The Relationship Between Perceived Loneliness and Video on Demand Watching Behaviour: A Secondary Analysis of an Experience Sampling Study

Master Thesis

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Abstract

Background: In the past years, there has been a growth in Video on Demand (VoD) watching behaviour, especially among young adults. Multiple studies have tried to explore potential predictors and consequences of VoD watching since concerns about a decrease in mental health due to this behaviour have grown as well. This post-hoc Experience Sampling Method (ESM) study aimed to explore the association between perceived loneliness and VoD watching behaviour among students over time in more detail.

Methods: For 14 days, 56 students were asked to use the application Ethica to daily report the amount of time and episodes they had watched the day before and twice a day to indicate their level of perceived loneliness. They also filled out a baseline questionnaire in which trait emotional stability and trait loneliness were measured. Linear mixed models (LMM) were used to explore the between- and within-person associations between VoD watching behaviour and state loneliness, and the potential moderating effect of trait emotional stability.

Results: The results showed that state loneliness and trait loneliness in this study weakly correlated with each other over time ($\beta = .21$, $SE = .07$, $p < .01$). Higher levels of perceived loneliness among students were significantly associated with a small increase in both indicators of VoD watching behaviour on the same day on the within-person level (hours watched ($\beta = .09$; $p = .02$), episodes watched ($\beta = .08$; $p < .01$)). There were no significant associations found between state loneliness and VoD watching behaviour the day before, on either the between- or within-person level. The personality trait emotional stability had no significant moderation effect on the relationship between the perceived loneliness and VoD watching behaviour.

Conclusion: The findings have shown that VoD watching behaviour was not significantly associated with levels of perceived loneliness among students the next day. However, higher levels of perceived loneliness were significantly associated with a small increase in VoD watching behaviour on the same day. Further explorations of this association indicated that this was mostly driven by a within-person relationship, meaning that participants that reported feeling more lonely than their average also tended to watch slightly more that day. The personality trait emotional stability had no significant moderation effect on the relationship between perceived loneliness and VoD watching behaviour.

Keywords: Binge-watching, VoD watching behaviour, experience sampling method, state loneliness, trait loneliness, emotional stability

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Introduction

Binge-watching

Since 2013, streaming services such as Netflix, HBO GO, and Disney+ rapidly increased in popularity, especially among young adults (Flayelle et al., 2020; Starosta & Izydorczyk, 2020). A shift has been made from linear TV watching, in which people sometimes have to wait another week before they can watch another episode of their favourite series, towards Video on Demand (VoD) watching, in which they can watch the next episode directly after the previous one. Since people nowadays can choose whichever series they prefer to watch, whenever they want, and for how long they want, the phenomenon 'binge-watching' was coined (Flayelle et al., 2019). With the rise of binge-watching behaviour, so did studies interested in the phenomenon. However, there is not one clear definition of the term. In most studies, someone is considered to binge-watch when they keep watching the same series and this occurs in one sitting (Netflix, 2013; Flayelle et al., 2019; Nielson, 2013). Furthermore, binge-watching is also known by many different names such as Marathon watching, Problematic or Excessive viewing, and Over the Top viewing. Due to the lack of clarity in naming, definition, and operationalization, it is complicated to compare the data and results of studies that have examined the phenomenon.

Predictors

Irrespective of these definitional issues of binge-watching, increasing concerns about its association with a deterioration of physical and mental health have come to rise (Flayelle et al., 2019). As a result, more and more psychological studies have been interested in identifying the predictors of binge-watching. For example, Panda and Pandey (2017) found that college students are motivated to binge-watch because of the social aspect that comes with it, the tendency to escape reality, the availability of the preferred content, and the advertisement of the series. Starosta et al. (2019) complemented the social aspect of binge-watching by showing that it tends to help make social connections when watching together and increase feelings of acceptance by peers. However, they also found that some people might binge-watch to try to escape from reality and to avoid their problems or negative emotions, such as feelings of loneliness. Furthermore, according to Shim and Kim (2018), people seem to be more motivated to binge-watch when someone recommends them a series. Personality traits such as low conscientiousness, low emotional stability and low agreeableness have also been found to be significant predictors of binge-watching across different studies (Starosta et al., 2020).

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Consequences

In addition to identifying predictors of binge-watching, several studies have also been concerned with its potential health and well-being consequences. Various studies imply that binge-watching may result in addiction (Starosta & Izydorczyk, 2020; Flayelle et al. 2017; Panda & Pandey, 2017). Excessive consumption as a form of coping to deal with or avoid negative emotions and problems is also seen in other behavioural addictions, such as a video game addiction or gambling (Flayelle et al. 2019). Furthermore, binge-watching is often used as a form of procrastination, which can lead to regret and unhappy feelings for the watcher after they are done watching (Merrill & Rubenking, 2019). This could be a result of the watcher returning to reality and having to deal with their obligations and emotions again (Castro et al., 2021). Sleeping problems also appear to be a negative consequence of binge-watching. Choosing to keep watching at night results in fewer hours of sleep which can cause fatigue and lower productivity the next day. There also seems to be a positive relationship between binge-watching and symptoms of depression, loneliness, and anxiety (Wheeler, 2015).

Loneliness

Not all of these established correlates can be specifically considered either a predictor or a consequence of binge-watching and studies vary in their assumptions on this. The feeling of loneliness is one of those variables that may be either a predictor or a consequence of binge-watching, or even both. Some studies suggest that people start watching VoD services to cope with their perceived loneliness or try to escape from that feeling (Starosta et al., 2019). For example, in a study by Dixit et al. (2020) with 548 participants, 15.7% used binge-watching to overcome their feelings of loneliness. However, other studies claim that because someone binge-watches they isolate themselves, therefore causing a reduction of social contact which in turn can lead to feelings of loneliness and desertion (Starosta et al. 2020). Panda and Pandey (2017) even mentioned that the association between binge-watching and loneliness could be seen as a vicious cycle. They explain that when someone feels lonely, they tend to start binge-watching to escape that feeling. Then, when they are done watching and have not had any social contact, the feeling of loneliness comes back, which leads them to start watching again soon. Thus, it is not yet clear if loneliness can be a predictor of binge-watching, a consequence, or maybe even both.

Limitations of Earlier Studies

Although a large amount of research has already been done on the predictors and consequences of binge-watching, there are some limitations to these. First of all, according to Flayelle et al. (2019), previous studies have mainly used a confirmatory approach in which it is assumed that binge-watching has a negative effect on people's (mental) health. Because of this confirmation bias, psychological research stagnates in understanding the phenomenon of binge-watching. Therefore, they suggest that a more exploratory approach can help in solving this knowledge gap.

Secondly, for most of the studies, cross-sectional online surveys were used to collect the data (Flayelle et al., 2020). In these studies, each respondent fills out a questionnaire once involving retrospective recalls since they are asked about certain feelings and behaviours as they occurred over a certain period of time (e.g., the last week, month, year). Therefore, there is an increased chance that respondents do not remember their behaviour, cognitions or feelings clearly. This can result in less accurate estimates and artificially inflated associations caused by recall bias (Van den Bergh & Walentynowicz, 2016).

Additionally, and related to the issue of variables being either a predictor or consequence of binge-watching, cross-sectional studies only use data from one specific point in time making it impossible to draw conclusions about the temporal nature of relationships over a period of time. To identify underlying factors and processes involved in the onset and maintenance of binge-watching, with a lower chance of recollection bias, longitudinal studies are needed that examine how this behaviour, and its association with perceived loneliness, develops over time (Flayelle et al., 2019).

Experience Sampling Method

A research design that would be suitable for such longitudinal studies, is the Experience Sampling Method (ESM). ESM is an intensive real-time self-report data collection method which aims to assess (changes in) momentary experiences, behaviours and someone's mental state over time (van Berkel et al., 2017; Verhagen et al., 2016; Myin-Germeys & Kuppens, 2022). This is done by repeated measures in which participants are asked to fill out a short questionnaire, usually done through a smartphone application, to track their behaviour, cognitions, emotions and/or feelings at that specific moment. By repeatedly measuring these variables, it is possible to display their development over time and analyze whether there are relationships between the variables. Because of the 'in the moment' assessment and the longitudinal nature of ESM, there is a minimal recollection bias and a possibility to examine temporal associations between context, experience, and behaviour (Myin-Germeys et al.,

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2018). This makes it possible to examine the potential association and its temporal direction between VoD watching and perceived loneliness in more detail. Also, the ecological validity and accuracy of ESM are high because of the real-time data collection (Verhagen et al., 2016).

Another advantage of an ESM study is that it is possible to disaggregate variation in experiences between individuals and within an individual over time (Curran & Bauer, 2011; Meyin-Germeys & Kuppens, 2022). Most studies often focus only on between-person differences. However, studying the variation in behavioural patterns of individuals over a period of time is important as well since it allows us to provide personalized feedback which could be used in interventions (e.g., treatment). Cross-sectional studies are not suitable for conducting such analyses since one-time measurements cannot determine the variance between and within variables over time. Therefore, differences in associations over time between and within participants cannot be distinguished. With longitudinal ESM data, it is possible to do this.

ESM and VoD Watching

In the past three years, bachelor psychology students of the University of Twente (UT) conducted multiple ESM studies on the relationship between VoD watching and several health-related variables over time (Cordts, 2019; Mezielis, 2021; Buschmeyer, 2020). Mezielis (2021) specifically studied the relationship between perceived loneliness and binge-watching over time. In her study, she found a small but positive significant relationship (β = .07, p = .04) with loneliness as a predictor of binge-watching on the same day. However, this study has some limitations and provided several suggestions for future research. To begin with, the study used a one-time measured validated multi-item scale for trait loneliness and a repeated measured validated single-item scale for state loneliness. When participants' state loneliness is measured in this study, it is expected that this somewhat corresponds with their measured trait loneliness. For example, according to a study by van Roekel et al. (2018) participants that report having a high level of trait loneliness are more likely to report higher levels of perceived loneliness over time. However, it also often occurs that similar state and trait variables do not strongly correlate with each other (Cupach & Spitzberg, 1983; Porter et al., 1999). The construct validity of the scale for trait loneliness that was used in this study has proven to be acceptable (de Jong-Gierveld & van Tilburg, 1987). Since state loneliness in this study is measured with a one-item question, it is not clear whether it is measuring a similar construct as the multi-item measured trait loneliness. Analyzing the extent to which trait and

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state loneliness correlate with each other in this study would be helpful for better interpreting finding on associations with state loneliness over time.

Secondly, the data of the study was only analyzed at the aggregated group level. To examine the extent to which VoD watching is associated with perceived loneliness in more detail, analyzing the distinction between within-person and between-person associations can be useful. Mezielis (2021) also suggests that it could be interesting to examine to what extent personality traits could play a moderating role in the strength of the association between perceived loneliness and VoD watching behaviour. Studies have shown that personality traits are associated with both binge-watching behaviour and loneliness (Startosta et al., 2020; Buecker et al., 2020). However, whether personality traits also have a moderating effect on the association between those two variables is not yet known. One of the personality traits that was examined during the 2020 study from the bachelor students from UT was Emotional Stability. Emotional stability can be defined as being consistent and predictable in one's emotional reactions. Someone with low emotional stability deals with mood swings more often. According to a study by Cacioppo et al. (2006), a low level of emotional stability was found to be a significant predictor of higher levels of perceived loneliness. Therefore, it is plausible to expect that the connection between perceived loneliness and VoD watching behaviour could be (partially) dependent on the level of one's emotional stability. Thus, exploring to what extent emotional stability has a moderating effect on the association between VoD watching behaviour and perceived loneliness would be an addition to Mezielis' study.

Objective

Using the data from the study of Mezielis (2021), this study aims to explore the association between perceived loneliness and VoD watching behaviour among students over time in more detail. To do this, the following research questions are examined:

1. To what extent is there a between- or within-person association between perceived loneliness as a consequence of VoD watching behaviour over time among students?
2. To what extent is there a between- or within-person association between perceived loneliness as a predictor of VoD watching behaviour over time among students?
3. To what extent does trait emotional stability moderate the association between VoD watching behaviour and perceived loneliness over time among students?

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Methods

Design

To answer the research questions of this current study, a post-hoc data analysis was performed on previously collected data from the ESM study from six bachelor UT students, conducted in 2021. The Ethics Committee of the UT gave permission to carry out the ESM study (approval no. 210327). During the recruitment, interested participants received an e-mail with information about the study and detailed explanations and instructions on what would be expected from them (e.g., how to use the Ethica app). In the app, they were asked to accept the consent form. After that, they were able to be part of the study.

The data was collected with the use of Ethica (https://ethicadata.com/), a smartphone application that was specifically created for the collection of longitudinal data on people's behaviour, cognitions, and feelings. The data collection took place from the 8th to the 22nd of April 2021. According to Van Berkel et al. (2017), a fourteen days data collection with multiple measurement points each day is quite common for ESM studies and frequently results in a good response rate.

All the participants started on the same day. On the first day, the participants were asked to fill out a questionnaire for their demographics and a baseline questionnaire assessing validated multi-item trait-like measures of, among others, loneliness and emotional stability. They had time to complete these questionnaires until the end of the study. For the next fourteen days, twice a day, they were asked to fill out a short questionnaire in which they had to track, among other variables, their watching behaviour of the day before and their perceived loneliness at the time of completing the questionnaire. By doing so, data on VoD watching behaviour and perceived loneliness were collected at different moments and over a longer period, which made it possible to gain insight into the course of the relationship between the variables. The time intervals of the questionnaires were predetermined using interval contingent sampling, namely at random time points between 8 a.m. and 12:30 p.m. and between 6 p.m. and 12 a.m. This form of sampling is especially used for measuring mental and physical states (e.g., feelings and behaviour) at fixed time points (Wheeler & Reis, 1991). Between 12:30 p.m. and 6 p.m. and between 12 a.m. and 8 a.m. it was not possible to fill out the questionnaires. Per questionnaire, they received a notification and, if needed, a reminder to complete it.

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Participants

To recruit participants, the study used convenience sampling. The researchers asked friends and family members through social media or face-to-face contact. This type of sampling method was chosen because these groups were more likely to participate in the study since they knew the researchers personally (Schwerdtner, 2021). In addition, only students with a smartphone, who were able to read English properly, were included in this study. For this post-hoc analysis, participants with another kind of occupation were excluded from the study. A total of 60 participants met the inclusion criteria. Since the mean amount of participants for an ESM study is 53 (van Berkel et al., 2017), the number of participants for this study was considered to be acceptable.

Materials

Demographics and Baseline Questionnaire

On the first day of the study, the participants received a demographic and baseline questionnaire (Appendix A). In the demographic questionnaire, they were asked to indicate their age, gender, nationality, occupation and the streaming services they were using regularly. The baseline questionnaire contained 61 questions that addressed different kinds of validated multi-item trait-like measures. This study only used two measures from the questionnaire that assessed trait loneliness and trait emotional stability. Therefore, other measurement variables of the questionnaire are not mentioned.

To measure trait loneliness, a valid and reliable ($\alpha = .74$) six-item scale, called De Jong Gierveld Scale (Gierveld & Tilburg, 2006), was used. This scale intends to measure loneliness on overall, emotional, and social levels. An example of one of the items is: "I experience a general sense of emptiness". A 5-point Likert scale was used with answers from "None of the time" (1) to "All of the time" (5). Trait loneliness is calculated by the mean score of these six items whereby a high score means a high level of loneliness and a low score means a low level of loneliness. In this current study, the internal constancy was high with a Cronbach's α of .81.

To measure trait emotional stability, the ten-item emotional stability scale from the International Personality Item Pool (Golberg et al., 2006) was used. This questionnaire has an internal consistency between $\alpha = .79$ and $\alpha = .87$ (Ypofanti et al., 2015). In this study, the Cronbach's α was even higher at .91. For this construct, a 5-point Likert scale was used with answer options from "Very inaccurate" (1) to "Very accurate" (5). An example of one of the items is: "I am relaxed most of the time". The construct of emotional stability is computed by

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the mean score of all ten items, whereby a high score means that a participant has high emotional stability.

Morning Questionnaire

For fourteen days, the participants received a short questionnaire between 8 a.m. and 12:30 p.m. (Appendix B). In total, this questionnaire contained ten questions. First, participants answered questions focused on their watching behaviour of the day before. Two questions were included in this study. The first question was: "How long did you watch Video on Demond services yesterday?". The participants had to answer in a range from less than one hour to more than five hours, or that they did not watch any VoD services. The second question, "How many episodes did you watch yesterday?", was an open question in which they had to count every episode, movie, or documentary as one episode. The dichotomous variable 'Binge-watching' was created from these two items. Based on the study of Mezielis (2021), it was decided that for this study binge-watching occurs when someone watches three or more episodes and two or more hours of VoD services in a row. Therefore, the variable 'binge-watching' has the code 0 for 'not binge-watching' and 1 for 'binge-watching.

Furthermore, this 'morning questionnaire' included a validated single-item scale focused on the current perceived loneliness of the participants, formulated as: "How lonely do you feel at the moment?" (Reissman et al., 2018). For this, they had five options to answer in a range from "Not at all" to "Very much".

Additional questions about the sleep quality, snacking behaviour, and stress level of the participants were included in this questionnaire, but are not used in this post-hoc study.

Evening Questionnaire

The second questionnaire was received every day between 6 p.m. and 12 a.m. (Appendix C). This 'Evening questionnaire', contained five questions of which only one was used for this current study. The single-item question about the current perceived loneliness that was also asked in the morning questionnaire, was asked again and had the same answer options. Daily state loneliness was computed by the mean score of the single-item loneliness question from the morning and evening questionnaires.

The other questions of the evening questionnaire were concerned with measuring perceived stress, procrastination behaviour and fear of missing out.

Data analysis

Data were analyzed with the use of the program IMB SPSS Statistics 27. Firstly, four participants with a response rate below 60% were deleted. According to Conner and Lehman

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(2012), a response rate of at least 50% is considered to be acceptable in an ESM study. This means that 56 participants were included in the analyses.

A series of Linear Mixed Model (LMM) analyses were performed to answer the research questions. ESM data typically involves missing data and nested observation within individuals. Multilevel models such as LMMs can deal with both missing data and such 'random effects' and variability within respondents and time (Myin-germeys et al., 2018). For all models, participants were set as subjects and time in days as repeated factor. The covariance type AR(1) was used to model the repeated measurements. The AR(1) function uses a progress of autoregressive time series in which these individual random effects and within-individual errors are autocorrelated (Chi & Reinsel, 1989). Furthermore, all LMM analyses were performed using unstandardized (B) and standardized (β) estimates. For unstandardized estimates, the raw data was analyzed. However, standardized estimates can be helpful to interpret and compare the results, especially when different measurement scales are used. Whenever a correlation had a p-value < .05, the results were considered to be statistically significant.

The first LMM analyses were done to explore to what extent trait loneliness (measured once in the baseline questionnaire) and daily averaged state loneliness (measured daily during the morning and evening questionnaires) are slightly measuring the same construct in this study. For this analysis, only the standardized scores were used. Here, state loneliness was set as a dependent variable and trait loneliness as a fixed covariate. A significant weak to medium association of $.30 < \beta > .70$ was expected to be a valid measurement between the two variables.

In the subsequent LMM analyses, state loneliness was considered as a potential consequence and therefore set as the dependent variable with VoD watching behaviour the day before as fixed predictor. The overall association between state loneliness and VoD watching behaviour was analyzed with the variables Hours Watched Yesterday (HWY), Episodes Watched Yesterday (EWY), and Binge-Watching (BW) as fixed covariates and state loneliness as the dependent variable in separate univariate LMM models. Next, the within- and between-person associations were analyzed by disaggregating EWY and HWY into person mean (pm) and person mean centered (pmc) variables (Curran & Bauer, 2011). For the analyses of the between-person associations, a pm variable was created by calculating the mean score for each person over all the time points. For the within-person analyses, a pmc variable was created by subtracting the pm from all individual and time-specific time-varying

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scores. These two variables were simultaneously entered into the LMM analyses as fixed covariates.

To analyze the extent to which trait emotional stability has a moderating effect on the relation between VoD watching behaviour and perceived loneliness as a consequence the next day, several LMM analyses were conducted. Each time, trait emotional stability, one of the indicators of VoD watching behaviour (EWY, HWY, and BW), and their interaction terms were set as fixed covariates. A moderating effect is assumed to occur when the interaction term is significant ($p<.05$).

The potential relationship was also analyzed with state loneliness considered as a predictor of VoD watching behaviour on the same day. For this, a lagged variable (Lag(1)) was created for the watching behaviour to fall on the same day as the reported state of loneliness. The same LMM analyses were done for the overall association, between- and within-person association, and the moderation effect of emotional stability. However, for these analyses, EWY, HWY, and BW were set as dependent variables and lag state loneliness (including pm and pmc loneliness) as fixed covariates. For the analyses of the potential moderation of emotional stability, lag state loneliness, emotional stability and their interaction term were set as fixed covariates.

Results

Participant Characteristics

After screening the data, three participants were removed because they had a response rate below 60%. One participant did not fill in the baseline questionnaire and therefore was removed from the study. Seven participants had a response rate of 100%. The analysis was done with 56 participants, all students. From this sample, the lowest response rate was 72.7%.

The mean age of the sample was 22.2 (SD=1.5) ranging from 20 to 26 years old. The majority of the participants were female (85.7%, n=48). Regarding nationality, almost all participants (94.6%, n=53) were German. Two were from another European country (3.6%), and one was Dutch (1.8%).

From a total of 715 available measurement points, 340 times (44.3%) participants met the definition of binge-watching ($\geq$3 episodes and $\geq$2 hours watched). The mean amount of episodes participants watched in one sitting was almost three (M=2.6, SE=3.7). The maximum amount of episodes in one sitting was 32 (0.3%). Regarding the hours participants watched VoD services, 27 times (3.5%) participants watched for more than 5 hours in one

sitting. The mean score of hours watched the day before was 3.5 (*SE*=1.9), which equals an amount of time of almost 2 hours.

Correlation Between Trait and State Loneliness

To analyze the extent to which baseline trait loneliness and state loneliness are measuring a similar construct in this study, the two variables were compared and analyzed. Figure 1 shows the frequency of the mean levels of loneliness as a trait, as the participants indicated in the baseline questionnaire. On average, the participants reported they rarely feel lonely (*M*=2.3, *SD*=0.6). No participant indicated feeling lonely all the time; the highest mean score for trait loneliness was 3.8 (*n*=2), which can be translated to feeling lonely often.

Figure 1

Mean levels of one-time measured trait loneliness (n=56)
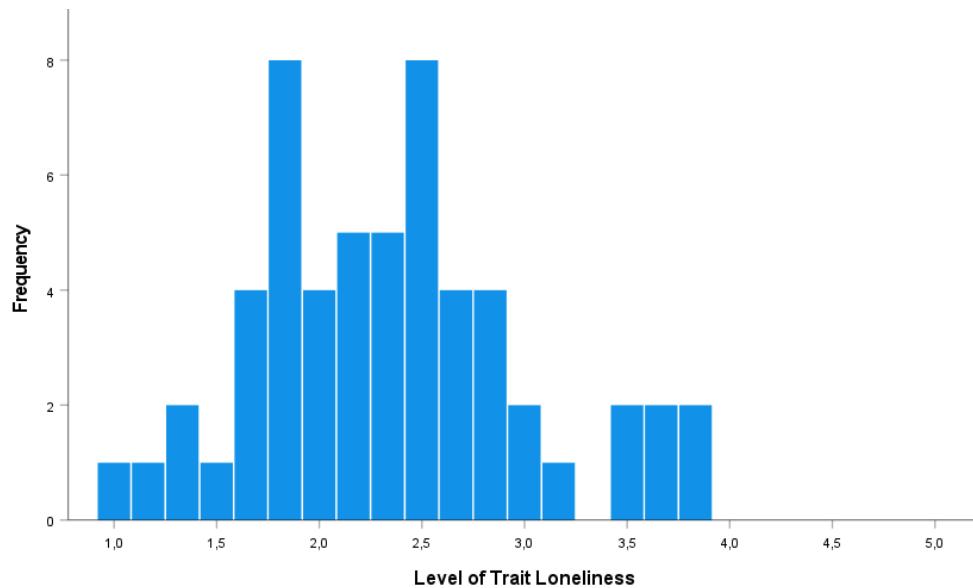
Over fourteen days, twice a day, the participants had to indicate their current level of perceived loneliness. The total frequency of the mean daily level of (state) loneliness of all participants over those fourteen days is displayed in Figure 2. The figure shows that the scores were severely right-skewed, indicating that participants did not feel lonely on most measurement occasions. The mean score on state loneliness over all time points was 1.8 (SE=0.9), which equals a low level of loneliness. Only five times a participant reported a daily mean score of 5 (feeling lonely very much).

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Figure 2

The total frequency of daily level of (state) loneliness over 14 days
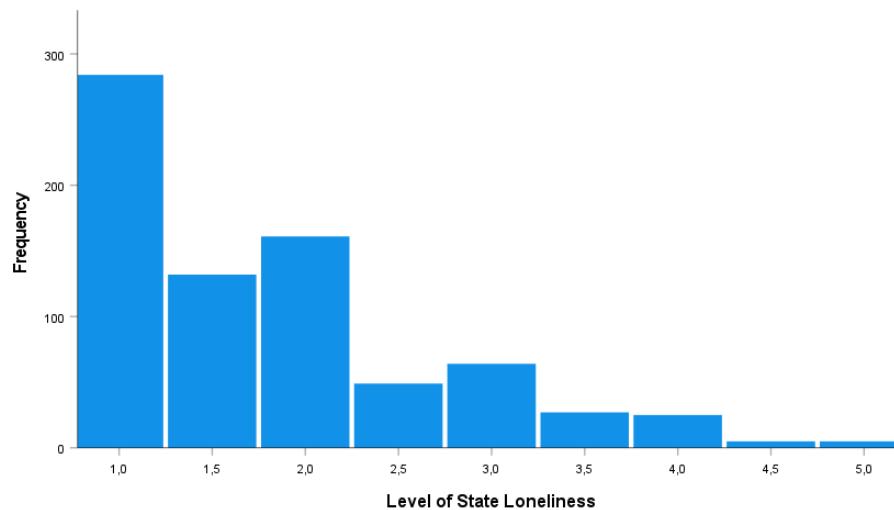
The LMM analysis showed that there was a significant small positive relationship between trait and state loneliness (β =.21, *SE* =.07, *p*<.01). This indicates that trait and state loneliness measure significantly related but also different constructs in this study.

Association Between State Loneliness and VoD Watching Behaviour

Next, the overall and the disaggregated between-person and within-person associations between state loneliness and VoD watching behaviour were tested. Besides using the created dichotomous variable of binge-watching, the association was also analyzed using the continuous number of hours watched and episodes watched the day before. All LMM analyses were done with both state loneliness as a consequence the day after and as a predictor (with lagged analyses) on the same day as watching VoD services.

In figure 3, the estimated standardized mean scores of state loneliness, binge-watching, hours, and episodes watched the day before are displayed over a time of fourteen days. The highest mean score of state loneliness was on day 4 (*M*=2.0; *SE*=0.1). That same day also showed one of the highest mean scores for binge-watching (*M*=0.6; *SE*=0.1). Furthermore, the highest mean score of the hours that participants watched VoD services was on day 3 (*M*=4.1 *SE*=0.3). This corresponds with VoD watching for slightly longer than two hours.

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Figure 3

Mean scores of the level of loneliness, episodes and hours watched VoD yesterday, and binge-watching over time (14 days)
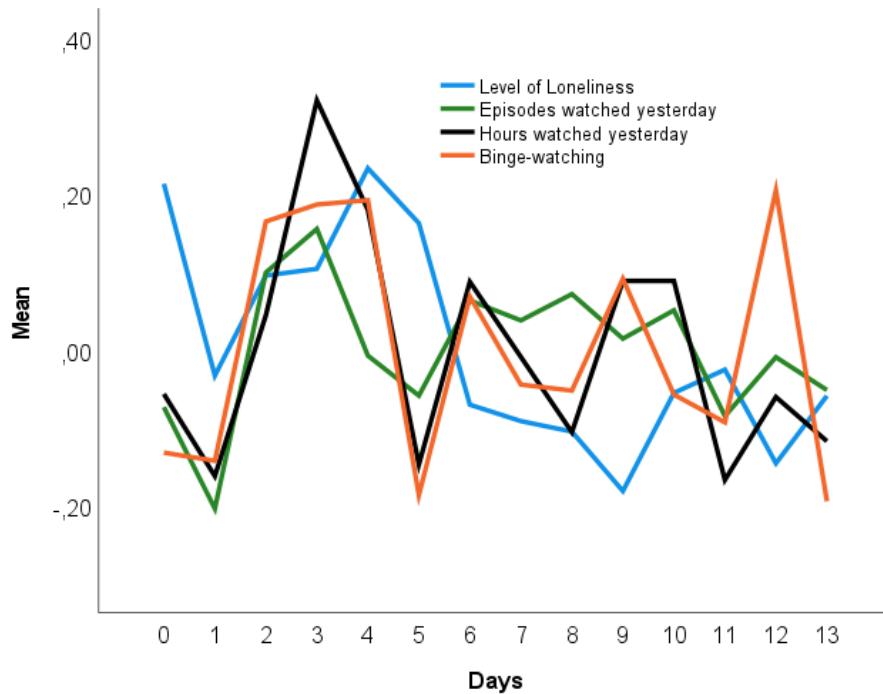
Note. Mean scores are displayed in standardized scores.

Loneliness as a Consequence of VoD Watching Behaviour the Next Day

The LMM analyses for the overall association showed no statistically significant relationship between state loneliness and HWY, EWY, and binge-watching the previous day. Therefore, VoD watching behaviour was not significantly associated with levels of state loneliness the next day. The results are displayed in Table 1.

Table 1

Linear Mixed Model analyses of State loneliness the Day After VoD Watching Behaviour

Fixed Covariate	*B* (95% *CI*)	β (95% *CI*)	*t*(df)	*p*
Hours Watching Yesterday	-0.00 (-0.05 to 0.05)	-.00 (-.10 to .10)	-0.03(594.95)	.98
Episodes Watched Yesterday	0.00 (-0.03 to 0.03)	.00 (-.11 to .11)	0.04(704.93)	.97
Binge-watching	0.05 (-0.10 to 0.20)	.03 (-.06 to .11)	0.62(593.24)	.54

Note. Dependent variable is State Loneliness. *B* stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

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To answer the research question of the extent to which there is a between- or within-person association between perceived loneliness as a consequence of VoD watching behaviour, the analyses were conducted with the person-mean and person-mean centered variables of both the hours and the number of episodes of VoD watching the day before. As presented in Table 2, the results did not show any statistically significant associations at either the between-person or within-person level for both hours and episodes watched. This indicates that there was no significant evidence found that participants who watched more hours or episodes on average than others reported higher levels of loneliness the next day. It also means that there was no significant evidence found that a participant who watched more hours or episodes on VoD services than they did on average reported a higher level of loneliness the next day.

Table 2

Linear Mixed Model Analyses of Disaggregating Between- and Within-person Associations of State Loneliness a Day After the Hours Watched and the Episodes Watched VoD Services

Fixed Covariate	B (95% CI)	β (95% CI)	t(df)	p
Hours Watched Yesterday PM (Between-person)	0.04 (-.08 to .16)	.05 (-.10 to .20)	0.67(96.22)	.50
Hours Watched Yesterday PMC (Within-person)	0.01 (-0.02 to 0.04)	.02 (-.03 to .06)	0.61(563.15)	.54
Episodes Watched Yesterday PM (Between-person)	-0.02 (-0.07 to 0.03)	-.05 (-.20 to .10)	-0.76(94.53)	.50
Episodes Watched Yesterday PMC (Within-person)	0.01 (-0.01 to 0.03)	.02 (-.03 to .08)	0.93(598.98)	.35

Note. Dependent variable is State Loneliness. B stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

Loneliness as a Predictor of VoD Watching Behaviour the Next Day

LMM analyses were done with state loneliness as a predictor of VoD watching behaviour on the same day. Table 3 shows the results of these analyses. State loneliness was similarly weak but statistically significant associated with binge-watching, hours, and episodes watched on the same day. This implies that an increasing level of loneliness had a significant small increasing effect on VoD watching behaviour.

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Table 3

Linear Mixed Model Analyses of State Loneliness on the Same Day as VoD Watching Behaviour

Dependent variable	*B* (95% *CI*)	β (95% *CI*)	*t*(df)	*p*
Hours Watched	0.22 (0.03 to 0.42)	.10 (.01 to .19)	2.24(518.62)	.03
Episodes Watched	0.40 (0.11 to 0.69)	.10 (.03 to .17)	2.67(647.03)	.01
Binge-watching	0.06 (0.01 to 0.10)	.10 (.01 to .19)	2.21(479.82)	.03

Note. Fixed covariate is Lag State Loneliness. *B* stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

The results for the between- and within-person associations between state loneliness as a predictor of the hours and number of episodes watching VoD services are displayed in Table 4. It showed no statistically significant relationship for the between-person associations. This means that respondents with higher levels of loneliness on average than others, did not watch VoD services longer or watch more episodes at different time points. However, the results did show a small positive statistically significant relationship for the within-person associations with both hours watched and episodes watched. This indicates that participants who reported higher levels of loneliness than they normally do on average watched slightly longer or more episodes of VoD services that same day.

Table 4

Linear Mixed Model Analyses of Disaggregating Between-person (BP) and Within-person (WP) Associations Between State Loneliness the Same Day as the Hours Watched and Episodes Watched VoD Services

Dependent variables	*B* (95% *CI*)	β (95% *CI*)	*t*(df)	*p*
Hours watched (BP)	0.12 (-0.22 to 0.45)	.04 (-.07 to .15)	0.68(153.75)	.50
Hours watched (WP)	0.28 (0.04 to 0.52)	.09 (.01 to 16)	2.29(633.84)	.02
Episodes watched (BP)	-0.22 (-1.09 to 0.64)	-.04 (-.19 to .11)	-5.51(103.05)	.61
Episodes watched (WP)	0.48 (0.17 to 0.79)	.08 (.03 to .13)	3.01(562.98)	<.01

Note. Fixed covariate is Lag State Loneliness PM and PMC. *B* stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

Moderating Effect of Emotional Stability

Table 5 displays the results of the moderation effects of trait emotional stability on state loneliness as a consequence of VoD watching behaviour on the same day. There were no

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statistically significant interactions found with HWY, EWY, and binge-watching. As displayed in Table 6, the moderation effect with state loneliness as a predictor of VoD watching also did not show any statistically significant interactions. Based on the results displayed in Tables 5 and 6, it appears that there is no significant evidence that trait emotional stability has a moderating effect on the association of VoD watching behaviour and state loneliness (both as consequence and predictor).

Table 5

Linear Mixed Model Analyses of the Moderation Effect of Trait Emotional Stability (ES) on the Association Between State Loneliness the Day After VoD Watching Behaviour

Fixed Covariate	*B* (95% *CI*)	β (95% *CI*)	*t*(df)	*p*
ES*Hours Watched yesterday	0.01 (-0.03 to 0.04)	.01 (-.05 to .07)	0.29(623.99)	.77
ES*Episodes Watched Yesterday	0.02 (-0.01 to 0.05)	.06 (-.04 to .16)	1.19(637.76)	.23
ES*Binge-watching	0.01 (-0.12 to 0.14)	.00 (-.05 to .06)	0.17(629.91)	.86

Note. B stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

Table 6

Linear Mixed Model Analyses of the Moderation Effect of Trait Emotional Stability on the Association Between State Loneliness on the Same Day as VoD Watching Behaviour

Dependent variable	*B* (95% *CI*)	β (95% *CI*)	*t*(df)	*p*
Hours Watched	0.19 (-0.06 to 0.44)	.07 (-.02 to .16)	1.48(528.50)	.14
Episodes Watched	-0.03 (-0.41 to 0.35)	-.01 (-.08 to .07)	-.16(637.90)	.88
Binge-watching	0.05 (-0.01 to 0.11)	.07 (-.02 to .16)	1.55(492.04)	.12

Note. Fixed covariates are Lag Loneliness and trait Emotional Stability. *B* stands for the unstandardized estimates, β for the standardized estimates, both with a 95% Confidence Interval.

Discussion

This post hoc study aimed to explore in more detail the association between perceived loneliness and VoD watching behaviour over time among students. The results showed that VoD watching behaviour was not significantly associated with levels of perceived loneliness among students the next day. However, higher levels of perceived loneliness were significantly associated with a small increase in VoD watching behaviour on the same day.

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Further explorations of this association indicated that this was mostly driven by a within-person relationship, meaning that participants that reported feeling more lonely than their average also tended to watch slightly more that day. The personality trait emotional stability had no significant moderation effect on the relationship between perceived loneliness and VoD watching behaviour.

It was first examined to what extent the daily measured state loneliness item was measuring a similar construct as one-time measured trait loneliness. It was assumed that participants with a higher level of trait loneliness would also report higher levels of state loneliness during the study (Roekel et al., 2018). Despite the results showing a positive significant correlation between the variables over time, the strength of this association was remarkably weak. Therefore, it can be assumed that state loneliness over time slightly measures a construct related to trait loneliness but also something else. Hence, equating the two variables would not be justified. This may also mean that the conceptualization of state loneliness in this study is not totally clear. However, earlier research also showed weak correlations between state and trait-like variables (Cupach & Spitzberg, 1983; Porter et al., 1999) indicating that these are indeed measuring other things too. Since this ESM study measured in-moment loneliness over a longer period of time, it can provide other insights into the experiences of loneliness and its association with other variables than with one-time measured trait loneliness. Furthermore, assessing the feelings of loneliness in the moment instead of remembering them from the past period decreases the chance of recall bias (Van den Bergh & Walentynowicz, 2016). This makes the results of this study potentially more reliable. To further check the validity of the single-item state loneliness scale it may be helpful to include a short multi-item scale for state loneliness in the study in future research.

Due to the intensive ESM data collected during this study, it was possible to analyze the relationship between VoD watching and perceived loneliness in more detail. This allowed analyses of the temporal direction of a possible relationship between the variables and the possible between- and within-person relationships. Earlier research has suggested that perceived loneliness can be a result of social isolation due to excessive VoD watching behaviour (Starosta et al., 2020). In contrast, Mezielis (2021) concluded in her study that increased VoD watching did not significantly relate to higher levels of perceived loneliness the next day. The results of this current study complement the statement of Mezielis. For both the overall associations as well as on the disaggregated within- and between-person level associations, this study found no significant evidence that increased VoD watching behaviour among students is associated with an increase or decrease in their perceived loneliness the

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next day. However, the results also showed that the majority of this small sample reported low levels of perceived loneliness and that there were only a few times when respondents reported higher levels. It is expected that the outcome would be different with a larger sample with respondents that feel lonely more often.

In contrast to cross-sectional studies, ESM studies allow the identification of predictors and consequences because the data is collected over a longer period of time, rather than at a single point in time. With the use of lagged analyses, the association of perceived loneliness as a predictor of VoD watching behaviour on the same day was also analyzed on both the between- and within-person level. Multiple studies have stated that feelings of loneliness could lead to an increase in VoD watching behaviour (Starosta et al., 2019; Mezielis, 2021). This current study supports these findings since the results showed a similar weak but significant positive relationship between perceived loneliness and both the different indicators of VoD watching behaviour (hours and episodes watched). After exploring this in more detail, it was found that the relationship only occurred on the within-person level, not on the between-person level. This means that students who reported feeling more lonely than they did on average tended to watch slightly more and longer VoD services. According to earlier research, concerns about people's physical and mental health are growing due the increasing VoD viewing behaviour (Flayelle et al., 2019). Several studies have explored the predictors of this behaviour (Panda & Pandey, 2017; Starosta et al., 2019). However, it is not clear to what extend VoD watching actually has a negative effect on people's health. For instance, VoD watching might be a positive coping mechanism to deal with feelings of loneliness. In addition, other studies indicated that confirmatory research is often conducted in which it is assumed that excessive VoD watching behaviour has a negative effect on people's health, but not enough evidence has proven that yet (Flayelle et al., 2019). This current study did also not provide evidence for this effect. Therefore, it is recommended to further explore the potential positive or negative effects of VoD watching behaviour in future research.

Since other studies showed that emotional stability was correlated with both loneliness and with VoD watching behaviour (Starosta et al., 2019; Cacioppo et al. 2016), it was also explored to what extent it may moderate the relationship between those two variables. However, with loneliness considered both as either a consequence and a predictor of VoD watching behaviour, no significant moderation effects of emotional stability were found. Therefore, this study suggests that the level of trait emotional stability does not influence the strength or direction of the relationship between VoD watching and perceived loneliness over time among students. However, it should be noted that this outcome may have been severely

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underpowered for detecting a moderation effect. As common in an ESM study, this study used a small sample size. According to Hsiao and Lai (2018), the power of a moderation effect analysis increases with a larger sample size. Therefore, the outcomes of this current study for the moderation effects may be less precise than when a larger sample size was used. Thus, unless a moderation effect is very strong already, it is difficult to find this in an ESM study. For future research, it would be interesting to investigate the potential moderation effect of trait emotional stability on the association between state loneliness and VoD watching behaviour with a larger sample size.

Conclusion

Based on this research, it can be concluded that students who are more lonely than they are on average are more likely to slightly increase their VoD watching behaviour that same day. The personality trait emotional stability does not play a moderating role in this relationship. Furthermore, no significant relationships were found between VoD watching behaviour and perceived loneliness the next day among students. Overall, the results have shown that there is little to no relationship between VoD watching behaviour and momentary feelings of loneliness. For this study, state loneliness was repeatedly measured using a single-item scale that weakly correlates with a one-time measured multi-item scale for trait loneliness. Future research may focus on exploring to what extend VoD watching actually has a negative effect on the physical and mental health of young people, using a large sample size.

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Appendix A

Demographics Questionnaire

Thank you for participating in our study and welcome to your first questionnaire 😊 With this questionnaire we want to gain some information about you and your background - no worries, just some casual facts. Have fun filling it out!

PS: concerning the whole study coming up: please try to fill out the questionnaires on time! You will receive reminders so you won't forget it since we know how easily that can happen. Still, if it happens that you forget to fill out one questionnaire that is okay, please just continue with the next ones, so we can still use the data! Thank you 💜

1. What is your age?

2. What is your gender?
a. Female
b. Male
c. Diverse
d. Wish not to disclose
3. What is your nationality?
a. German
b. Dutch
c. Other European
d. Non-European
4. What is your occupation?
a. Pupil
b. Student
c. Apprentice
d. Part-time employee
e. Full-time employee
f. Unemployed
g. Self-employed
h. Other
5. Which streaming services are you using? (multiple answers possible)
a. Netflix
b. Amazon Prime
c. Disney+
d. TVNow
e. Joyn

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f.   Youtube

g.   Sky

h.   Hulu

i.   Maxdome

j.   Dazn

k.   Other

l.   I do not use streaming services

Great work! Thank you for your information, if you have a couple more minutes, please take a look at the baseline measurement. Thank you!

Reminder:

Tell us something about you!

Please fill out your first short questionnaire about your background

Baseline questionnaire

Please fill out this questionnaire! Thank you!

This questionnaire only needs to be filled out once. We know this one is a bit longer than the others (it will take you around 10 minutes to fill it out) but please take your time and answer as honestly as possible. The daily questionnaires will take you way less time to fill out, we promise! 😊

1.   In the last month, how often have you been upset because of something that happened unexpectedly? a.   Never

b.   Almost never

c.   Sometimes

d.   Fairly often

e.   Very often

2.   In the last month, how often have you felt that you were unable to control the important things in your life? a. Never

b.   ...

3.   In the last month, how often have you felt nervous and "stressed"?

a.   Never

b.   ...

4.   In the last month, how often have you felt confident about your ability to handle your personal problems? a.   Never

b.   ...

5.   In the last month, how often have you felt that things were going your way?

a.   Never

b.   ...

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6. In the last month, how often have you found that you could not cope with all the things that you had to do? a.   Never

        b.   ...

7. In the last month, how often have you been able to control irritations in your life?

a. Never

b. ...

8. In the last month, how often have you felt that you were on top of things?

a. Never

b. ...

9. In the last month, how often have you been angered because of things that were outside of your control? a.   Never

        b.   ...

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

a. Never

b. ...

11. I am relaxed most of the time

a. Very accurate

b. Moderately accurate

c. Neither inaccurate nor accurate

d. Moderately inaccurate

e. Very inaccurate

12. I seldom feel blue

a. Very accurate

b. ...

13. I get stressed out easily

a. Very accurate

b. ...

14. I worry about things

a. Very accurate

b. ...

15. I am easily disturbed

a. Very accurate

b. ...

16. I get upset easily

a. Very accurate

b. ...

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17. I change my mood a lot

a. Very accurate

b. ...

18. I have frequent mood swings

a. Very accurate

b. ...

19. I get irritated easily

a. Very accurate

b. ...

20. I often feel blue

a. Very accurate

b. ...

Please indicate now, how often do you experience the following feelings:

23. There are many people I can trust completely.

a. None of the time

b. ...

24. I miss having people around.

a. None of the time

b. ...

25. There are enough people I feel close to.

a. None of the time

b. ...

26. I often feel rejected.

a. None of the time

b. ...

27. I fear others have more rewarding experiences than me.

a. Not at all true of me

b. Slightly true of me

c. Moderately true of me

d. Very true of me

e. Extremely true of me

28. I fear my friends have more rewarding experiences than me

a. Not at all true of me

b. ...

29. I get worried when I find out my friends are having fun without me.

a. Not at all true of me

b.   ...

30. I get anxious when I don't know what my friends are up to.

a.   Not at all true of me

b.   ...

31. It is important that I understand my friends "in jokes".

a.   Not at all true of me

b.   ...

32. Sometimes, I wonder if I spend too much time keeping up with what is going on.

a.   Not at all true of me

b.   ...

33. It bothers me when I miss an opportunity to meet up with friends.

a.   Not at all true of me

b.   ...

34. When I have a good time it is important for me to share the details online.

a.   Not at all true of me

b.   ...

35. When I miss out on a planned get-together it bothers me.

a.   Not at all true of me

b.   ...

36. When I go on vacation, I continue to keep tabs on what my friends are doing.

a.   Not at all true of me

b.   ...

You are almost done! Just a few questions more ▨

37. I am good at resisting temptations

a.   Not at all like me

b.   Not like me

c.   Neutral

d.   Like me

e.   Very much like me

38. I have a hard time breaking bad habits

a.   Not at all like me

b.   ...

39. I am lazy

a.   Not at all like me

b.   ...

40. I say inappropriate things

a.   Not at all like me

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b.   ...

41. I do certain things that are bad for me, if they are fun

a.   Not at all like me

b.   ...

42. I refuse things that are bad for me.

a.   Not at all like me

b.   ...

43. I wish I had more self discipline

a.   Not at all like me

b.   ...

44. People would say that I have iron self discipline

a.   Not at all like me

b.   ...

45. Pleasure and fun sometimes keep me from getting work done

a.   Not at all like me

b.   ...

46. I needlessly delay finishing jobs, even when they're important.

a.   Disagree

b.   Slightly disagree

c.   Neither disagree nor agree

d.   Slightly agree

e.   Agree

47. I postpone starting in on things I don't like to do.

a.   Disagree

b.   ...

48. When I have a deadline, I wait until the last minute

a.   Disagree

b.   ...

49. I delay making tough decisions.

a.   Disagree

b.   ...

50. I keep putting off improving my work habits.

a.   Disagree

b.   ...

51. I manage to find an excuse for not doing something.

a.   Disagree

b.   ...

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52. I put the necessary time into even boring tasks, like studying.

a. Disagree

b. ...

53. I am an incurable time waster.

a. Disagree

b. ...

54. I'm a time waster now but I can't seem to do anything about it.

a. Disagree

b. ...

55. When something's too tough to tackle, I believe in postponing it.

a. Disagree

b. ...

56. I promise myself I'll do something and then drag my feet.

a. Disagree

b. ...

57. Whenever I make a plan of action, I follow it.

a. Disagree

b. ...

58. Even though I hate myself if I don't get started, it doesn't get me going.

a. Disagree

b. ...

59. I always finish important jobs with time to spare.

a. Disagree

b. ...

60. I get stuck in neutral even though I know how important it is to get started.

a. Disagree

b. ...

61. Putting something off until tomorrow is not the way I do it.

a. Disagree

b. ...

YOU DID IT! We are proud of you, thank you so much for giving us your time 💟 See you again for the daily measurements and like we said, those are not as long as this questionnaire so please keep filling them out 😊 Reminder: Please fill out the Baseline Questionnaire!

This one will take a bit longer than the others, still it would be great if you fill it out timely!

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Appendix B

Morning Questionnaire

We wish you a wonderful morning

Please take a moment to reflect and fill out this short questionnaire!

1. How **long** did you watch VOD services **yesterday**?

(If you did not watch a full hour, please just round up/off - e.g., if you watched more than 1 hour and 30 minutes please indicate 2 hours)

a. I did not watch
b. Less than 1 hour
c. 1 hour
d. 2 hours
e. 3 hours
f. 4 hours
g. 5 hours
h. More than 5 hours

2. How many **episodes** did you watch **yesterday**? (please set the number to 0 if you did not watch any episodes and please count all movies/documentaries you watched also as episodes)

. At   **ti**   did you start watching video   demand content **yesterda**

Multiple answers possible

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. - 6 a.m.)
e. I did not watch VOD services

4. What were your **reasons** for watching? (multiple answers are also possible)

a. Entertainment
b. Boredom/nothing else to do
c. Stress
d. Interest/curiosity
e. Escape from reality
f. Escape from reality/Distraction
g. Peer activity (watching with friends/family)
h. Procrastination/Avoidance of responsibilities

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i. Information seeking
j. Relaxation/Taking a break
k. Loneliness
l. Other

I did not watch

. How many **hou** did **sleep approximately**

+

7

−

. Last night, how would you rate your**quality of sleep**

Very bad   Very good

5

. Did you eat a snack yesterday**after dinnertime**

a.   Yes
b.   No
c.   I cannot remember

8. If you ate a snack yesterday during the evening, which **type(s) of snack(s)** did you eat? (Multiple answers possible)

a.   Chocolate, candy, cake, ice cream or something similar
b.   Chips, flips or something similar
c.   Fruit or vegetables or something similar
d.   Crackers, nuts, yogurt or something similar
e.   Other
f.   I cannot remember
g.   I did not eat a snack

What is your **current stress level**

not stressed   extremely
at all   stressed

5

Ho **lon** do you feel at the moment?

a.   Not at all
b.   Only a little

  c. To some extent
  d. Rather much
  e. Very much

That's already all we needed from you for now, see you in the evening.

Have a nice day! 💜 Remider:

Please fill out the morning questionnaire

Sleepyhead you there? We are waiting for your responses 😋

Appendix C

Evening assessment
Hello there again,

We hope you had a great day. Now it is time for your evening questionnaire! Please take a short moment and fill it out
✨

 1. What is your **current stress level**?

not stressed at all	extremely stressed
	5

 2. I intentionally **delayed a task today** that is personally important to me, although it was unreasonable to put this task off.
  a. Disagree
  b. Slightly disagree
  c. Neither disagree nor agree
  d. Slightly agree
  e. Agree

 3. What **kind of planned task** did you delay?
  a. Household (doing the dishes, cleaning the bathroom etc.)
  b. Work (projects, phone calls, protocols etc.)
  c. Education (learning for exam, preparation for lesson etc.)
  d. Leisure activity (exercise, socializing, hobbies etc.)
  e. Other
  f. I did not delay any tasks

 4. How **lonely** do you feel at the moment?

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a. Not at all
b. Only a little
c. To some extent
d. Rather much
e. Very much

5. Do you experience the **fear of missing out**?

extremely
not true of me   true of me

2
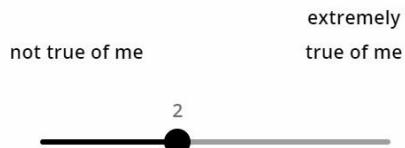
That's already everything we need from you right now.   Have a good night, we will see you tomorrow in the morning

eminder

Are you forgetting something? Please fill out the evening questionnaire!

Tick tock - the time is running out ⏰ Take a short moment to fill out the questions

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