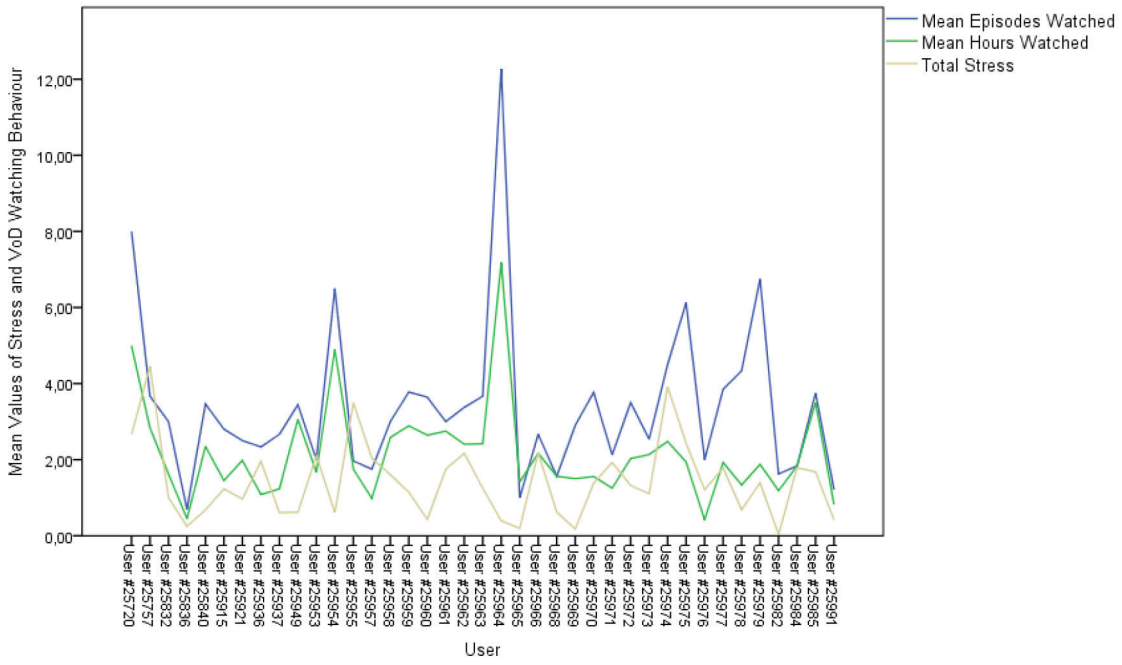
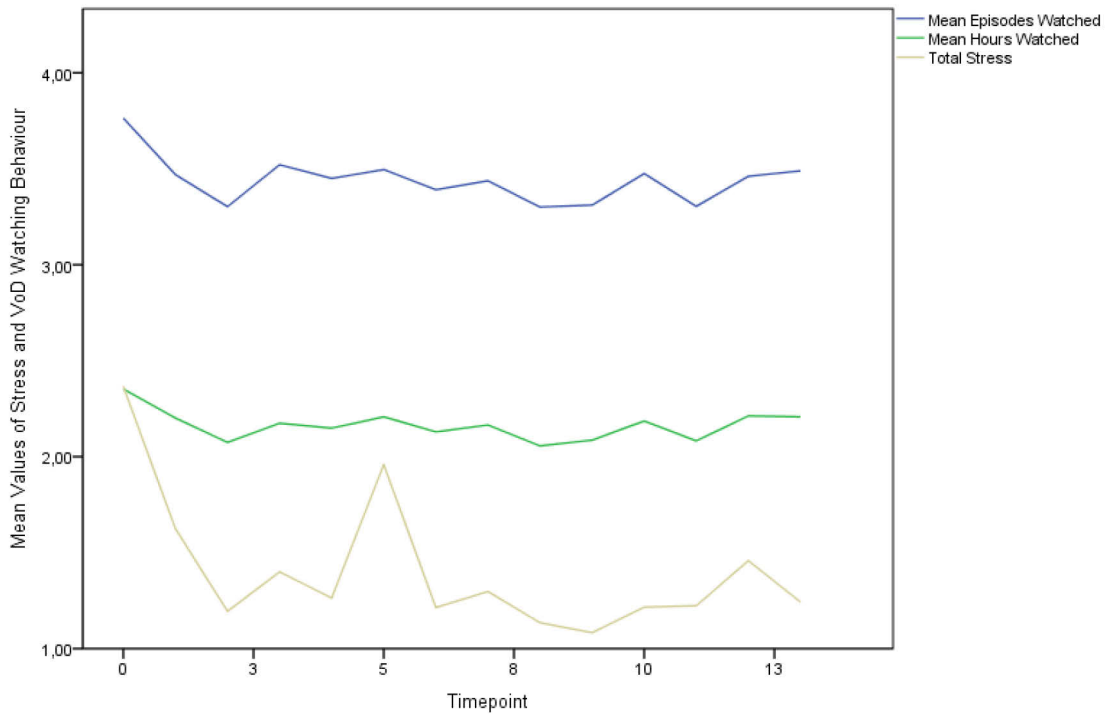


Figure 3

Line Graph Showing Within-person Associations of Stress and VoD Watching Behaviour Over Time



Stress as a predictor of VoD watching behaviour

To examine how stress during the day was associated with VoD watching behaviour that same day, LMM's were constructed with stress as a predictor for VoD watching behaviour (Table 1). VoD watching behaviour included the measurements of hours watched, and episodes watched. Findings showed that state stress neither significantly predicted hours watched nor episodes watched on that same day at the group-level.

Stress as an outcome of VoD watching behaviour

The conducted LMMs with state stress as an outcome of VoD watching behaviour the day before indicated that state stress was not an outcome of VoD watching behaviour the day before (Table 1). This means that, at the group-level, stress scores the next day were not linearly associated with VoD watching behaviour the day before.

Table 1

Linear Mixed Model Analyses Concerning the Dependent Variable of Total Stress as Predictor and Outcome and VoD Watching Behaviour as Covariates

VoD Watching	B [SE]	β [SE]	F [df]	p
Stress as predictor				
Lag hours watched	0.00 [.03]	.01 [.05]	0.05 [237.72]	.81
Lag episodes watched	0.02 [.02]	.06 [.05]	1.43 [249.82]	.23
Stress as outcome				
Hours watched	0.03 [.03]	.05 [.05]	0.93 [254.77]	.33
Episodes watched	0.01 [.02]	.03 [.05]	0.31 [270.01]	.57

Note. B = unstandardised scores, β = standardised scores, B and SE indicate B-estimate and standard error. F = F value, df = degrees of freedom, p = significance

Between- and within-person associations of VoD watching behaviour and stress

Concerning the overall associations, the separate between-person and within-person associations were also not significant for both hours watched and episodes watched (Table 2). The between-person associations were displayed by the person mean, and the within-person associations were illustrated by the person mean centred scores in Table 2. The results showed that the between-person associations were slightly higher than the within-person associations when state stress was assessed as an outcome of VoD watching behaviour. This indicates that individuals who watched more VoD media content tended to be more stressed the next day on average than individuals who watched less VoD media content. However, the results displayed neither a significant association regarding the between-person nor the within-person associations.

Table 2

Linear Mixed Model Analyses Concerning the Dependent Variable of Total Stress as Predictor and Outcome and Person Mean and Person Mean Centred Scores of VoD Watching Behaviour as Covariates

VoD Watching	B [SE]	β [SE]	F [df]	p
Stress as predictor				
Lag Hours watched				
Person mean	0.00 [.10]	.00 [.09]	0.00 [59.80]	.95
Person mean centred	0.00 [.03]	.00 [.03]	0.01 [191.22]	.92
Lag Episodes watched				
Person mean	-0.02 [.06]	-.03 [.09]	0.11 [56.59]	.73
Person mean centred	0.03 [.02]	.05 [.04]	1.74 [204.27]	.18
Stress as outcome				
Hours watched				
Person mean	0.14 [.11]	.13 [.10]	1.55 [51.92]	.21
Person mean centred	0.02 [.04]	.02 [.04]	0.36 [201.06]	.54
Episodes watched				
Person mean	0.05 [.07]	.07 [.10]	0.54 [50.99]	.46
Person mean centred	0.00 [.02]	.01 [.04]	0.11 [214.83]	.73

Note. B = unstandardised scores, β = standardised scores, B and SE indicate B-estimate and standard error. F = F value, df = degrees of freedom, p = significance

Moderating role of gender

Moderation analyses were conducted to examine the fourth research question (Table 3). All associations were very similar for both male and female participants. Indicating that interaction effects of gender for stress as a predictor (lagged variables) were neither significant for number of hours [$F(252,20) = 0.03$, $p = .96$], nor number of episodes watched [$F(224,43) = 0.80$, $p = .44$]. The same applied for stress as an outcome where neither interaction effects between gender and hours [$F(269,62) = 0.56$, $p = .57$], nor episodes watched [$F(254,35) = 0.33$, $p = .71$], were significant. Based on these outcomes, gender did not moderate the relationship between VoD watching behaviour and stress.

Furthermore, the simple slope analyses, illustrated in Table 3, did not determine significant outcomes that could confirm the moderation effect of the two sexes, male and female, on the associations between stress and VoD watching behaviour. To investigate these analyses, this study calculated associations between VoD watching behaviour and stress, as predictor and outcome, separately for both genders. Results indicated no notable differences in slopes between both genders.

Table 3

Simple Slope Analyses for each Gender Analysing the Moderation Effect on the Associations Between Stress and VoD Watching Behaviour

VoD Watching	**B [SE]**	**β [SE]**	**F [df]**	**p**
Stress as predictor				
Hours watched				
Male	0.05 [.04]	.07 [.06]	1.20 [135.90]	.27
Female	-0.02 [.05]	-.03 [.07]	0.26 [94.02]	.60
Episodes watched				
Male	0.04 [.02]	.11 [.06]	2.94 [135.70]	.08
Female	0.00 [.03]	.02 [.08]	0.06 [99.92]	.80
Stress as outcome				
Hours watched				
Male	0.05 [.05]	.07 [.07]	1.10 [153.94]	.29
Female	0.01 [.05]	.02 [.08]	0.11 [95.73]	.73
Episodes watched				
Male	0.02 [.02]	.05 [.06]	0.70 [153.89]	.40
Female	0.00 [.04]	.01 [.09]	0.02 [102.30]	.88

Note. B = unstandardised scores, β = standardised scores, B and SE indicate B-estimate and standard error. F = F – value, df = degrees of freedom, p = significance

Discussion

The current secondary data ESM study aimed to better understand the exact nature of associations between VoD watching behaviour and stress over time and explored whether gender could moderate these associations. The results of this study provided no indication of any significant temporal, between-person or within-person association between daily VoD watching behaviour, either measured as number of hours or episodes watched, and stress over time. Also, associations were not moderated by gender. This suggests that, at the group level, VoD watching behaviour and stress are not linearly related over time.

The current ESM study could not derive negative inferences such as increased stress levels associated with VoD watching behaviour, as stated in previous cross-sectional studies (Flayelle et al., 2020; Jenner, 2017). Also, participants did not report being more or less stressed before watching VoD content and did not report being more or less stressed after watching VoD content for longer amounts. As a result, the outcomes of this study about the associations between VoD watching behaviour and stress are not in line with previously conducted research. Since previous conducted cross-sectional research suggested that enhanced VoD watching behaviour is significantly associated with negative health indicators such as increased perceived stress, sleep impairment, exacerbating solitude and enables the development of addiction concerning watching more and more VoD media content (Dandamudi & Sathiyaseelan, 2018; Flayelle et al., 2019; Govaert & Rangarajan, 2014; Panda & Pandey, 2017; Pierceall & Keim, 2007; Rubenking et al., 2018). Reasons for the distinct outcomes might be related to the design of this study. As the current ESM study collected data over 14 days, which enabled the researcher to assess dynamic patterns of internal and situational variations within the participants daily lives, previous cross-sectional studies can only cover a short snapshot of it (Myin-Germeys et al., 2009; Palmier-Claus et al., 2011). Therefore, results obtained by analysing intensive longitudinal data with ESM may not be linearly related to findings of cross-sectional studies (Myin-Germeys et al., 2009).

Furthermore, this study could not determine a significant moderation effect concerning gender on the associations between VoD watching behaviour and stress. In addition, no significant association between VoD watching behaviour and stress for both men and women could be detected, which is illustrated in Table 3. From this it can be concluded that the overall associations were not moderated by gender. Contrary to these outcomes, previous cross-sectional studies suggested that women reported experiencing higher stress levels than males (Campbell et al., 1992; Durand-Bush et al., 2015; Pierceall & Keim, 2007). Moreover, other cross-sectional studies suggested that women have a proclivity towards watching higher

amounts of VoD media content (Flayelle et al., 2020; Pittman & Sheehan, 2015). As a result, the current study assumed that there might exist an association between stress and VoD watching behaviour that is moderated by gender. However, this assumption could not be confirmed within the current ESM study. It seems to be the case that state stress and VoD watching behaviour are not associated with each other at the group-level, and that gender does not significantly moderate the overall associations.

Comparing findings of the current ESM study with previous cross-sectional studies resulted in contradicting outcomes that might be related to the strengths and limitations of this study. One major strength of the current study was that this research utilised intensive longitudinal data to investigate the overall associations of the variables of interest. Using ESM to analyse intensive longitudinal data, it was possible to analyse participants time-varying responses in 14 days, which provided information about how participants experienced themselves in each moment (Trull & Ebner-Priemer, 2009). Contrary to cross-sectional studies, which ask participants retrospectively about their perceived distress, ESM studies prevent participants from retrospectively under- or overestimating their memories of actual distress due to real-time assessments (Conner & Barrett, 2012; Karvounides et al., 2016; Sato & Kawahara, 2011). In other words, this study measured participants' actual experiences of themselves in each moment. In contrast, cross-sectional studies can only measure how participants remembered their past sensations regarding previous weeks or months, which jeopardises them to experience memory biases (Conner & Barrett, 2012; Karvounides et al., 2016; Larson & Csikszentmihalyi, 2014; Palmier-Claus et al., 2011; Sato & Kawahara, 2011). These memory biases can occur through retrospective measurements, manipulating the perception regarding previous experiences as the accurate preservation of memories is limited (Redelmeier & Kahneman, 1996).

Another strength of the current study is the utilised longitudinal design, along with the more extensive analyses options provided using ESM. The design in combination with ESM enabled the researcher to follow an exploratory research approach trying to determine potential group-level associations over time that were not examined before. By this, the rather confirmatory approach of previous cross-sectional studies that confirmed the adverse health effects of VoD watching was left behind (Flayelle et al., 2019). As such, it was possible to reappraise previous assumptions in more detail. For instance, by disaggregating between-person and within-person associations and investigating stress as a predictor and outcome of VoD watching behaviour. It was assessable whether an individual scored on a specific variable on average higher or lower than the remaining sample by analysing between-person

associations. By examining within-person associations, the current ESM study could investigate if and when an individual scored within one time frame higher or lower than his/her own average. Through considering perceived stress over time the current study examined the fluctuating stress levels of the participants over 14 days. These analyses options enabled the researcher of this study to measure the implemented fluctuating behaviours and feelings accurately at the group-level over two weeks.

The final strength of this study is that it considered the amount of VoD watching behaviour instead of assessing the phenomenon of binge-watching. Since there is no unified definition of the term binge-watching, an accurate operationalisation that would allow comparisons of study findings with other research seems impossible to conduct (Flayelle et al., 2020). Measuring the number of hours and episodes watched gives a clearer picture of the amount of VoD content watched than idiosyncratic definitions.

Concerning potential limitations, this study was a secondary analysis of previously collected data by Buschmeyer (2020). Therefore, the design, inclusion, and exclusion criteria for participants could not be changed. The convenience sample had to be included, which was relatively homogeneous. It included many students within their twenties, complicating the generalisability to the broader population concerning the age, occupation, and educational background. However, regarding the sample's average age, it fits into the suggested age range of 18 to 29 years who use VoD services primarily (Panda & Pandey, 2017). Future studies should implement a more diversified heterogeneous sample representing greater occupational and educational diversity than the homogeneous sample.

Another factor contributing to this study's limitations is the relatively brief period of 14 days of data collection. This frame of two weeks was selected to decrease participants burden of answering too long-time daily questionnaires (Csikszentmihalyi, 2011). However, it is possible that the brief period of data collection masked potential long-term relationships of associations between VoD watching behaviour and stress as well as the moderating role of gender. A more extended data collection period enables more measurement points to allow individual-level analyses that could not be measured within this study due to the brief period of 14 days of data collection (McDonald et al., 2020). Hence, future studies should extend the brief measurement period, gaining more measurement points to enable individual-level analyses.

The final limitation of this study is related to the exclusive implementation of group-level analyses, which impairs the generalisability to the broader population. Since the utilised models can only create a straight line concerning the group-level analyses, representing the

total variance of all participants, individual differences of participants might be neglected. This may reduce the generalisability of results to the broader population. In contrast to that, individual-level analyses might have the advantage of creating a more accurate picture of individuals behaviours, feelings, and thoughts, which can lead to better generalisation of results concerning the broader population (McDonald et al., 2020). Therefore, to improve the generalisability of results regarding the population, individual-level analyses should be conducted, taking the individuals over a longer period into account and gaining new insights about their idiosyncratic behaviours, feelings, and thoughts.

Conclusion

The current ESM study was one of the first that collected intensive longitudinal data for thoroughly analysing the associations between VoD watching behaviour and stress over time and the potential moderating role of gender. Overall, no significant associations between stress and VoD watching behaviour could be detected. Also, no moderating role of gender could be determined. These outcomes suggest no association between VoD watching behaviour and stress and no moderating role of gender at the group-level. The current study examined a relatively unexplored area which is why it may serve as a starting point for future analyses that might extend the measurement period and implement individual-level analyses to improve the generalisability of outcomes. In conclusion, the current ESM study may contribute to a better understanding and provides unique and detailed insights into the impact of VoD watching behaviour concerning individuals stress levels. This might reduce its negative connotation and may diminish concerns regarding potentially associated negative health indicators.

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Appendix A

Morning state assessment

wellbeing, 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. …

Appendix B

Evening state assessment

wellbeing, stress, guilt, depression, anxiety

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. …

Appendix C

Behaviour assessment

Amount of VoD watching

Questions

1 (Q#22): Hey there! Now we'd like you to answer some questions concerning your video-on-demand watching behaviour.

2 (Q#13): Did you watch a series on a video-on-demand platform such as Netflix or Amazon Prime Video **yesterday**?

1) ○ Yes
2) ○ No

3 (Q#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*.

1) ☐ Morning (6 a.m. - 12 p.m.)
3) ☐ Afternoon (12 p.m. - 6 p.m.)
4) ☐ Evening (6 p.m. - 11 p.m.)
6) ☐ Night (11 p.m. - 5 a.m.)

4 (Q#12): Did you watch for more than 1 hour?

1) ○ Yes
2) ○ No

5 (Q#26): Please indicate the number of hours you watched.

6 (Q#15): Please indicate how many episodes you watched. If you watched more than 20 episodes, choose *21*.

7 (Q#27): What type of content did you watch?

1) ☐ Comedy
2) ☐ Thriller
3) ☐ Documentary
4) ☐ Horror
5) ☐ Action
6) ☐ Drama
7) ☐ Romance
8) ☐ Adventure
9) ☐ Animation
10) ☐ Mystery
11) ☐ Science-Fiction
12) ☐ Fantasy
13) ☐ Other

8 (Q#20): What was your reason for watching?

1) ☐ Entertainment
2) ☐ Boredom/nothing else to do
3) ☐ Stress
4) ☐ Interest/Curiosity
-1) ☐ Escape from reality/distraction
11) ☐ Procrastination/Avoidance of other responsiblities
12) ☐ Information seeking
13) ☐ Peer activity (watching with friends/family)
14) ☐ Relaxation/taking a break

9 (Q#28): In what kind of context did you watch?

1) ☐ Alone
2) ☐ With friends
3) ☐ With family
4) ☐ With partner

10 (Q#23): After that, did you feel guilty about watching?

1) ○ Yes
2) ○ Not at all.

11 (Q#29): To what extent did you feel guilty?

1) ○ Slightly guilty
2) ○ Moderately guilty
3) ○ Very guilty
4) ○ Extremely guilty

12 (Q#24): Please mark the reason for your guilty feeling.

1) ☐ I watched more episodes or for a longer time than I wanted / planned to.
2) ☐ I neglected other obligations that I should have fulfilled.
3) ☐ I neglected other free-time activities that I wanted to pursue.
4) ☐ I neglected bodily needs, for example sleep.
5) ☐ I think that I wasted time or could have spent that time more wisely/ useful.
6) ☐ Other

13 (Q#30): Other:

Please explain why you felt guilty.

14 (Q#17): Thank you for answering the questions. See you later!