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Mood as a predictor of Video-on-demand watching and the moderating influence of the personality trait of Introversion:
An experience sampling study

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Abstract

Background. Due to the world's technological development, the use of online streaming services has become dominant in people's daily TV watching routines. This usage often ends up in the new behavioural phenomenon of binge-watching, especially among young people such as students. There is a need for research in the factors that motivate this common watching behaviour. Based on a qualitative study that suggested a possible relationship between mood and binge-watching, this study examined whether a positive mood or a negative mood does indeed predict binge-watching. In an experience sampling study (ESM) this association was investigated in participants' daily lives. Furthermore, it was researched whether the personality trait of introversion acts as a moderator on the relationship of interest.

Method. The study was completed by 45 participants aged 20-56 who were recruited by convenience sampling through social contacts. They took part in a two-week study where they were required to use a mobile application to complete daily questionnaires. At the beginning, they were asked to answer questions regarding their personality once and then to indicate their watching behaviour of the previous day daily and about their current mood three times a day.

Results. A series of linear mixed model analyses showed that a positive mood had a significant negative relationship with the number of episodes of video on demand watched that day but no significant relationship with the number of hours watched. Individual positive emotions of enthusiasm and cheerfulness had a significant negative relationship with the number of hours watched, while the emotion of self-assuredness had a significant positive relationship with the watching time. Negative mood was significantly positively related to the number of hours watched, but not with the number of episodes watched. Furthermore, the trait of introversion displayed no significant moderation effect on the relationship between a positive mood/ negative mood and binge-watching.

Conclusion. Individuals in a positive mood tended to watch less of Video-on-demand content. In contrast, individuals experiencing a negative mood watched more Video-on-demand content. Interestingly, it was found that the positive emotion of self-assuredness also predicts the watching of more Video-on-demand content whereas cheerfulness and enthusiasm predict a decrease in the usage of it. Finally, findings suggest that the personality trait of introversion does not influence the relationship of mood (positive and negative) and binge-watching.

Introduction

Imagine yourself coming home after a very long working day and your thought goes only about relaxation and chill. You decide to sit yourself down in front of the television to start watching the new series of “Stranger Things” all your friends are talking about. Up to midnight you watched through half a season and you still feel your temptation to stay awake to finish just *one more* episode even though you know that you will regret the next morning when your alarm is going. “361,000 people watched all nine episodes of the second season of 'Stranger Things' in the first 24 h on the first day it was released.” (Wetmore, 2018). The behaviour that the 361,000 Stranger Things watchers and you experienced might be familiar as binge-watching.

Binge-watching, like any over-consumption behaviour, can emerge from easy accessibility as it’s often the case in food and alcohol habits which may end up in bingeing as well (Samuel, 2017; Trouleau et al., 2016). Regarding binge eating, the DSM III R definition describes bingeing as a rapid consumption of food in a short period of time (Ballard, Mohan, Mcgibben, Kurian, & Silveira, 1992). Applying this conceptualization to video on demand (VOD) services, binge-watching gets predominantly referred to as “the experience of watching multiple episodes of a program in a single sitting” (Pitman & Sheehan, 2015; Flayelle, Canale, Vögele, Karila, Maurage, & Billlieux, 2019; Samuel, 2017). However, this definition is arbitrary since it is not concrete in the number of episodes and disregards the duration. Rather, Davis (2016) defined binge-watching as “two to six episodes of the same show in one sitting” but Merrill and Runbenking (2019) conceptualized it as watching three or more episodes in one sitting. However, both still miss out on a threshold to the typical length of the show which makes their definitions causing some problems (Davis, 2016). Davis’s (2016) definition already classifies a user watching two episodes each 20 minutes or two Youtube videos each eight minutes as engaging in binge-watching although s/he is only watching 16 minutes in total. Further, since they do not mention the hours spent viewing, it is a debatable point whether watching a movie, which lasts 90 minutes on average, is binge-watching as well then or not since the movie is played consistently similar to one episode. Therefore, determining whether someone behaves in binge-watching by only using the number of episodes is not very appropriate, but there does not exist a concrete solution for this definition problem until now (Shim et al., 2018). Since 2017, mainly journalists compete with which definition fits best. Pierce-Grove queried whether the number of episodes watched, or the hours

spent watching TV, conceptualizes binge-watching (Samuel, 2017). However, regarding this quantity-based index, recent studies recommended the usage of the watching time only (Shim et al, 2018; Vaterlaus et al., 2018). This recommendation is supported by Walton-Pattison, Dombrowski, and Preasseau (2018) but they also suggested that a definition should include both the "cut-offs of time and/or the number of episodes" from which one could draw different benefits. Considering these recommendations this research will concern the watching time as a good indicator to measure binge-watching and its predictors since there still exists ambiguity and debate about how to conceptualize it. Therefore, in this study binge-watching will be defined as watching more than three hours of VOD services in a single sitting (Horvath, Horto, Lodge, & Hattie, as cited by Flayelle et al., 2019).

Binge-watching is a new behavioural phenomenon that was almost Oxford's "Word of the Year" in 2013 according to Michelle Obama (Pittman & Sheehan, 2018). The relatively new behavioural trend is the outcome of the world's technological development and its resulting advent of technological devices such as the incorporation of broadcast TV, computer/laptop, tablets, phones, and online streaming websites in the people's environment (Merrill & Runbenking, 2019; Steiner & Xu, 2018a). According to Mikos (2016), the internet as an additional media gets increasingly more attention since the internet connection got faster and more reliable which in turn causes classical linear TV to become a secondary medium and online offerings such as video-on-demand (VOD) platforms or Web-TV to become the primary medium (Netflix, 2018). Already in 2013, 63% of households in the US used several video streaming services, and especially among young people the use of streaming websites is dominating in comparison to the older generation (Matrix, 2014; Riddle, Peebles, Davis, & Schroeder, 2017).

VOD services such as Netflix, Amazon Prime Video, and YouTube count as the most popular ones. This is, for instance, seen by the increase in the user rate of Netflix from 50 countries in 2010 to 190 countries in 2017 to today being a VOD service in every country (Brennan, 2018). It is said that their various offers in films, series, and TV shows account for their popularity (Mikos, 2016; Ahmed, 2017). Further essential characteristics are that a user can watch at any time and anywhere without getting disturbed by any advertisement in-between. Especially crucial is that the watcher gets the autonomy to decide how much s/he wants to watch at that moment (Mikos, 2016; Feeny, 2014; Netflix, 2018; Trouleau, Ashkan, Ding, & Eriksson, 2016; Granow, Reinecke, & Ziegele, 2018). In the past, TV stations released new episodes once a week which resulted in

consumption behaviour of one-at-a-time. However, now with the invention of VOD users are confronted with a massive availability and easy access to full seasons of television episodes at once which simplifies binge-watching. This is supported by Matrix (2014) who stated, "When all episodes of a session were released simultaneously, these shows inspired widespread marathon-viewing sessions for the 18-34 age demographic and among the younger audiences of Netflix, many of whom binge-watched". Additionally, the user can continue watching the next episode of the same season because of the post-play which means that it gets played automatically after five seconds when s/he finished an episode (Matrix 2014; Merrill & Rubenking, 2019). Especially, because a season often provides a coherent story starting in the first and ending in the last episode in which the user gets immersed, s/he gets tempted to watch *"just one more episode*" because of the generated suspense (Merrill & Rubenking, 2019; Walton-Pattison et al., 2018). Finally, several internet sites and articles promote binge-watching by providing their readers with information about how to create the best binge-watching experience (Govaert & Rangarajan, 2014). All these mentioned factors encourage an individual ending up in the mentioned behavioural pattern to watch multiple TV episodes or even an entire season in a single sitting (Trouleau et al., 2016).

Apparently, VOD services simplify the occurrence of binge-watching, recognized by the prevalence rates. In America already 73% of Americans engage in it on a regular basis for five hours or by watching six episodes in one sitting (Shim et al., 2018). This is also seen in American kids who spent billions of minutes watching the Disney television programming content of VOD services (Matrix, 2014). However, college students have the highest binge-watch rates for a longer time period than others do which makes them the most common age group that engages in intense and consecutive consumption of series. (Merrill & Rubenking, 2019). Another study supports this statement as they found that students engage in binge-watching with a mean of 1.42 days a week (Walton-Pattison et al., 2018). On average, a daily watching behaviour of two hours and 55 minutes per person arose worldwide which is the new television viewing style that gets practiced and became a daily habit in many people (Benoit, 2019).

Given that binge-watching refers to the viewing of VOD services for several hours, individuals often end up procrastinating other things since they rather spend the time watching (Starosta, Izydorczyk, & Lizinczyk, 2019). While viewers engage in binge-watching, it is assumed that they often lay down on the sofa or generally decrease their physical activity while watching a series. Vioque, Torres, and Quiles (2000) tested adults and found that hours spent watching

television are related to obesity, however, independently of physical activity. This means that binge-watching acts as sedentary behaviour with adverse health outcomes regardless of physical activity. Further negative health outcomes would be that an adult's mental health or well-being gets poorer through an excess of watching TV (Trembely, Colley, Saunders, Healy, & Owen, 2010; Frey, Benesch, & Stutzer, 2007). Depression and physical and chronic fatigue might arise after intensive and consecutive consumptions of series in a single sitting (de Feijter, Khan & can Gisbergen, 2016; Flayelle et al., 2019). Besides the potential consequences on the health status, binge-watching has also other negative outcomes such as higher levels of anxiety and lower self-control (Frey et al., 2007).

The reason why binge-watching got a common phenomenon in individuals may lie in the enjoyable experience that they are exposed to when watching satisfying television content (Merrill & Rubenking, 2019). The enjoyable experience of binge-watching might convert into a reward for individuals which in turn might positively affect an individual by its encouragement to first complete a task and to reward her/himself with binge-watching afterward (Merrill & Rubenking, 2019). Therefore, the memory of the enjoyable experience when watching a VOD service and the attribution of VOD-services as a reward can act as a predictor of binge-watching. As a further predictor, they found out that not lower self-control but lower self-regulation predicts binge-watching in its frequency and duration which is underlined by a positive relationship between self-regulation deficiencies and more binge-watching (Merrill & Rubenking, 2019; Rubenking, Bridget, Bracken, Sandoval, & Rister, 2018, Sung, Yoon, Kan, & Lee, 2015). Self-regulation refers to the action of setting a goal and regulating one's behaviour in order to achieve this goal. An individual low in self-regulation may delay the primary task such as an academic task to achieve the set goal of a high grade, for example, and rather engage in the secondary task of binge-watching (Merrill & Rubenking, 2019). In turn, other researchers indicated low self-control as a motivator for binge-watching, but also escapism, engagement, positive emotions, dependency, and pleasure-preservation (Flayelle et al., 2019; Pena, 2015). Furthermore, the desire to pass time, social interaction, entertainment, information, habit, and hedonism are associated with the overconsumption behaviour (Pittmann, & Sheehan, 2015; Sung, Kang, & Lee, 2015). As these studies generally concerned cross-sectional surveys it is important to mention that these predictors only associate with binge-watching but no conclusions about causality or the actual predictive nature of these associations can be made.

Next to surveys, Steiner and Xu (2018b) conducted qualitative semi-structured interviews. Here results displayed that a sense of completion, relaxation, improved viewing experience, cultural inclusion, and catching up to others in their social group who have seen more of the show were important motivators for binge-watching. In another exploratory study, Gangadharbatla, Ackerman, and Bamford (2019) conducted a qualitative focus group in which recruited participants had to discuss binge-watching over 60 minutes. Analyses and results displayed that seven antecedents of "family, friends, relaxation, procrastination, entertainment, addiction, content-related and environmental factors are the driving factors for binge-watching".

As mentioned, binge-watching can provide an enjoyable experience, as it often serves as a relief from stress and loneliness for individuals and, therefore, acts as a coping mechanism. Hence, stress and loneliness do motivate binge-watching (Kubey & Csikszentmihalyi, 2002). However, what about mood as an antecedent for binge-watching as it is the case for binge-eating? The mood state can be split into a positive affect which includes positive emotions such as joy, enthusiasm and alertness, and negative affect which deals with negative emotions such as sadness, anxiety, guilt, and irritability (Leventhal, Greenber, Trujillo, Ameringer, Lisha, Pand, & Monterosso, 2013). According to Hilbert and Tuschen (2007), a negative mood can predict binge-eating since binge eaters display a more negative mood on those binge days. Binge-eaters seek a positive change that binge-eating provides by a reduction in the negative mood and an increase in the positive mood. An individual experiences certain pleasantness during binge-eating which generates this positive affect. However, this is only a temporary effect and decreases after binge-eating (Hilbert & Tuschen, 2007).

The Affect Regulation Model is one of many theories that accounts for the binge-eating since it suggests that "maladaptive behaviours function to decrease negative emotions" (Haedt-Matt & Keel, 2012). Negative emotions are responsible for the binge-eating which helps individuals to get distracted from the negative emotions only because other coping strategies failed. Further, the Mood Management Theory of Zillmann (1998) also states that individuals always seek to relieve themselves from a negative mood state by changing the negative state into a positive mood state or at least, to reduce the intensity of the current mood state. But further, it also mentions that individuals strive for a positive mood state or the maintenance of the intensity of the current positive mood state. The theory assumes that individuals meet several arrangements and put forth an effort in order to receive a positive mood in the end. The arrangements which

achieved a positive mood state leave a memory trace that increases the probability of an individual doing the same arrangement next time under similar circumstances again. This can be connected to the operant learning theory of Skinner (2014).

Applying both, the affect regulation model, and the mood management theory, to binge-watching, individuals may engage in it because they seek or try to maintain a more positive mood state or have to cope with negative emotions. As mentioned, binge-watching a satisfying content creates an enjoyable experience that may lead to a positive mood that gets stored in memory and therefore, leads to an increased use of VOD services (Merrill & Rubenking).

Govaert and Rangarajan (2014) already researched the variable of mood in correlation to binge-watching and how it evolved during a binge-watch session. They conducted a qualitative study by interviewing only five binge-watchers. Results have shown that a negative mood predicted binge-watching such as when they had a fight with the girlfriend or boyfriend and that those emotions decreased in their intensity during binge-watching (Govaert & Rangarajan, 2014). But they also mentioned that they watched multiple episodes for fun, meaning because they experienced positive emotions. However, these results are not reliable since only five participants were interviewed which is a very small sample. Further, no statistical analysis was conducted because of the small number of participants and therefore, a replication and empirical validation of this study is suggested.

Moreover, they studied the stable variable of personality by investigating the Big Five personality traits such as extraversion, agreeableness, conscientiousness, openness to experience, and neuroticism by the Five Factor Personality Inventory in (Govaert & Rangarajan, 2014). Only results regarding neuroticism and conscientiousness were significant and displayed a negative relationship with binge-watching, meaning that individuals higher in neuroticism and lower in conscientiousness tended to watch fewer episodes in succession. Results regarding extraversion, openness to experience, and agreeableness were non-significant.

From Hilbert and Tuschen's (2007) study about binge-eating it can be hypothesized that a negative mood might be an important antecedent of binge-watching. Further, as the study of Govaert and Rangarajan (2014) delivered no reliable conclusion regarding the mood (positive and negative), it would be interesting to examine whether mood (both positive and negative) actually predicts binge-watching. Mood is variable within single subjects meaning that mood can change from negative to positive within a person. Larsen (1987) conceptualized variability as "frequent

and extreme fluctuations in mood and emotions over time", therefore, it is important to acknowledge the changing nature of mood over time. Furthermore, it can be inferred from the study of Govaert and Rangarajan (2014) that personality traits may exert an influence on this watching behaviour. Here, they focused on the Big Five personality traits but only found that neuroticism and conscientiousness significantly predict a decrease in binge-watching but results regarding the other personality traits were non-significant. The current study's focus lies on prediction as well but tries, regarding personality traits, to research whether a stable personality influences the possible correlation of a positive and negative mood with binge-watching. Therefore, it may act as a moderator rather than a predictor, wherefore personality is still of further interest to investigate. Furthermore, the retrospective study of Govaert and Rangarajan (2014) is the only research that concerned personality traits in regard to binge-watching and has found no correlation between extraversion and binge-watching. However, taking into account the literature, the personality trait of extraversion sits on a continuum at the opposite end of introversion and an introverted person can be defined as "quiet, imaginative, and more interested in ideas than in interacting with people". Since binge-watching brings the benefit that individuals can watch VOD services alone and do not have to leave the house, it is possible that individuals who are more introverted are more inclined to binge-watch when they are either in a positive or negative mood. They prefer calm environments rather than social events and are satisfied by their own inner life instead they are interested in interacting with other people (Frey, Benesch, & Stutzer, 2007). Therefore, this study also aims to assure oneself whether introversion moderates the relationship between mood and binge-watching as an investigation of introversion in regard to binge-watching is still of interest and required (Dolliver, 1994).

Research questions and Experience sampling method:

Based on the existing literature and the tentative findings of Goveart and Rangarajan (2014), one research question will concern mood in relation to binge-watching. According to the theories of the affect regulation model and the mood management theory, individuals in a negative mood state seek a reduction of the negative emotions or individuals in a positive mood state try to maintain this positive mood. It can be hypothesized that the use of VOD services leads to a positive mood or maintenance of a positive mood wherefore it acts as operant learning that ends up in an

unconscious conditioning effect. This may cause the viewer to display VOD-watching behaviour increasingly more than before. Since the mood can be split into a negative and positive mood state, there are two research questions which read as follows:

RQ1: "*Does a positive mood state significantly predict increased binge-watching over time?*"
RQ2: "*Does a negative mood state significantly predict increased binge-watching over time?*"

Moreover, a third research question relates to the personality trait of introversion and whether it acts as a moderator on the relationship between mood and binge-watching. More introverted individuals feel comfortable in calm environments such as their home and enjoy being on their own instead of trying to socialize. Therefore, it might be that they are more prone to binge-watching in a positive and negative mood than more extroverted persons in a positive and negative mood as they have easy access to VOD services at home. Therefore, the last research question reads as follows

RQ3: "*Does the personality trait of introversion significantly moderate the relationships of a positive and negative mood with subsequent binge-watching?*"

Generally, previous studies have investigated cross-sectional relationships between binge-watching and mood and other factors in survey studies. It might be that mood is a predictor or consequence of binge-watching, but no conclusion can be made since the results only provide information about relationships but no temporal direction. This is also coming off by their data collections made at a single time point which solely relies on retrospective memory of participants. This cross-sectional retrospective kind of assessment additionally increases the probability of a recall bias wherefore the formulation of meaningful statements is cautious to make (van Berkel, Ferreria, & Kostakos, 2017). Since the studies are often not experimental, such as the qualitative study of Govaert and Rangarajan (2014), results do not give any information about cause and effect (associations over time) but rather about associations. This study aims to study binge-watching by conducting an experience sampling study of video-on-demand watching over a period of two weeks. The experience sampling method (ESM) is assumed to have high ecological validity and reliability due to repeated measures over time and makes the study of temporal relations between

antecedents or consequences and binge-watching possible (Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016). Therefore, the ESM is very suitable for this study. ESM will deliver several measures of the mood during the day and therefore, can provide an accurate insight into the day-to-day fluctuations within-and between individuals. It can also provide information about whether a positive and negative mood state is associated with subsequent engagement in intense and consecutive consumption of series in a single sitting.

Methods

Design

A within-group Experience Sampling Method (ESM) design was chosen for this longitudinal two-week study in order to assess the daily watching-behaviour. More precisely, an active experience sampling method with acoustic sampling was conducted where participants self-reported momentary experiences (Conner & Lehmann, 2012). Participants were assessed on a daily basis by using six short questionnaires. The principle of signal contingent sampling was applied so that participants could not anticipate when they were expected to fill out the questionnaires. This means that they had to report on an experience as they received a signal three times (morning, midday, evening) throughout the day (Christensen, Barrett, Bliss-Moreau, Lebo, & Kaschub, 2003).

Participants

The study was completed by $N = 45$. Participants were recruited using convenience sampling through social contacts. Since above 20 participants are considered as sufficient for ESM studies to get data in order to receive adequate results, the process of recruitment was stopped after achieving 45 participants (Conner & Lehmann, 2012). The participants' data that were incomplete ($n = 6$) were excluded from the data set. This resulted in the data of $N = 39$ participants for analysis. This sample group consisted of participants who fulfilled five conditions. At first, participants had to own a technical device with either an Android or IOS system, had to have access to Wi-Fi and to VOD services, and needed to use those VOD on a regular basis. Finally, participants had to have

sufficient English language skills. Most of the participants were female (71.8%), students (61.5%), and had a German nationality (82.1%). The mean age was 24.8 years (see table 1.)

Table 1. *Descriptives of participants (N= 39)*

Demographics		Frequency	Percentage	*M*	(*SD*)
Age	Minimum	20			
	Maximum	56			
				24.8 (7.6)	
Gender	Male	11	28.2 %		
	Female	28	71.8 %		
Occupation	Pupil	1	2.6 %		
	Student	24	61.5 %		
	Full-time	14	35.9 %		
	Part-time	-	-		
	Other	-	-		
Nationality	German	32	82.1 %		
	Turkish	2	5.1 %		
	German-Turkish	2	5.1 %		
	Mexican	2	5.1 %		
	American	1	2.6 %		

Materials

ESM is increasingly used by scientists to get an increased insight into the intra-psychic elements of human life since it is similar to a traditional diary study (Moskowitz & Young, 2006; van Berkel, Ferreria, & Kostakos, 2017). This study applied ESM via smartphones through the app called "Ethica" in order to measure the mood state and the watching behaviour of the participants throughout their day-to-day activities in a natural environment. The ESM study contained an informed consent, a baseline questionnaire (one assessment in the beginning), the personality questionnaire of HEXACO (one assessment in the beginning), a retrospective assessment (one assessment each day), and several questions regarding the mood (three assessments each day). Here, participants were expected to respond to those questions or fill out the Likert Scales once daily or proactively several times a day (van Berkel et al., 2017).

The app of "Ethica" was used by participants and researchers. At first, Ethica contains and allows researchers access to many different features such as several answer categories in order to create their own questionnaires and to end up in their own study design. Secondly, this app provided participants with all the necessary questionnaires. For having access and to reply to the questionnaires, participants were supposed to use their own mobile phones regardless of the system software of IOS or Android.

Baseline questionnaire:

The baseline questionnaire included 15 questions that participants had to answer.

Demographics

The first four questions were about their demographics. Here participants reported their age and nationality and filled out questions regarding their gender (male/female/other) and occupation (pupil/ student/ part-time employee/ full-time employee/ other). Regarding the nationality, participants were able to state more than one nationality.

VOD services

The fifth item concerned the VOD services (Netflix/ Amazon Prime Video/ YouTube/ Sky/ Other) the respondents used to get an overview about the preferences of VOD services. Considering the VOD services, participants were allowed to give more than one response option to the item of "*Please indicate which of the video-on-demand streaming services you use* ".

Introversion

Since this study is interested in the personality trait of "Introversion ", one scale of Extraversion/Introversion out of the HEXACO was used which generally measures six personality dimensions (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, Openness to Experience) (Ashton, Lee, & De Vries, 2014). 10 items related to Introversion were chosen of which was one, for example, "I prefer jobs that involve active social interaction to those that involve working alone.". On a Likert-Scale, participants had to decide for one out of five response options of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). The individual total score of introversion was calculated by averaging the ratings of all relevant items measuring this construct. However, before the scores of four questions regarding this trait had to be reversed that 1 (strongly disagree) was reversed into a 5 (strongly agree), for instance. The introversion scale out of the HEXCO was taken since factor-analyses revealed fairly low correlations between the six factors meaning that those constructs are roughly independent and measure their own construct (Lee & Ashton, 2004). According to them, the 10-item extraversion (introversion) scale displays high reliability since it exceeded .93 (Lee & Ashton, as cited by Lee & Ashton, 2005). In this study, Cronbach's alpha indicated questionable statistical reliability, meaning the internal-consistency, that all items measuring only the construct of introversion, is questioned ($\alpha = .65$).

Daily retrospective measurement of watching behaviour:

For the daily measurement of the watching behaviour the daily retrospective questionnaire was utilized. This assessment contained four items that concerned the watching behaviour of the last 24 h of the participants. In order to ensure that participants watched VOD services instead of broadcast TV, the first item of *"Did you watch video-on-demand content yesterday?"* was asked.

Participants could choose *"yes"* or *"no"* as a response option. The second item of *"At what time did you start watching the video-on-demand content yesterday?"* was asked to get an insight into the time participants used VOD services. Beforehand, respondents were asked to keep in mind the time when they started watching but they were not expected to know the exact time frame but to indicate an estimation when and for how long they watched. Since on average one episode endures 30 minutes, it could help the participant to guess the total watching time for that day (Rigby, Brumby, Cox, & Gould, 2018). The third question aimed to gain information about the number of episodes by asking *"How many episodes did you watch yesterday?"*. Participants could choose one answer ranging from *"I did not watch"*, *"I watched a movie"*, *"less than one episode", "one episode"* raising in steps of one episode (two episodes, three episodes, etc.) up to *"seven episodes",* or *"more than seven episodes"*. In the end, *"I did not watch"* and *"I watched a movie"* were coded as 0, *"less than one episode"* was coded as 0.5, and *more than seven episodes"* was recoded into 8. The episodes ranging from one to seven were coded equal to the amount they watched, meaning three episodes were coded into a 3, for instance. Finally, the question of *"How many hours did you watch video-on-demand content yesterday?"* was asked to indicate how long they watched in a single sitting. Response categories started from "*0 (I did not watch)"* and were set in steps of 0.5 hours (0.5 hour, 1 hour, 1.5 hours, 2 hours etc.*)* up to *"more than 7 hours"*. All response categories were coded equal to the hours they watched meaning that "*0"* remained 0 or "*1 hour"* was coded into a 1, for example. The last option of "more than 7 hours" was coded into 8. All items except the second one chosen for this daily retrospective questionnaire were based on the ESM studies of binge-watching conducted in 2019 (Troles, 2019; Sundermann, 2019) (Appendix A).

Momentary mood assessment:

In order to measure the experienced mood, a momentary assessment was operationalized. Here, items were modeled after items that were identified by means of principal component analysis with varimax rotation by Van Eck, Berkhof, Nicolson, and Sulon (1996). They have found that items of "cheerful," "satisfied," "relaxed," "energetic," "self-assured," "concentrated," and "enthusiastic" ($\alpha = .95$) best reflected positive affect and items of "depressed," "anxious," "worried," "lonely," "tired," and "miserable" ($\alpha = .87$) best reflected negative affect. Participants were expected to reply to three items measuring the positive mood state and to three items

measuring the negative mood state. As mentioned, Leventhal et al. (2013) defined positive mood with the item of "enthusiasm" as well, wherefore, this study chose the items of "enthusiastic", "self-assured", and "cheerful" to measure the positive mood state. Also, the item of "anxiety" was chosen by Leventhal et al. (2013) to define a negative mood. Therefore, this study decided on the items of "anxious", "miserable", and "depressed". An example item for a positive mood is "I feel enthusiastic right now." and for a negative mood "I feel anxious right now" which provided an insight into the momentary state and was in line with the ESM fundamentals (Delespaul, 1995). Answer categories ranged from 1 (*not at all)* to 5 (*very much)* (Appendix B). The total score of positive mood was calculated by averaging the ratings of all three relevant items measuring this construct. The total score for negative mood was calculated by the same procedure by taking the mean of all the ratings of all three items assessing negative mood. Regarding the scale measuring a positive mood, high internal reliability was found which indicates an inter-item correlation of the three items of enthusiasm, self-assuredness, and cheerfulness ($\alpha = .81$). Also, for the scale assessing negative mood, high internal reliability was found which indicates an internal consistency between anxiety, miserableness, and depression ($\alpha = .82$).

The current study was a joint research of three Bachelor theses that aim to study different predictors and consequences of binge-watching. Therefore, besides information about the variability in the mood and changes in watching patterns, ESM additionally provided a more accurate measure of snacking behaviour and physical fitness in relation to binge-watching by including questionnaires relevant for these specific topics.

Procedure

The study was approved by the Ethical Committee of the Faculty of Behavioural Sciences of the University of Twente. Participants were recruited via convenience sampling. After the recruitment was finished, all participants received an email including information about the start date of the 7th April and the end date of 20th of April (14 days). This time frame was chosen as studies that involve several reports per day usually run between 3 days to three weeks (Conner & Lehmann, 2012). Further, the invitation email entailed a description of the longitudinal study, and how to get and use the app of Ethica (Appendix C). To ensure that participants chose the right app, the email provided them with two links as support. The first link forwarded them to the process of registering

as a participant in this study. After signing up online, they received a confirmation email from Ethicadata and an informed consent in the Ethica app which they had to sign (Appendix D). Here, they were informed about their anonymity, how their data were dealt with, their right to withdraw from this study at any time without giving a reason, and the opportunity to contact the researchers in case of questions or problems. This agreement was essential since it allowed researchers to assign each participant to the study via the Ethicadata app. The second link forwarded them to the download they had to conduct on their mobile phone in order to be able to receive the daily notifications and to complete the daily questionnaires. Here they first had to type in a code which was provided by an email of Ethica in order to get into the study.

On the first day of data collection, only the baseline questionnaire about demographics, eating behaviour, physical fitness, and introversion was administered at 9 a.m. once. Participants received a reminder after six hours to complete the questionnaire and it expired after 24 hours. It took the participants around 15 minutes to complete this questionnaire. Next, participants received daily measures for 14 days. From study day two, participants received a daily retrospective questionnaire about their watching behaviour, snacking behaviour, and physical fitness of the last 24 hours between 9 a.m. and 11 a.m. each day which disappeared after 24 hours. Furthermore, a mood questionnaire was sent out three times a day between 9 a.m. and 11 a.m., 2 p.m. and 4 p.m., and 7 p.m. and 9 p.m. This questionnaire served for an assessment of their current mood which expired after one and a half hours. It was sent out three times a day since mood can fluctuate during a day wherefore, a more accurate insight into the average mood level of each participant was achieved. Furthermore, three measures increased the probability to collect enough data about their current mood as participants were busy during the day and might not have the chance to reply to every questionnaire. The daily retrospective questionnaires took a maximum of five minutes and each mood questionnaire took a maximum of two minutes to complete. In case participants did not complete the questionnaires yet they received a reminder after one hour and once after six hours for the daily retrospective questionnaires and one reminder after one hour for the mood questionnaire to fill in their answers. Reminders served to reduce the probability of missing data.

On the last measurement day, a final email informing about the end of the study and expressing a “Thank you” was sent to all participants.

Analysis

Hence the gathered data could be analysed, the program of IBM SPSS Statistics was used. Before certain analyses were performed, the data from Ethica were exported into SPSS. Here, new variables were created by transforming qualitative variables into numerical variables. Six participants were excluded from analysis because they completed less than 50% of all questionnaires over the 13 days (Conner & Lehmann, 2012). Furthermore, data from the 8th of April of the daily retrospective questionnaire and data from the 20th of April of the momentary assessment were omitted as those were irrelevant for analyses of the predictive association with mood which resulted in data of 12 study days that were used for the main analyses. First, descriptive statistics were administered to analyse data of the baseline questionnaire such as the demographics and the means of the watching behaviour (number of watched episodes and hours) which was assessed by the daily retrospective questionnaire.

As participants did not manage to fill in every daily retrospective questionnaire or momentary assessment, a series of Linear Mixed Model (LMM) analyses were conducted that accounted for missing values. LMM with a first-order autoregressive covariance structure was applied to analyse the hierarchically nested repeated measurements. For every single LMM the variable of "user ID" (39 participants) was set as the subjects and the variable of "days" (12 days) was determined as the repeated measurement. Regarding the daily retrospective questionnaire, in order to get an insight into the watching pattern of the total sample, whether respondents watched VOD content, how many episodes they watched, and how many hours they spent watching VOD services were set as dependent variables. "Days" and "User ID" were set as fixed independent factors to calculate estimated marginal means for each study day and each participant over the 12 days. Estimated marginal means for positive and negative mood over time were also computed.

In order to answer the first two research questions, whether a positive and negative mood state predicts binge-watching, the dataset had to be adjusted first. The daily mood means had to be adjusted to be in line with the watching behaviour on the same day. Next, the variable of watching time was set as a dependent variable, and the variables of positive and negative mood were set as an independent fixed covariate in two separate LMM analyses. Afterwards, the dependent variable was exchanged by the variable of how many episodes they watched but the covariates remained. This resulted in four separate LMMs. Furthermore, as each mood level consists of three emotions

such as the positive mood of cheerfulness, enthusiasm, and self-assuredness, and negative mood of anxiety, depression, and miserableness, six further LMM analyses were conducted. Each emotion was again set as a fixed covariate with watching time and the number of watched episodes as dependent variables.

Further, to analyse the moderation effect of the personality trait of introversion on the association of mood and binge-watching, at first introversion was added to positive mood along with their interaction term as fixed covariates, and in the second analysis, it was added to the negative mood as a fixed covariate, with the dependent variable of how many hours respondents spent watching VOD content (watching time) (positive * introversion, negative mood * introversion). These two procedures were repeated for how many episodes they watched as a dependent variable which resulted in four separate LMMs again.

A significance level of .05 was used for all analyses. With the help of Microsoft Office Excel, exploratory graphical analyses of the associations between variables of interest were created.

Results

General findings

All 39 participants filled in the baseline questionnaire. Furthermore, the daily retrospective questionnaire was 99.15% of the time answered except on 4 days by three participants. For the momentary assessment, the questionnaire in the morning was filled in 78.06%, the questionnaire in the afternoon was 85.77%, and the questionnaire in the evening was filled in 85,97% of the time.

In the baseline questionnaire, participants had to provide answers about which VOD services they mostly use. Analyses of all responses revealed that 2.6% currently used one, 41% two, 43.6 % three, and 12.8% four VOD services. Furthermore, items regarding introversion were filled in on a scale ranging from 1-5. A total mean score of 3.48 (SD= 0.46) was observed, which indicates that on average participants were not introverted and tended to be more extraverted. This means, participants were not much inwardly oriented but also not totally extraverted. On a personal

level, scores ranged between 2.44 and 4.30 which suggests that no participant scored the minimum or maximum score.

Estimated watching behaviour over time and across participants

The watching patterns of participants were assessed by the daily retrospective questionnaire. On average, 70.1% of participants watched VOD services daily over the 12 days while 29.1 % of participants did not use VOD service each day within this time period. On average, participants watched a daily mean of 1.85 (*SD*= 2.15) episodes in a single sitting during the 12 days. The highest daily average of watched episodes was 2.33 and the minimum was 1.18 (Figure 1). Therefore, it can be concluded that on average participants watched at least one episode each day. Moreover, there was a significant difference for episodes over days indicating that on some days participants watched more episodes than on other days ($F(285.69)=1.88$, $p= .04$). For instance, according to the pairwise comparison, on day 10 (*M*= 2.15) participants on average watched almost an episode more than on day 5 (*M*= 1.18). Furthermore, compared to day 5, participants significantly watched 0.97 (p= .01) more episodes on day 6, 0.87 (p= .04) more episodes on day 7, and 1.15 (p= .02) more episodes on day 12. Moreover, on day 10 participants significantly watched 0.72 (p= .04) episodes more than on day 9. With the same significance level (p= .04) and the number of episodes participants watched 0.72 more episodes on day 12 in comparison to day 11.

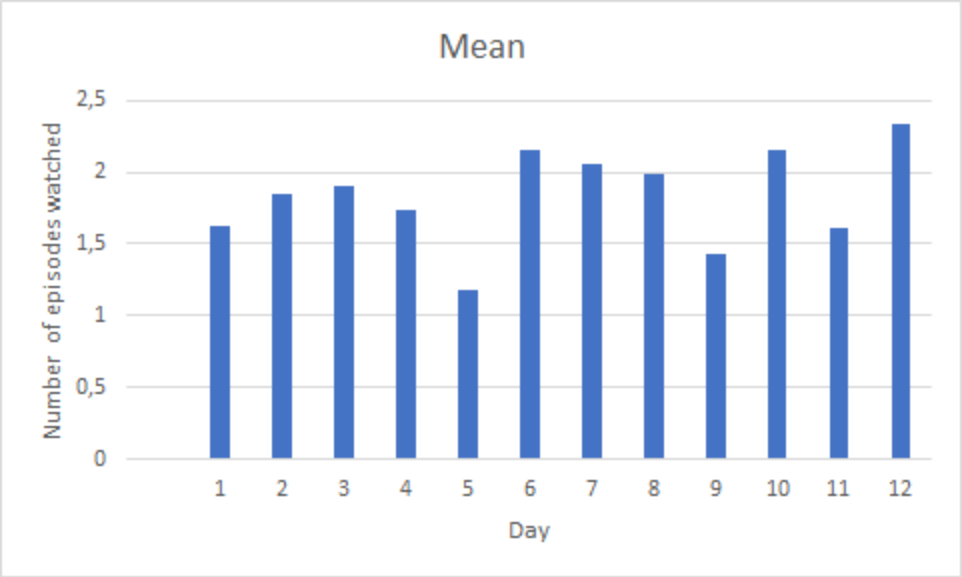

Figure 1. Sample means of the daily numbers of episodes watched of VOD for each of the 12 days

Analysing the estimated marginal means of episodes between the 39 participants over the 12 days, the estimated individual mean varied greatly between participants as the minimum number of episodes watched was 0 and the maximum was 6.85 (Figure 2). As a visualization, according to the mean of 6.85, participant 7 watched up to 7 episodes but at least 6 episodes each of the 12 days whereas participant 8 watched a maximum of one episode (M= .61) each day. This is also underlined by the significance level (F(95.90) 6.98, p<.01) confirming that there exists a significant difference between participants in the number of episodes watched.

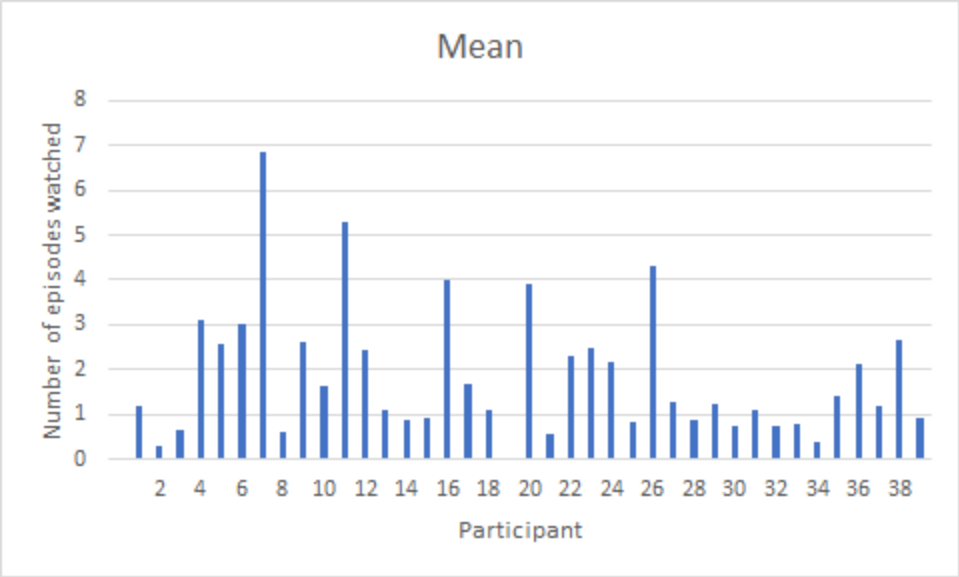

Figure 2. Mean of the daily number of episodes watched of VOD for each participant over the 12 days

On average, all participants watched a mean of 1.73 (*SD*= 1.67) hours every day in a single sitting during the 12 days. Thus, it can be implied that on average participants watched at least one hour VOD content per day. Generally, the overall daily means range from 1.24 to 2.02 but there was non-significant difference between the daily means (F(278.96) 1.11, p=.35) (Figure 3).

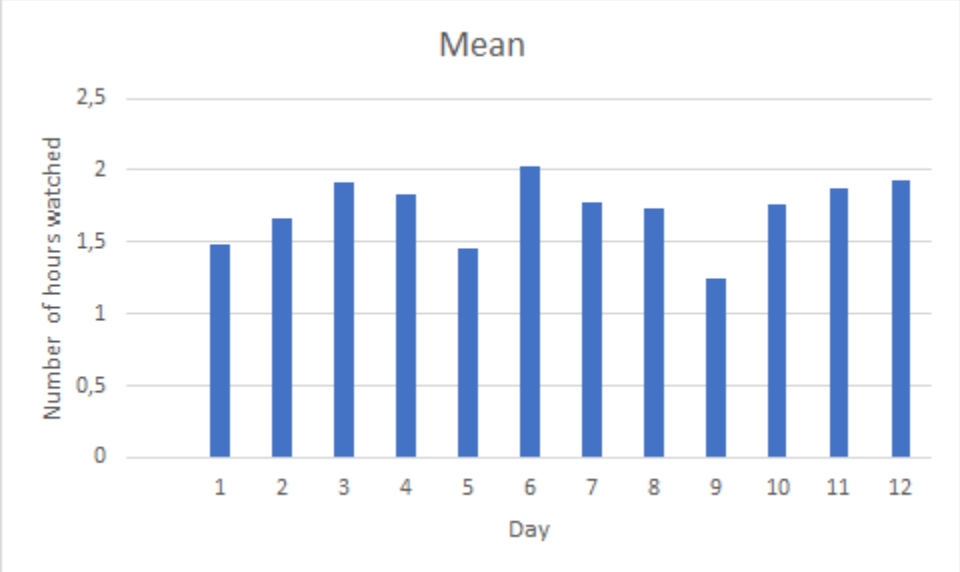

Figure 3. Sample mean of the daily hours watched of VOD for each of the 12 days

When analysing the estimated marginal means of hours between the 39 participants over the 12 days, again the individual mean varied greatly between them as it is displayed by a minimum of .16 and a maximum of 5.08 (Figure 4). Comparing participant 11 with participant 19, participant 11 watched on average five hours (M= 5.08) whereas participant 19 watched only up to one hour (*M*= 1.05) each day. This is also supported by the significant difference (F(94.40)5.46, p<.01) for hours between participants that some participants watched longer than others did.

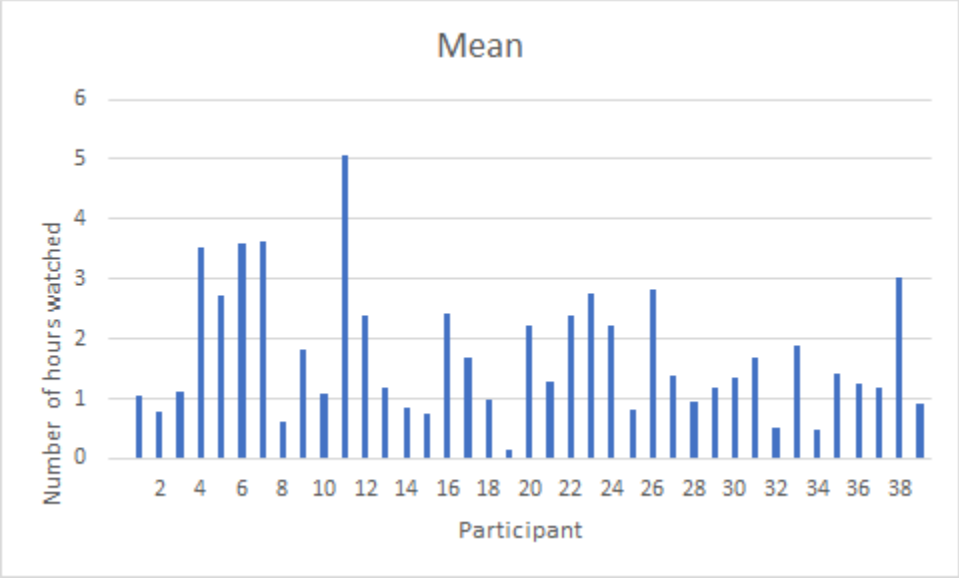

Figure 4. Mean of the daily hours watched of VOD for each participant over the 12 days

Comparing the sample means of watched episodes with the sample means of watched hours of each day, both seem to display similar results (Figure 5). Consequently, a significant strong positive correlation between both was found as the Pearson correlation was .80 (p<.01).

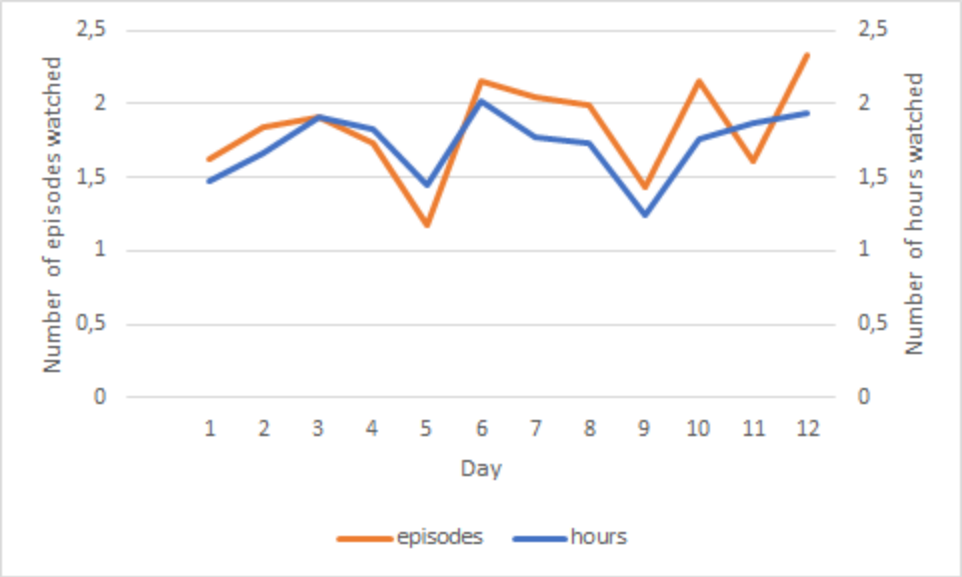

Figure 5. Comparison of the sample mean of the watched episodes (blue) with the watched hours (orange) of VOD over the 12 days

Estimated mood over time

Besides the daily retrospective questionnaire, the momentary assessment served as an input of the current mood throughout the day. On a scale of 1 to 5, the overall sample mean of positive mood across all assessments was 3.31 (*SD*= .87) which indicates a moderate positive mood over the 12 days (Figure 6). Adding to this, the positive mood significantly differed between the days meaning on some days they had a more positive mood than on other days (F(298.96)2.33, p=.01). For the negative mood, the overall mean was 1.35 (*SD*= .57) which indicates that participants mostly did not experience a negative mood over the 12 days (Figure 6). Further, there was no significant difference for negative mood between the days found (F(269.98).99, p=.46).

When comparing the sample means of positive with the means of negative mood, both seem to display the opposite results (Figure 6). Consequently, a significant low negative correlation was found as the Pearson correlation was -.27 (p<.01).

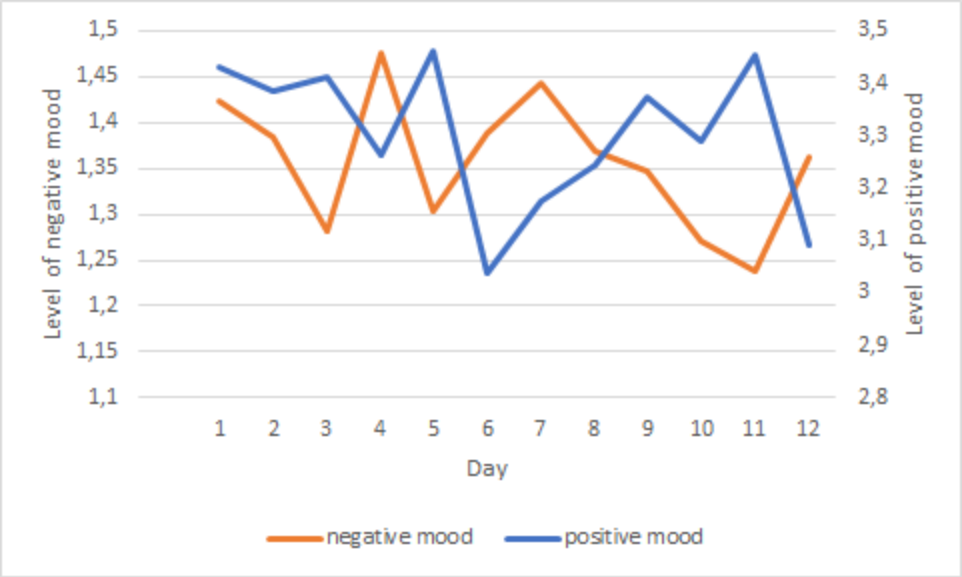

Figure 6. Comparison of the sample mean of the positive mood with the negative mood for each of the 12 days

When analysing the estimated marginal means of positive mood between the 39 participants over the 12 days, the individual mean did vary greatly between them as it is shown by a minimum of 1.46 and a maximum of 4.48 (Figure 7). Comparing participant 22 with participant 34, participant 22 experienced on average quite a positive mood (M= 4.48) whereas participant 34 experienced only a little bit a positive mood each day (M= 1.95). This is also supported by the significant difference (F(76.30)7.22, (p<.01) for positive mood between participants confirming that some participants experienced a better mood than others did.

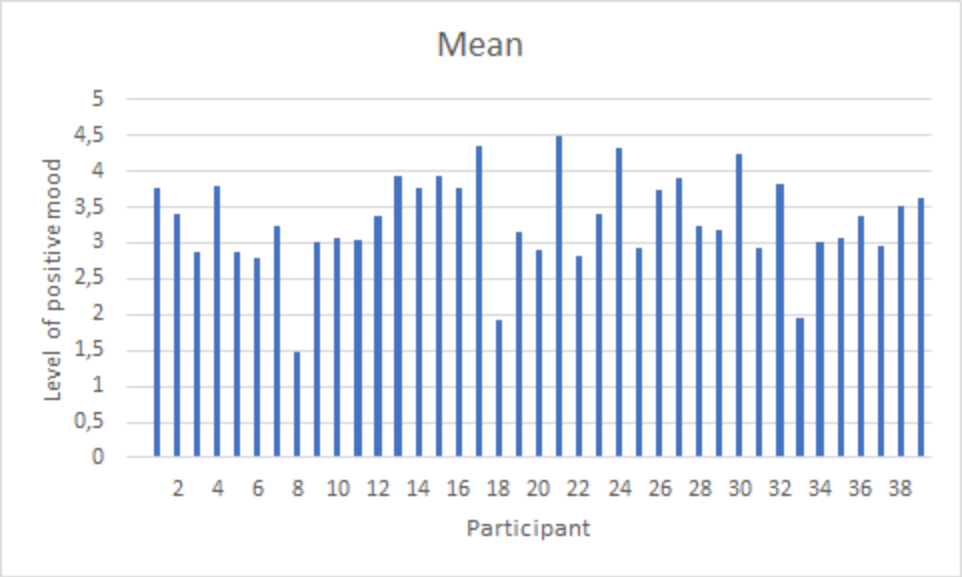

Figure 7. Mean of the positive mood for each participant over the 12 days

Now, in regards to the estimated marginal means of negative mood between the 39 participants over the 12 days, again the individual mean did vary a bit between them as it is displayed by a minimum of 1.00 and a maximum of 2.72 (Figure 8). Comparing participant 33 with participant 15, participant 33 experienced on average somewhat a negative mood (*M*= 2.72) whereas participant 15 experienced a negative mood not at all each day (*M*= 1.00). By the significant difference (F(94.34)6.92, (p<.01) for negative mood between participants, it is also supported that some participants experienced a more worse mood than others did.

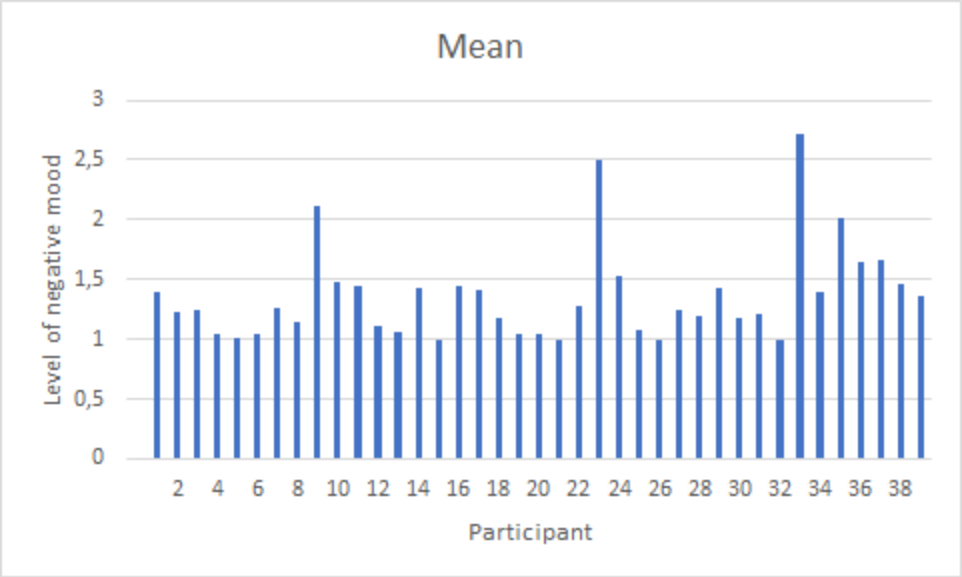

Figure 8. Mean of the negative mood for each participant over the 12 days

Association between mood and binge-watching

Additional LMM analyses were used to estimate whether a positive and negative mood was associated with binge-watching. Furthermore, the moderation effect of introversion on this association was computed by LMM. Here, "Estimates of Fixed Effects" displayed relevant results.

Fixed effect of positive mood on the watching behaviour of the same day

Regarding positive mood and the number of episodes watched, the LMM displayed a significant negative effect for the fixed independent variable of positive mood with the number of episodes watched (estimate -.28, F(418.27)=4.53, p=.03). A significant negative fixed effect was found for the separate emotions of cheerfulness (estimate -.31, F(432.03)=8.24, p=.01) and enthusiasm (estimate -.26, F(428.77)=6.59, p=.01) but no fixed effect of self-assuredness (estimate .04, F(380.25)=.09, p=.76). In contrast, positive mood as a fixed independent factor in relation to watching time (hours) had a non-significant overall effect (estimate -.11, F(396.85)=1.19, p=.28), meaning watching time as DV and positive mood as IV are not significantly associated. However, every individual positive emotion of cheerfulness (estimate -.23, F(419.42)=7.08, p=.01),

enthusiasm (estimate -.17, F(414.06)=4.94, p=.04), and self-assuredness (estimate .21, F(351.24)=5.42, p=.02) displayed significant but partly opposing effects. Cheerfulness and enthusiasm had a significant negative fixed effect whereas self-assuredness had a significant positive fixed effect on the watching time. These findings indicate that positive mood significantly covaries with the number of episodes watched (Figure 9) over time but not with the amount of how long VOD content was watched. Thus, it is indicated that a more higher positive mood is associated with fewer episodes watched. Further, individual positive emotions are associated with the watching time that being more cheerful and enthusiastic is associated with fewer hours watched but being more self-assured is associated with more hours watched.

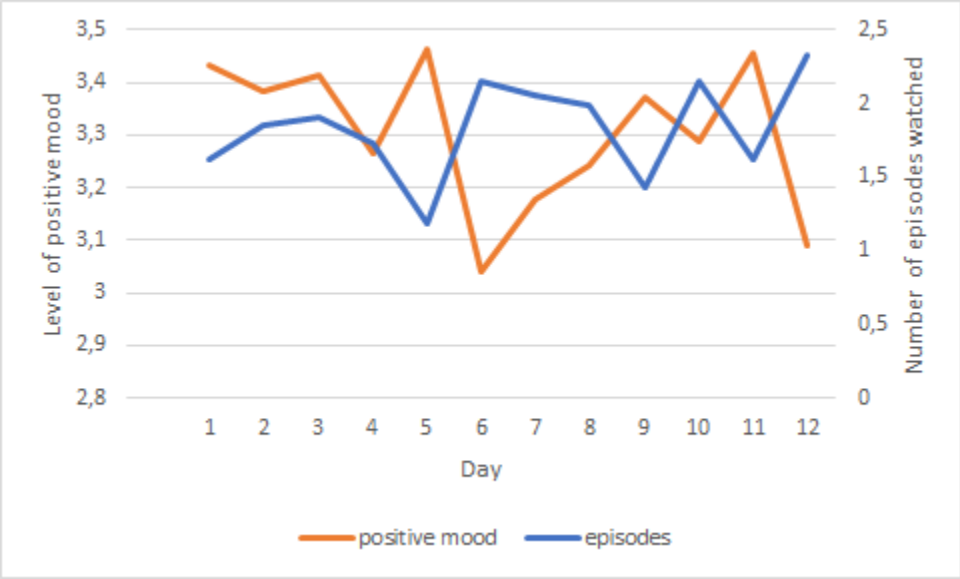

Figure 9. Daily sample mean of the watched episodes (blue) and the daily positive mood (orange) over the 12 days

Fixed effect of negative mood on the watching behaviour of the same day

The fixed independent factor of negative mood displayed a non-significant association with the number of episodes watched (estimate .27, F(436.88)=2.1, p=.15). Furthermore, the fixed factors of individual anxiety (estimate .19, F(430.87)=1.55, p=.21), miserableness (estimate .11, F(430.20)=.58, p=.45), and depression (estimate .30, F(416.37)=2.92, p=.08) also turned out to be not significantly related to the amount of watched episodes. However, negative mood as an independent fixed factor did have a fixed effect on the DV of watching time (estimate .32,

F(435.38)=4.7, p=.03). The fixed effect of anxiety (estimate .19, F(419.71)=2.46, p=.19) and miserableness (estimate .20, F(435.63)=3.10, p=.08) was found to be non-significant on watching time. However, a significant fixed effect was found for depression (estimate .30, F(426.19)=4.86, p=.03). Compared to the positive mood the effect is the other way around for a negative mood. Results indicate that negative mood covaries with the hours of watched VOD but not with the number of episodes (Figure 10). The results indicate that a higher negative mood, in particular depression, is associated with more hours watched.

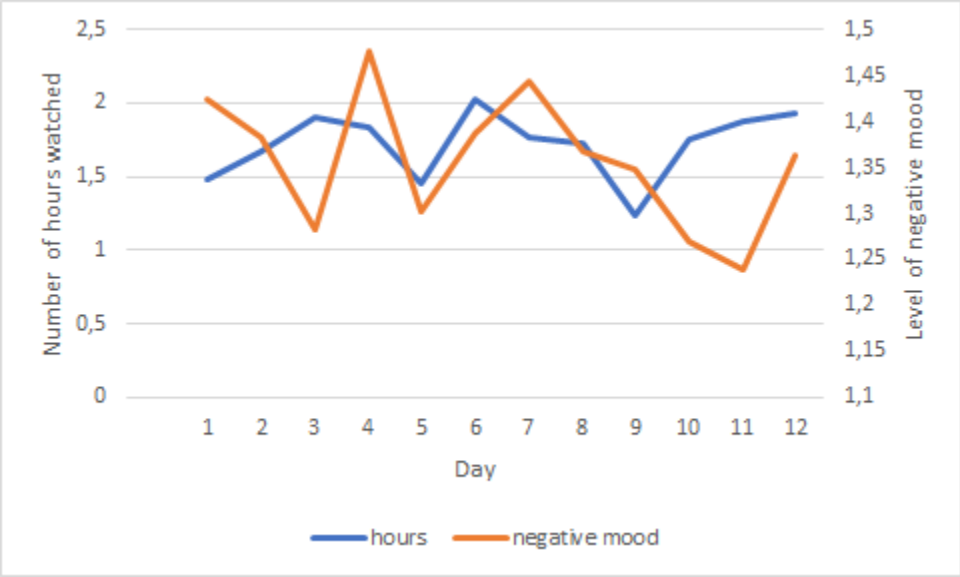

Figure 10. Daily sample mean of the watched hours (blue) and the daily negative mood (orange) over the 12 days

Fixed effect of introversion

Analyses in regards of introversion as an independent variable showed there was no main effect found on either episodes watched (estimate -.62, F(86.15)=3.35, p=.07) or hours watched (estimate -.06, F(91.76)=.07, p=.79).

Fixed effect of introversion on the association of positive and negative mood with binge-watching

LMM analyses regarding the moderation effect of introversion on the association of mood with binge-watching also revealed no significant effect. There was a non-significant moderation effect of introversion (estimate .21, F(398.79)=1.04, p=.31) on the relationship between the IV of positive mood and the DV of watching time. Similarly, a non-significant moderation effect of introversion (estimate -.23, F(410.93)=.78, p=.38) was found on the relationship between positive mood (IV) and the amount of watched episodes (DV). Furthermore, there was a non-significant moderation effect introversion (estimate -.18, F(434.53)=.32, p=.57) on the relationship between negative mood (IV) and the watching time (DV). Again, there was also a non-significant moderation effect of introversion (estimate .16, F(434.87)=.17, p=.69) on the relationship of negative mood (IV) and the amount of watched episodes (DV). These results indicate that introversion has no significant effect on the association between mood and watching behaviour.

Discussion

Findings

The overall goal of the current ESM study was to investigate whether mood predicts binge-watching and whether the personality trait of introversion moderates this relationship over time. The sample included 39 participants who used a mobile app to report their daily VOD watching behaviour and their current mood to take part in this study. The study showed by multiple mood measures that a positive mood predicts less watching of episodes of VOD content, and that with respect to negative mood, higher depression scores were significantly predictive in watching more hours of it. The personality trait of introversion had no moderation effect on the associations between mood and VOD watching.

Regarding the first hypothesis, the study has shown that people who experienced a positive mood did watch fewer episodes than people who did not experience a positive mood. However, this result did not apply to the number of hours. Since results displayed an intercorrelation between the number of episodes watched and the number of hours watched, further separate analyses were

conducted to explore the cause of the non-association between positive mood and hours watched. Interestingly, individuals higher in cheerfulness and enthusiasm watched fewer hours of VOD content, but individuals higher in self-assuredness watched more hours. All these findings indicate that a positive mood state does not predict the watching of more episodes, but rather predicts a decrease in the usage of VOD services. This result does not coincide with the Mood-Management Theory of Zillmann (1998). It states that individuals in a positive mood state try to maintain the intensity of the current mood state by meeting several arrangements such as here watching more episodes in a single sitting. However, in the current study, participants did not engage in such a watching behaviour when having a positive mood. Trying to find another possible explanation, it became obvious that according to the average score of the personality trait of introversion, participants were not introverted and rather tended to be slightly extraverted but there was not much variance in the sample. According to the study of Watson and Clark (1997), extraverted individuals are "happy, enthusiastic, active, and enjoy excitement in their lives". They are interested in outgoing and joining large groups as they see themselves as much more pleasurably engaged in various aspects of their lives. For such a physical and extremely social behaviour is the positive affect (PA) responsible, meaning that PA motivates those activities (Rossi & Rossi, as cited by Watson and Clark, 1997). As the participants tended to be slightly extraverted, they might have not really experienced a negative mood but also not completely a positive mood. On average, they experienced a slightly positive mood. Also having a look at individual scores, individuals who tended to be more extraverted mostly had a more positive mood. In a positive mood, it might be that they pleasurably preferred other aspects of life instead of using VOD services. This leads to a possible assumption that more extraverted individuals are likely to watch fewer episodes. As this sample did not show variability in regard to introversion, further research in a more diverse sample is needed. The sample should represent more people scoring in the extremes of being introverted or extraverted to make a conclusion whether the personality trait of Introversion/Extraversion is associated with binge-watching.

Furthermore, the lack of an association between a positive mood and the number of hours watched can be explained by the negative association of cheerfulness and enthusiasm with the watching time and the positive effect of self-assuredness on the watching time that cancel each other out and therefore, result in a non-significant overall relationship. Interestingly, this means that an individual might have experienced emotions separately that acted differently instead of a

generally positive mood state as emotions are generally felt more intensively than moods (Cropanzano, Becker, & Feldman, 2012). According to Seifert (1996), self-assuredness is defined by having confidence in oneself and one's abilities. Here it was stated that individuals who are self-assured, meaning they have high confidence in oneself and their abilities, are more motivated to learn. Maybe this in turn can predict that when individuals feel very self-secure that they feel they are able to manage all necessary tasks including academic tasks also when they do watch VOD content. It's hypothesized that they do not get a bad conscience easily because they are sure they will finish everything on time. However, this result should not be weighted much due to the pitfall of capitalization of chance when conducting multiple testing. However, indeed mood is seen as having discrete affects (Watson & Clark, 1997). Therefore, further research is needed to be able to make a conclusion about whether self-assuredness predicts binge-watching by using ESM again.

Having a look at the scores of negative mood, on average respondents did not really experience a negative mood state. Now, to answer the second research question of whether a negative mood predicts binge-watching, results suggested that respondents in this state of mood watched more hours of VOD content than individuals who were not experiencing a negative mood. However, individuals in a negative mood did not watch more episodes.

This result can be related to the Affect Regulation Model and the Mood Management Theory (Haedt-Matt & Keel, 2012; Zillmann, 1998). In terms of the Affect Regulation Model, individuals in a negative mood may watch more hours of VOD content as individuals who were not in a negative mood in order to decrease negative emotions. Using more hours of VOD services gets labeled as maladaptive behaviour which functioned as a distraction from the negative mood state (Haedt-Matt & Keel, 2012). Further, this point of view is supported by the Mood Management Theory which also highlights individuals who try to relieve themselves from the negative moods (Zillmann, 1998). Further, based on this theory, it can be assumed that respondents tried to reduce those negative emotions by changing them into positive ones. They might have made several arrangements such as here watching more hours of VOD content as those provide enjoyable content. It can be assumed that individuals experienced a more positive mood afterward which was stored in their memory and in turn increased the probability of watching more hours VOD content when experiencing a negative mood. This might be connected to the operant learning theory of Skinner (2014), that individuals might have experienced the usage of VOD services as a positive reward to their negative mood for several times and learned that they felt much better after

watching for some hours. By this positive reinforcement, they might have learned to use those services to decrease their negative mood. Adding to this, it might be hypothesized that the watching time increases from time to time as individuals may get used to it. Human beings are creatures of habit so that they always need to exceed their previous amount of VOD content to still feel the positive consequence (positive mood) of watching VOD content (Kilipien, 2012). Together this may ultimately end up in the maladaptive behaviour of binge-watching. As results displayed a non-significant association between a negative mood and the number of episodes watched it might be that individuals in a negative mood preferred to watch one or more movies rather than several episodes since the number of hours and episodes is highly intercorrelated.

Finally, this study has shown that an individual who is more introverted and experiencing a positive or negative mood does not watch more episodes or more hours of VOD content. However, as discussed above, this sample was not very diverse in regard to the personality trait of introversion, which makes it difficult to conclude that it does not moderate the association. Rather a replication of this study with a more diverse sample is suggested. Further, the study of Shim and Kim (2018) displayed a moderation effect of sensation and cognition on the association between certain motivators such as enjoyment and binge-watching. This can explain individual differences in the watching behaviour that individuals in high need of both tend to watch more VOD content. Additionally, in the study of Shim, Lim, Jung, and Shin (2018), it was found that the personality trait of immediate gratification (IG) had an interaction effect on the association of a negative attitude and binge-watching. Here, individuals high in IG and in a negative attitude were more likely to binge-watch than individuals low in IG. Based on those studies it may be that participants in this study tended to watch more episodes or more hours of VOD content because they felt a need for instant need satisfaction (IG). As individuals experience a constant availability of VOD content, they constantly can enjoy those services and therefore, immediately satisfy their need for gratification. As Merrill and Rubenking (2019) introduced that individuals who are low in self-regulation do binge-watch more, especially those individuals might be prone to IG as they can not delay their need for gratification. Now regarding the results of mood and how it is associated with binge-watching, it might be that individuals, especially those who were in a negative mood and experienced an urgent need for an increase in their mood state, could not resist IG such as as the reward of pleasurable VOD content. All individuals who can not resist IG might have binge-watched more than individuals who can resist IG. As the study of Shim et al. (2018) researched

negative attitudes in association with binge-watching and IG, further research is needed to explore this assumption.

Generally, most of the participants made use of the VOD services which suggest the watching of VOD content as a habitual pattern of individuals. On some days they watched more episodes than on other days. Generally, it might be said that participants tended to watch more on the weekend or on a day off than within the week in their everyday life, also if it's only up to one or at least one episode. As Eastern Monday was a public holiday which might not be much celebrated, participants may have watched up to one episode more than the day before on Sunday as this day was celebrated within their family. In regard to interpersonal differences, participants displayed a diverse watching behaviour with extremes of watching a low or very high number of episodes or in a single sitting. In regard of hours watched, participants watched at least one hour of VOD everyday but on an individual level some watched extremely long whereas others watched extremely less over the 12 days. Here, the relevance of ESM gets underscored as it allows an insight into intrapersonal scores over 12 days for which diverse watching behaviours became obvious which potentially indicated binge-watching. By just taking the sample mean, it would seem that participants did not really use VOD content at all.

Considering the mentioned ambiguity of the definition of binge-watching again, whether the cut-offs of episodes or hours are crucial, this study defined binge-watching as watching more than three hours VOD content (Horvath, Horto, Lodge, & Hattie, as cited by Flayelle et al., 2019). Here, taking into account the average watching time one hour and three-quarters of an hour, the sample watched 85% of the 12 days less than three hours in a row on average which means that they mostly did not engage in binge-watching. Rather they only engaged 14.1% of this time in binge-watching. But taking "more than three episodes" as the cut-off, respondents watched 79.7% less than three episodes during the 12 days but 19.4% of this time engaged in binge-watching. Based on these findings it is possible that the sample was well educated and high in self-regulation. They might have been conscious and in control of their watching behaviour which might have caused them to engage to some extent in this new behavioural phenomenon but not much (Merrill & Rubenking, 2019). On average, only six participants binge-watched episodes which is almost the same for hours where only five participants engaged in binge-watching. Therefore, this sample may not be really representative of the general population where individuals might engage in binge-watching more. In order to have more statistical power, the mentioned cut-off scores were

not used for analyses in regard to the research questions. Instead, all analyses were performed using all provided data about the number of episodes and hours watched. Results were not interpreted in terms of binge-watching but of "watching more".

Limitations

The current ESM study has some limitations. First of all, one limitation concerns the measurement reactivity which is an important issue to consider. According to Scollon et al. (2009), especially ESM studies suffer from reactivity because of the repeated measurements that make people "pay unusual attention to their internal states and own behaviour". This means, as daily the same questions were asked such as three times as day the questions of "I'm cheerful right now", that participants might have changed their behaviour. Participants might have executed an action immediately in the morning that has made them more cheerful or contributed to a more positive mood generally. Respondents might have searched for events or planned situations.

Further, currently in 2020 the world experiences a COVID-19 lockdown phase and has people must stay in isolation wherefore, participants might have binge-watched more than usual. In regard to that, it might be that they did watch twice a day. As the questionnaire was triggered once and asked about a single sitting in which participants watched, they might have mentioned the sitting in which they watched less as in the other sitting which biased the results. Further, for instance, if they watched VOD content in the morning and answered the momentary mood questionnaire before they started with a more negative mood and afterward, when they finished their watching session, with a more positive mood, the positive mood is the consequence of binge-watching. According to results, participants in a positive mood tend to watch less VOD services. Therefore, the positive mood as a possible consequence of watching VOD services might have prevented the individual from watching VOD content again. However, if this was only caused by the positive mood or just caused by the participants feeling that they got enough of VOD services this day, is questioned.

At least, taking the COVID-19 lockdown phase again into account, it might be that a positive or negative mood was not the most important motivator for binge-watching. Rather respondents might have been motivated to binge-watch to pass time, escape, relieve stress, or

overcome loneliness which is attributed to IG again (Dixit, Marthoenis, Sharma, & Kar, 2020).

Strengths

First of all, as mentioned above, one strength was the reduction in memory bias in regard to the momentary assessment. Participants had to reflect their current mood immediately instead of the mood state a few hours ago, wherefore, they received the chance to report completely true emotions. With this a bias in their memory was reduced as retrospective questions about feelings and behaviors are often at risk to be biased (Scollon et al., 2009). Although in regard to daily retrospective questionnaires, there was a lag between signal and response as they got 24 hours to respond to the questionnaire, this is not likely to have biased the data. It was rather of benefit as participants learned to keep in mind their watching behaviour of the day before and could adapt themselves to the questionnaire as they knew the questions would repeat every day. Further, because the questions remained the same so that most participants did not have disputes with new questions every day, their effort was reduced, and response rates were higher.

That response rates and the number of participants were high in this study contributes to another strength. As many relatives and friends of the researchers were included, they might have really wanted to help by responding as much as possible to achieve qualitative data. Also, regarding the momentary questionnaires, it should be taken into consideration, whether the mood itself also determined the response rate. It could be the case that individuals in a positive mood felt more motivated to help the researcher to get many responses and therefore answered the questionnaires more often as individuals in a negative mood did. As on average participants did not experience a negative mood but rather slightly tended to be in a positive mood, high response rates could be attributed to this mood state. Additionally, in this study, only six participants had to be excluded which resulted in 39 participants. As in ESM studies above 20 participants are considered as high, results are more meaningful (Conner & Lehmann, 2012).

Adding to this strength, although COVID-19 may have caused some limitations, it might have also been of benefit. Participants may have remained motivated and got more time to respond to the questions as many events were canceled and isolation at home was required. Maybe some full time-workers, as well as students, stayed in the home-office. This might have contributed to higher response rates as well. Also, since the momentary assessment was triggered three times a

day, the chance of a higher response rate but also more adequate measures of positive and negative mood states was ensured as only 2 measures of the mood per day were considered as enough.

Future study

Based on this study, future research should focus more on interpersonal differences by investigating within-person processes in individual cases. This study did not find a moderation effect of introversion on the association between mood and binge-watching but also did not find a direct effect of introversion on watching more episodes or more hours. However, there is still literature with which it can be assumed that Introversion/ Extraversion is related to binge-watching, that extraverted people tend to watch fewer episodes. This study paid more attention to between-person differences but by investigating individual cases, more interesting patterns about this personality trait might be revealed (Scollon et al., 2009). Another suggestion is a replication of this study with a sample that includes much variance in regard to the personality trait of Introversion/Extraversion. Then better estimations of whether and how it is related to binge-watching and whether it has a moderation effect on the association between mood and binge-watching can be made. Further, the effect of immediate gratification (IG) on the association of mood and binge-watching, especially the effect of IG on negative mood with binge-watching, is of interest. Here, it is also of interest to estimate whether individuals with low self-regulation are more prone to IG, and if IG moderates the mentioned relationship (Shim et al., 2018). Thus, it is recommended to study the moderation effect of IG on mood and whether low self-regulation makes a difference in individuals. Further recommendation concerns the investigation of self-assuredness in regard to binge-watching in order to ensure that this association was not displayed only due to the capitalization of chance. At least, regarding variables of interest, it would be still of interest whether a negative or positive mood is the consequence of watching VOD content and to what extent this has an influence on when the individual does use it again. In regard to the daily retrospective questionnaire, it should include an answer option about how many VOD sittings they had and at which times. Here, individuals can indicate how often, when, and for how long or how many episodes they did watch to get a better insight into their watching behaviour. Also, individuals may experience less social desirability and embarrassment as they think it might be normal to have several VOD sittings which contribute to more concrete data. Further, it can be better distinguished whether mood acted only as a predictor or also as a possible consequence that

determined, in turn, the watching behaviour again. Finally, a more representative sample in which individuals tend to watch more VOD content is recommended.

Conclusion

Results of the study imply that individuals in a positive mood tend to watch less VOD-content. However, the individual emotion of self-assuredness predicted an increased usage of VOD services, but the states of cheerfulness and enthusiasm did not. Nevertheless, due to the capitalization of chance, this result should not be overinterpreted and rather explored further separately. If individuals experience a negative mood, they watch more VOD content. Lastly, no interaction effect was displayed between mood (positive and negative) and the personality trait of Introversion on binge-watching which implies that introversion does not influence the relationship of mood and binge-watching. However, as the sample was not representative regarding introversion and binge-watching, future research in this domain is needed.

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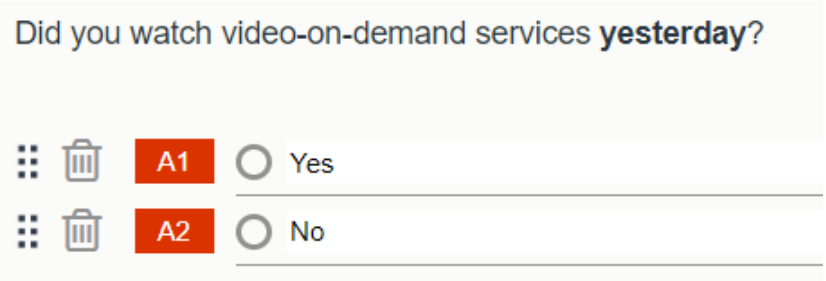
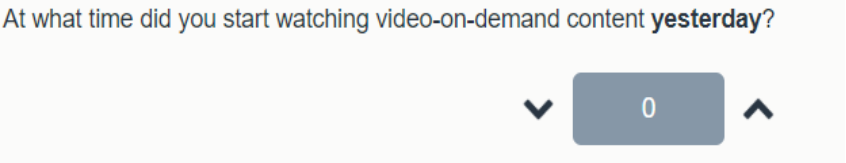
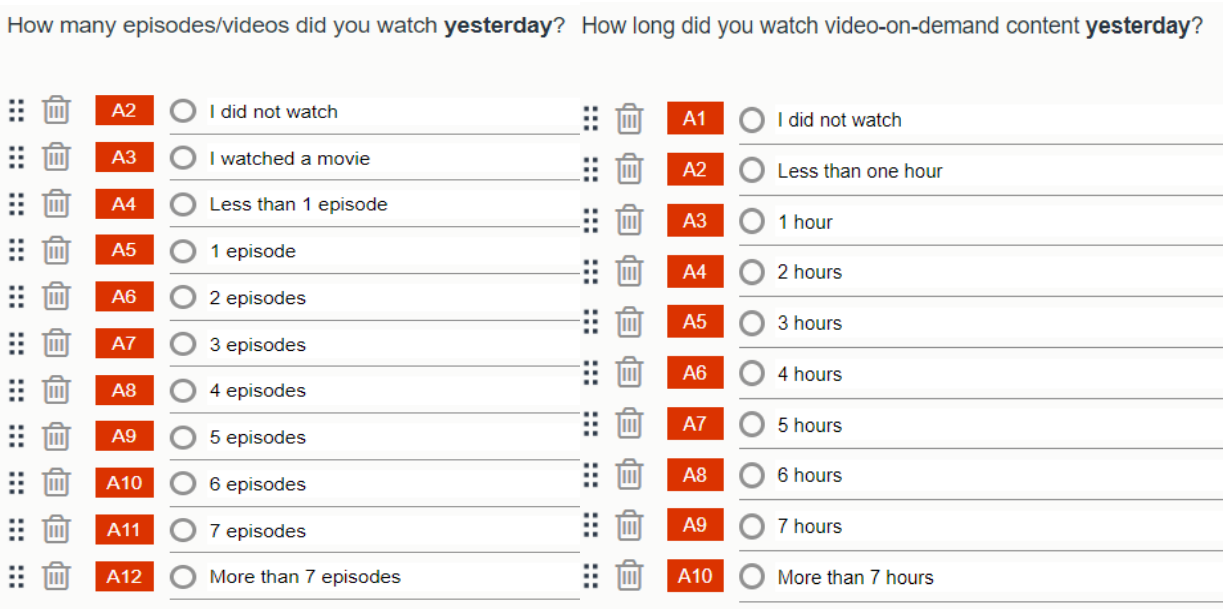
Appendices

Appendix A: Daily retrospective questionnaire







Appendix B: Momentary assessment

Positive mood

Negative mood

Appendix C: E-Mail containing the description and information about the study

Dear participant,

we would like to thank you in advance for choosing to be a participant in this study named "Binge-watching: an experience sampling study of video-on-demand watching". The aim of this study is to investigate the relatively new topic of binge-watching and its connection to eating

behaviour, physical activity, emotions and personality is investigated. This study starts on April 7,2020 and ends on April 21, 2020. It is emphasized that the time period of the study cannot be postponed. Thus, it is important to start exactly on the 7th of April. In the following, you will find the steps that need to be completed in order to participate in this study.

How to Start:

Within the next **2 weeks**, you need to complete different questionnaires. The questionnaire on day 1 is a more detailed one, compared to the following days, and takes therefore 15 minutes. It is important to fill out this questionnaire on April 7, 2020 because it will assess some baseline information like age, gender and personality that is needed for this study. You will have the whole day for this. From day 2 to day 15, the questionnaires are shorter but need to be completed multiple times a day.

- between **9 a.m.** and **11 a.m**. (max. 2 minutes)

- between **9 a.m**. and **11 a.m.** (max. 5 minutes)

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

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

The questionnaires are provided via the app **Ethica**. We ask you to complete the questionnaires as soon as you receive the notification. In case you won't complete it immediately, you will receive a reminder to complete the questionnaire. If you do not fill out the questionnaire in time, it will expire shortly after. In this case, you should continue with the upcoming questionnaires as usual. You are asked to click on the download-link below and download the app in the appstore or gamestore. The app can be downloaded **for free**. In addition to this e-mail you will also receive an e-mail from Ethica. In this e-mail you can find the registration code that is needed to register in this particular study.

Step 1: Download the app (download links are listed below) to create an account. Thus, you are asked to enter your e-mail address and to choose a password. Please register as a **participant.**

→ Itunes App Store: https://apps.apple.com/us/app/ethica/id1137173052

→ Google Play Store: https://play.google.com/store/apps/details?id=com.ethica.logger&gl=NL

Step 2: Open the app.

Step 3: Log-in with your account using your e-mail address and password.

Step 4: Enter the registration code that can be found in the e-mail from Ethica.

Step 5: If you agree with the consent form, please click on register.

Step 6: Turn-on the **notifications** for this app since the app will send you reminders to not miss out on any questionnaires and thus, make your data useful for the study.

Please register **before** the 7th of April 2020 in case any problems or questions regarding the study arise. The first questionnaire should appear on April 7, 2020 at 9 a.m. If this is not the case, please contact us immediately. The questionnaires will take you max. 15 minutes daily. Please check your phone around the time frames that were mentioned above in order to successfully participate in this study.

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

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

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

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

Kind regards,

Alisa Acar, Aline Feldkamp & Mara Wischmann

Appendix D: Online informed consent of Ethica

Purpose

In the following, the purpose of the study that you are planning to take part in is explained. Please contact us if anything is unclear to you. The purpose of this study is to investigate online television watching using video-on-demand streaming services since those services, as Netflix and YouTube, are becoming more popular in comparison to tradition television. Within this study, binge-watching behaviour with regards to eating behaviour, physical activity, emotions and personality is tested.

Study Procedure

As a participant, you need to fill out a baseline questionnaire including questions about your demographic data, your personality and your fitness habits. To do so, you will be asked to download the ETHICA application on your mobile device. This app will be used for two weeks to answer short daily questionnaires (XX minutes). For this study, it is emphasized to answer the questionnaires within the given time frame. Thus, switching on the notifications on your mobile device is recommended to be reminded of it. At least, it is important that you will have a look at the time when you start watching a video-on-demand service.

Confidentiality

All information that is gathered from this study will be kept confidential. Therefore, only the researchers have insight into the answers. All personal data will be anonymized and will not be published or given to a third party.

Contact Information

Concerning questions, the researchers can always be contacted.

Voluntary Participation

Participation in this study is voluntary. Therefore, it is possible to withdraw from this study at any point without giving any reason or justification.

Consent

I agree that I have read and understood the information provided and had the opportunity to ask questions regarding this study. I know that my participation is voluntary and that I know about the possibility of withdrawing, without any justification or cost. I hereby voluntarily agree to be a participant in this study.