Self-control, goal interference, and the binge-watching experience: An event reconstruction study

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ABSTRACT

High-speed internet connections and online streaming services gave rise to the possibility to binge-watch multiple television shows in one sitting. Binge-watching can be characterized as a problematic behavior but also as an enjoyable way to engage with television shows. This study investigates whether self-control explains the valence of binge-watching experiences as measured using the event reconstruction method. The study tests whether lower levels of trait self-control predict higher levels of negative affect and lower levels of positive affect during binge-watching. Additionally, the study tests whether these relationships are mediated by situational aspects of self-control (plans, goal interference, or automaticity). Regression analyses show that participants with higher trait self-control report lower levels of tiredness, boredom, guilt, and sadness when binge-watching compared to less self-controlled participants. These associations are partly explained by binge-watching interfering less with higher order goals for highly self-controlled participants. Lower levels of trait self-control are also associated with a stronger increase in happiness on initiating binge-watching and increased feelings of guilt after binge-watching. Overall, the study suggests that binge-watching is particularly pleasant when it does not interfere with other goals, which is more likely the case for individuals with high trait self-control.

1. Introduction

The rise of streaming services and affordable personal media devices has changed the way people watch television shows. Previously, viewers were restricted to watching a single episode of a television show at the time which was scheduled by conventional television channels. The increased availability of online streaming services and reliable internet connections has made it possible to watch television shows on computers, tablets, and other portable devices anytime, anywhere, and in any volume. By providing instant access to multiple episodes of television shows this technological progress has given rise to a new mass phenomenon: "binge-watching". Although the definitions of binge watching differ (Flayelle, Maurage, et al., 2020; Pittman & Steiner, 2021; Rubenking, Bracken, Sandoval, & Rister, 2018; Viens & Farrar, 2021), it is often described as the repeated viewing of several episodes of a television show in a single sitting. Binge-watching has become a prevalent behavior, particularly among the younger population (Koningsbruggen, Hartmann, & Du, 2017; Walton-Pattison,

Dombrowski, & Presseau, 2016).

Empirical research has begun to uncover the factors implicated in binge-watching (Exelmans & Bulck, 2017; Flayelle, Canale, et al., 2019; Flayelle, Maurage, et al., 2020; Jenner, 2017; Koningsbruggen et al., 2017; Pittman & Steiner, 2021; Reid et al., 2017; Riddle, Peebles, Davis, Xu, & Schroeder, 2017; Shim & Kim, 2018; Sung, Kang, & Lee, 2018; Tukachinsky & Eyal, 2018) as well as its potential detrimental effects such as poor sleep quality (Exelmans & Bulck, 2017), stress, loneliness, insomnia, depression, anxiety (Raza et al., 2021), worse health, social life, academic achievements, diets, and exercise (Vaterlaus, Spruance, Frantz, & Kruger, 2019). Like other types of binge-behaviors, such as binge-eating and binge-drinking, binge-watching television shows may be the result of self-control failures, where people attempt to reduce the behavior but fail to do so (Dieterich, Wüllhorst, Berghäuser, Overmeyer, & Endrass, 2021; Flayelle, Canale, et al., 2019; Kilian, Bröckel, Overmeyer, Dieterich, & Endrass, 2020; Ort, Wirz, & Fahr, 2021; Riddle et al., 2017). However, binge watching may also be a planned activity that is not the result of a self-control failure and that can be associated

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with positive emotional outcomes (Flayelle, Maurage, Karila, Vögele, & Billieux, 2019; Ort et al., 2021; Pittman & Steiner, 2021). A detailed understanding of the different decision-making processes related to self-control may help distinguishing problematic from unproblematic binge-watching.

This study adds to the existing literature by presenting novel information about how binge-watching is experienced in the moment. Such information on momentary experiences is distinct from data that describes how people cognitively evaluate a given situation (Kahneman & Riis, 2005) so that the study complements existing studies which analyze participants general reflections of binge-watching. Moreover, the present study focuses on the integral affect (i.e., anticipatory affect, during-behavior affect, and post-behavior affect) experienced when binge-watching, which provides a detailed account of dynamic binge-watching experiences rather than reflections of binge watching overall (Williams, Rhodes, & Conner, 2019). Furthermore, the study explores whether different aspects of self-control (such as plan, goal interference, or automaticity features) can explain the momentary binge-watching experience to help designing interventions that target these specific aspects of self-control, thus extending the small but growing literature on the experience of binge-watching (Anghelcev, Sar, Martin, & Moultrie, 2021).

To obtain data on the momentary experiences when binge-watching, an event reconstruction methodology is used which provides data specific to the last time participants binge-watched. This approach acknowledges that one binge-watching session can differ from another one even for the same person. The event reconstruction methodology is inspired by day reconstruction method, which was introduced by Kahneman, Krueger, Schkade, Schwarz, and Stone (2004) as a non-invasive alternative to experience sampling technologies to measure the activities and associated experiences of everyday life without interrupting everyday life. This approach is designed to prompt recall of the context and content of the previous day to minimize the impact of memory biases. Prior research has shown that the patterns of emotion elicited using the day reconstruction method align with those identified using the experience sampling method (Dockray et al., 2010; Kim, Kikuchi, & Yamamoto, 2013; Sonnenberg, Riediger, Wrzus, & Wagner, 2012).

2. Theoretical background

This section presents the theoretical background to the study and is organized in line with the statistical analyses we present later on in section 2.5. Section 2.1 reviews literature on the experiences related to binge-watching (the dependent variable). Section 2.2 deals with the link between self-control (the main independent variable) and binge-watching behavior, and section 2.3 examines the role of self-control to explain the binge-watching experience. Section 2.4 outlines elements of self-control for a more nuanced mediation analysis to provide a deeper understanding of the link between self-control and the binge-watching experience. Section 2.5 presents our analysis strategy.

2.1. The positive and negative experience of binge watching

Media consumption in general, and binge-watching in particular, have been linked to a number of positive (e.g., enjoyment, relaxation, gratification) and negative (e.g., guilt, regret, and loneliness) emotions (Flayelle, Maurage, et al., 2020; Ort et al., 2021; Pittman & Steiner, 2021; Song, Hu, & Mou, 2021; Tefertiller & Maxwell, 2018). These emotions are not necessarily stable while binge-watching but can evolve over time. For example, Tefertiller and Maxwell (2018) and Castro, Rigby, Cabral, and Nisi (2021) find that positive affect decreases after having binge-watched. The affective response to a target behavior is called "integral affect" and involves experiences leading up to, during, and immediately following a behavior (Williams et al., 2019). For example, guilt can increase over time when people binge-watch, as the initial decision to watch a television series might be planned, but

subsequent continuation might not be (Granow, Reinecke, & Ziegele, 2018). The potential presence of changing affective responses throughout binge-watching may suggest that it is important to examine binge-watching over time keeping track of the experiences during binge-watching sessions from start to finish. Moreover, research is converging on the view that binge-watching can, but not necessarily is, experienced as a problematic behavior (e.g., Flayelle, Verbruggen, et al., 2020; Ort et al., 2021). Self-control has been suggested as an important factor determining whether people binge-watch and how they experience the behavior.

2.2. Self-control and binge watching

Self-control refers to the ability to manage, monitor, assess, and alter cognitions, feelings, attention, and behaviors (Fujita, 2011; Hofmann, Friese, & Strack, 2009). It is used to regulate one's behaviors to behave in line with higher order goals by overriding, changing, or restraining urges, cravings, desires, impulses, or habitual responses. Self-regulatory challenges occur when people are confronted with short-term temptations that conflict with their long-term goals (Baumeister, 2002; Baumeister, Vohs, & Tice, 2007; de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Inzlicht, Werner, Briskin, & Roberts, 2021; Metcalfe & Mischel, 1999; Muraven & Baumeister, 2000).

Evidence suggests that problematic media use may be linked to lower levels of trait self-control. For people with lower trait self-control, media may be more likely to distract from attaining goals particularly when used for procrastination (Hofmann, Reinecke, & Meier, 2017; Reinecke & Hofmann, 2016), and self-control failures related to media occur frequently in individuals' daily lives (Delaney & Lades, 2017; Hofmann, Baumeister, Förster, & Vohs, 2012, 2017; Reinecke & Hofmann, 2016). For instance, social media use can result from self-control failures, where temptations to check Facebook or Instagram conflict with goals to use one's time in favor of pursuing long-term goals and social demands (Du, van Koningsbruggen, & Kerkhof, 2018; Ho, Lwin, & Lee, 2017; Hofmann, Reinecke, Meier, & Oliver, 2017; Reinecke & Hofmann, 2016).

Several studies have examined the relation between binge-watching and self-control failures, where people are unable to successfully resist the temptation to view "just one more episode" (Flayelle, Maurage, et al., 2020; Hasan, Jha, & Liu, 2018; Pittman & Steiner, 2021; Riddle et al., 2017; Schnauber-Stockmann, Meier, & Reinecke, 2018; Walton-Pattison et al., 2016). People who binge-watch without intentions to do so have been described as having impulsive personality traits and a tendency for self-regulation failures (Flayelle, Canale, et al., 2019; Riddle et al., 2017; Tukachinsky & Eyal, 2018).

Not all binge-watching experiences are linked to self-control failures (Flayelle, Maurage, et al., 2020; Flayelle, Verbruggen, et al., 2020; Merrill & Rubenking, 2019; Pittman & Steiner, 2021; Riddle et al., 2017; Rubenking & Bracken, 2018; Tefertiller & Maxwell, 2018; Tukachinsky & Eyal, 2018). For example, Pittman and Steiner (2021) distinguish between "cringe-watching" (which happens alone, accidental, and when the viewer is distracted) and "feast-watching" (which is planned, social, and when the viewer pays attention). Similarly, Riddle et al. (2017) distinguish between unintentional binges (which are linked to impulsivity and symptoms of addiction) and intentional binges (which are not linked to self-control failures), and Tukachinsky and Eyal (2018) show that binge-watching can reflect an active and very meaningful experience for viewers. Merrill and Rubenking (2019) find that only binge-watching frequency, not binge-watching duration, is related to lower self-regulation, and a review of the literature on binge-watching suggests that it manifests itself in either a rewarding and pleasurable activity or an excessive and problematic behavior (Flayelle, Maurage, et al., 2020). These findings point to the need for a more nuanced understanding of the role played by self-control for the binge-watching experience.

2.3. The role of self-control to explain the binge-watching experience

Consistent evidence suggests that trait self-control positively predicts cognitive and affective aspects of subjective well-being (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014; Wiese et al., 2018). This association appears to be mediated by the ability to avoid and deal with motivational conflict (Hofmann et al., 2014). Satisfying a desire that conflicts with a higher order goal has been linked to a lower increase in happiness compared to the satisfaction of a desire that is not conflicting (Hofmann, Kotabe, and Luhmann (2013). In the media domain, Hofmann et al. (2017) suggest that self-control is a key variable to better understand the interaction between media use and well-being suggesting that low levels of self-control are associated with high levels of media procrastination (e.g., Reinecke & Hofmann, 2016). This media procrastination can lead to heightened positive affect but at the same time to negative self-conscious emotions, such as guilt about one's media use, suggesting that perceived conflicts can detract from the pleasure of media consumption (Reinecke, Hartmann, & Eden, 2014). Reinecke and Hofmann (2016) show that recreational media use is positively associated with well-being, while the association is negative when media is used for procrastination.

The nuanced view of binge-watching as either unintentional or intentional suggests that self-control might be one key variable that explains how binge-watching is experienced (Flayelle, Maurage, et al., 2020). Self-control may predict the quality of the binge-watching experience and the post-binge watching gratification obtained (Nanda & Banerjee, 2020). Moreover, several different aspects of self-control exist, and self-control successes can happen in various ways (e.g., by avoiding temptation in the first place or by using willpower later on). These differences are relevant for the design of interventions to reduce self-control failures and hence a detailed understanding of the factors that lead to self-control failures and successes is important.

2.4. Different aspects of self-control and their relevance for binge-watching

At least three different aspects of self-control may be relevant to understanding the potential role of self-control in explaining binge-watching related experiences. Specifically, binge-watching can be a behavior that: (i) is not planned, (ii) interferes with higher order goals, and (iii) occurs automatically rather than deliberatively.

First, binge-watching may be considered to result from a self-control failure if the activity is not in line with a previously made plan (Riddle et al., 2017). In the economic literature on self-control, dynamically changing preferences (e.g., from watching a few planned shows to watching many more) are the defining characteristic of self-control failures (Frederick, Loewenstein, & O'Donoghue, 2002; Read, Loewenstein, & Kalyanaraman, 1999). The unexpected desire for immediate gratification makes people deviate from their plans. Often the consequences of such changes in plans are not considered and the resulting behavior is impulsive (Lades, 2014). In contrast, people with high self-control tend to stick to plans and behave in line with stable preferences. If people plan to binge-watch, for example to reward themselves or for recreational purposes (Reinecke, Klatt, & Krämer, 2011), this binge-watching does not constitute a self-control failure as no dynamic inconsistency occurs. Previous research on binge-watching thus distinguishes between intentional/planned and unintentional binge-watching. For example, Pittman and Steiner (2021) find that planned binge-watching is linked to positive mental health outcomes.

Second, binge-watching may result from a self-control failure if an intra-individual conflict between diverging motivations is present (Kotabe & Hofmann, 2015; Lades & Hofmann, 2019; Schnauber-Stockmann et al., 2018). For example, a student may want to watch a newly released series and simultaneously wishes to complete a college essay that is due the next day. Sometimes this conflict is called a vice-virtue conflict (Hofmann et al., 2009; Hofmann et al., 2014) and

when only the vice or the virtue can be fulfilled, a self-control dilemma is present (Fujita, 2011). Key to this definition of self-control problems is that individuals realize that a vice-type behavior interferes with a virtuous higher order goal. In this view, binge-watching is the result of a self-control failure where the person acknowledges that the short-term desire to binge-watch interferes with other important long-term goals. High levels of trait self-control are considered key to resolving such vice-virtue conflicts in favor of the virtuous activity.

Third, binge-watching can be linked to self-control via the extent to which the activity is automatic or habitual, acknowledging that an important aspect of self-control is the capacity to override unwanted response tendencies (Schnauber-Stockmann et al., 2018; Strack & Deutsch, 2004; Strack, Werth, & Deutsch, 2006). For example, Kilian et al. (2020) and Dieterich et al. (2021) find neurological differences related to inhibition between participants who binge-watch a lot and participants who do not binge-watch at all. However, Flayelle, Verbruggen, et al. (2020) do not find differences in response inhibition abilities between binge-watchers and non-binge-watchers. If binge-watching is mainly driven by automatic processes without any deliberative thoughts involved about whether to continue to binge-watch or not, it can be classified as a self-control failure (Pittman & Steiner, 2021; Tukachinsky & Eyal, 2018). For example, Pittman and Steiner (2021) find that binge-watching automatically is associated with regret and when people pay attention to the show, the likelihood of an enjoyable experience is higher. Features of the newly emerging streaming services, such as the automatic start of the next episode may induce distracted people to keep watching for several episodes without making a deliberative decision to do so (Pittman & Steiner, 2021).

2.5. The present study

This study aims to examine the role self-control might play in explaining potential differences in people's emotions during binge-watching. While previous research investigating the role of self-control for the binge-watching experience has largely measured binge-watching tendencies using psychological scales referring to typical behavior (e.g., Granow et al., 2018; Pittman & Steiner, 2021; Rubenking & Bracken, 2018), this study focuses on the specific experience of the last time participants binge-watched, and thus assesses situation-specific context variables. Identifying context-specific variables is critical for identifying different interventions to change binge-watching behaviors. For example, suggesting to "use self-control" is less helpful compared to more specific suggestions to change specific context variables related to, for example, binge-watching plans, higher order goals, and technological features that make the viewer binge-watch automatically.

The specific research questions of this study are: 1. Do people with high or low trait self-control experience binge-watching differently? 2. Why do people with high or low trait self-control experience binge-watching differently? 3. Can self-control explain the evolving experience of binge-watching over time?

First, we expected that those with low levels of trait self-control (as the independent variable in the analysis) would experience reduced levels of positive emotions and increased levels of negative emotions (as the dependent variables) whilst binge watching. Second, we examined three ways in which binge-watching may represent a situation-specific self-control failure (i.e., the behavior might not be planned, might interfere with higher order goals, or might continue automatically without deliberation) in a mediation analysis. We anticipated that for those with lower trait self-control, binge-watching would be more likely to represent a self-control failure and that this would explain why lower self-control predicted reduced well-being while binge-watching. Finally, we examined changes in integral affect before, during, and after binge-watching and tested whether those with lower trait self-control (again as the independent variable) may experience greater adverse *changes* in emotion over the course of the binge-watching session than others.

3. Methods

3.1. Participants

Participants were eligible if they were aged over 18 years and had recently binged-watched a television show, defined as having watched three or more episodes of a television show in a row without a break within the last seven days (Walton-Pattison et al., 2016). The study recruited 280 participants from the crowdsourcing platform Prolific Academic (https://www.prolific.ac/) and interest groups related to television shows that were popular at the time, popular streaming services, and groups that referred to binge-watching or similar phrases in the name on Facebook. Participants received a link to an online study and after providing informed consent engaged in an event reconstruction exercise about the last time they had binge-watched, answered a series of demographic questions and completed a trait self-control measure. Thirty-three participants were excluded from the final analysis due to not completing full information on the trait measures (n = 10) and not providing all experience ratings for all binge-watching phases (n = 23), leaving a final sample of 247 participants. Those recruited via Prolific Academic (43.3% of the sample) were paid £2 for participation and those recruited from social media participated voluntarily. It took participants on average 26.6 min to complete the survey (SD = 13.0). Most participants were female (70.9%), the average age was 29.5 (SD = 9.6), and participants were largely from the UK (42.9%), with 17% from the US. About 50% reported being single and 40.9% were married. The study received ethical approval from the Psychology Ethics Committee at the University of Stirling.

3.2. Event reconstruction

The core element of the study was an event reconstruction which asked participants to recall how they felt and what they had done the last time they had binge-watched. This event reconstruction approach is adapted from the Day Reconstruction Method as introduced by Kahneman et al. (2004). In the first part of the event reconstruction, participants were prompted to consider their most recent binge-watching session using the following instructions: *"We would like you to think about your last binge-watching session in four phases: 1. Before starting to watch; 2. The first half of watching; 3. The second half of watching; and 4. Right after watching."* The survey told the participants that the first half of watching is defined as the phase from the start of watching until about half-way of the binge-watching session, and the second half of watching is the phase from the half-way point until the end of the session. For each of the four phases, participants were asked to make a note in a box entitled *"Where were you? Who were you with? What did you do? How did you feel?"* and another note in a box entitled *"Any further notes to yourself?"* The aim of this procedure was to assist in the mental reconstruction of the last binge-watching episode.

In the second part, participants were presented with their phase-specific notes and asked to report how they felt during each of the four binge-watching session phases. After participants had finished the event reconstruction elements, they completed several survey measures as described below.

3.3. Emotions (the dependent variables)

For each of the four binge-watching phases, participants reported on their emotional experiences using a series of six response scales (i.e., relaxed, happy, sad, tired, bored, and guilty) rated on a 7-point Likert-scale (from 1 = *not at all* to 7 = *very much*). These seven emotional experiences cover the two dimensions (valence and activation) as suggested by previous research (Feldman Barrett & Russell, 1998), and psychometric evidence suggests that one-item measures are accurate for emotions, especially happiness (Abdel-Khalek, 2006).

3.4. Trait self-control (the independent variable)

Self-control was assessed using the 13-item Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004), which asks participants to rate how well each item describes them on a scale from 1 (*Not like me at all*) to 5 (*Very much like me*). Items include "*I have a hard time breaking bad habits*", "*I am good at resisting temptation*", and "*I blurt out whatever is on my mind*". The range of possible scores on the scale is 13–65 with higher scores indicating better self-control. Exploratory and confirmatory factor analyses provided evidence for mediocre fitting one- and two-factor solutions for the Brief Self-Control Scale (see Supplementary Materials). Due to the lack of strong support for a consistent two-factor model of the Brief Self-Control Scale in this and prior research (as summarized in the Supplementary Materials) we consider the self-control measure as unidimensional as it was originally conceptualized (see also Manapat, Edwards, MacKinnon, Poldrack, & Marsch, 2021). Cronbach's alpha in this study's data is 0.79.

3.5. Aspects of momentary self-control (the mediators)

The study assessed three different aspects of self-control: (i) whether the binge was planned with the yes/no question "*Had you planned to watch three or more episodes before you started watching?*", (ii) whether the binge interfered with other goals using the item "*binge-watching interfered with other goals I had in my life at the time*" (rated from 1 = *Not at all* to 5 = *Very much*), and (iii) the extent to which starting the next episode of the TV series during the binge was automatic with the Self-Reported Behavioral Automaticity Index (Gardner, Abraham, Lally, & de Bruijn, 2012) using the four items "*I started watching the next episode before realizing it*", "*I started watching the next episode without thinking about it*", and "*I started watching the next episode without having to consciously remember to do so*" rated on a 5-point Likert Scale (from 1 = *No/very few* to 5 = *(Almost) every*. Exploratory and confirmatory factor analyses provided evidence for a well-fitting one-factor model for the adapted Self-Reported Automaticity Index (see Supplementary Materials). Cronbach's alpha was 0.79 in our data. Additionally, participants reported the time when they started and finished the binge-watching sessions and indicated the online streaming service they had used.

3.6. Covariates

The covariates were participants' age, gender, country of origin (United Kingdom, United States, Germany, other), marital status (single, married, divorced, other) and recruitment channel (prolific academic or social media).

3.7. Analytical strategy

First, we present the descriptive statistics and correlations among the key variables. Next, we use linear regression models to examine the associations between trait self-control and individual affect items during the binge-watching episode. To do this, we first calculate the average feelings for each affect item across the two binge-watching phases (the first half and the second half) and examine the relationship between trait self-control and these average affect levels, controlling for demographics, mode of recruitment, time of day, and duration of the binge-session.

Next, we examine three aspects of self-control that may explain this association: planning, goal interference, and behavioral automaticity. We test whether the independent variable (trait self-control) predicts the potential mediating variables (planning, interference, automaticity) and whether the mediating variables are associated with affect levels during the binge-watching episode. Where the conditions for mediation are present, we conduct formal mediation analyses using the PROCESS macro (Hayes, 2012) with 95% bias-corrected bootstrapped confidence intervals estimated using 10,000 bootstrap samples to ascertain whether

indirect effects are statistically different from zero.

Finally, we examine whether affect levels tend to change throughout the binge-watching session and whether changes identified differ across the trait self-control gradient. For these dynamic analyses, we specify six separate multilevel linear regressions models predicting each of the six experiences in each phase. These phase-level regression models include 988 observations (4 phases × 247 participants) and a random intercept for each individual to account for the clustered data structure in which phases are nested within individuals. To test whether experiences differ over time and across people with different levels of trait self-control, we add the interactions between trait self-control and the phases to the model.

4. Results

4.1. Descriptive statistics and correlations

The descriptive statistics and correlations are detailed in Table 1. Most binge-watching episodes took place in the evening with some reported earlier (Mean = 18.11 h, SD = 4.96 based on the middle point of the binge-watch and a 24-h clock). The average duration of binge-watching was 4.27 h (SD = 2.16 h). Overall, participants reported feeling relaxed (M = 5.58, SD = 1.15 on a scale from 1 to 7) and happy (M = 5.14, SD = 1.27). Participants were somewhat tired (M = 3.97, SD = 1.6) and average levels of boredom (M = 2.45, SD = 1.42), guilt (M = 1.99, SD = 1.37), and sadness (M = 1.88, SD = 1.30) were lower. The majority (59%) of binge-watching episodes were reported as planned and most (49%) interfered with a higher order goal at least 'a little'. The mean automaticity score was 2.64/5 (SD = 1.11).

Histograms of the distributions of the interference and the automaticity variables are presented in the Supplementary Material. The average trait self-control levels (M = 38.3, SD = 8.1) are comparable to those reported in prior work (e.g., Tangney et al., 2004), and a histogram of the distribution of the variable is included in the Supplementary Material as well. Trait self-control was negatively correlated with binge watching interfering with other goals, automaticity, the duration of binge-watching, and negative emotions (i.e., feeling bored, guilty, sad) during binge-watching. Interference of binge watching with other goals was positively correlated with negative emotions.

4.2. Do people with high or low trait self-control experience binge-watching differently?

Trait self-control predicted negative affect levels whilst binge-watching, including boredom (b = −0.028, SE = 0.017, p = 0.015), guilt (b = −0.023, SE = 0.097, p = 0.023), and sadness (b = −0.026, SE = 0.018, p = 0.007) (see Table 2). The coefficient for the association

between trait self-control and tiredness was b = −0.024 (SE = 0.013, p = 0.052). Positive emotions during binge-watching were not predicted by trait self-control. Fig. 1 illustrates these associations.

4.3. Why do people with high or low trait self-control experience binge-watching differently?

To examine the associations between trait self-control and the negative affect measures during binge-watching, hypothesized mediating variables were entered into the regressions. Theses gauged whether the binge-watching session was *planned*, *interfered* with a higher order goal, or was characterized by *automaticity*. Table 2 shows that the associations between trait self-control and each of the negative affect items were attenuated after adjustment for the proposed mediating variables.

To better understand this attenuation, we tested whether trait self-control predicts the three potential mediators. Trait self-control predicted less interference with a higher order goal (b = −0.029, SE = 0.009, p = 0.001) and a lower likelihood of continuing watching the next episode automatically (b = −0.033, SE = 0.008, p < 0.001). Trait self-control was not associated with whether the binge-watching session was planned.

Regressing the mediators on the affect ratings showed that when binge-watching was planned, reported boredom was lower (b = −0.407, SE = 0.178, p = 0.023). Affect levels during binge-watching did not differ significantly depending on whether people continue to watch the next episode automatically. However, when binge-watching interfered with a higher order goal, participants reported feeling significantly less relaxed (b = −0.156, SE = 0.079, p = 0.047) and reported higher levels of tiredness (b = 0.213, SE = 0.99, p = 0.033), boredom, (b = 0.398, SE = 0.093, p < 0.001), guilt (b = 0.498, SE = 0.085, p < 0.001), and sadness (b = 0.286, SE = 0.080, p < 0.001). As such, greater interference with higher order goals tended to predict higher levels of negative emotions.

Of the three potential mediators, only interference with other goals is likely to mediate the relationship between trait self-control and levels of tiredness, boredom, guilt, and sadness experienced whilst binge-watching. Mediation analyses using the PROCESS macro showed a statistically significant indirect effect of trait self-control on tiredness (b = −0.006, SE = 0.003, 95% CI [−0.014, -.001]) through interference with a higher order goal (bootstrapped 95% CIs did not include zero). Interference also acted as a mediator between self-control and feelings of boredom (b = −0.011, SE = 0.005, 95% CI [-0.022, −0.004]), guilt (b = −0.014, SE = 0.005, 95% CI [−0.024, −0.005]), and sadness (b = −0.008, SE = 0.004, 95% CI [−0.017, −0.002]). Interference explained 25% of the total effect of trait self-control on tiredness, 39% of the total effect of self-control on boredom, 60% of the total effect on feelings of

Table 1
Descriptive statistics and Pearson's correlations for the sample (n = 247).

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Trait self-control	38.34	8.14	1											
2. Binge planned	0.59	0.49	0.06	1										
3. Binge interfered	1.86	1.1	**−0.22**	0.03	1									
4. Binge automatic	2.64	1.11	**−0.28**	0.06	**0.28**	1								
5. Start time	18.11	4.86	**−0.02**	−0.02	**−0.17**	−0.12	1							
6. Duration	4.27	2.16	−0.2	0.04	**0.14**	**0.25**	0.09	1						
7. Relaxed	5.58	1.15	0.06	0	**−0.14**	0.08	−0.05	−0.03	1					
8. Happy	5.14	1.27	0.12	−0.09	−0.12	0	−0.05	**−0.13**	**0.56**	1				
9. Tired	3.97	1.6	−0.11	−0.05	**0.16**	0.04	**0.14**	−0.04	−0.11	**−0.21**	1			
10. Bored	2.45	1.42	**−0.17**	−0.09	**0.36**	0.05	**−0.18**	0	**−0.23**	**−0.32**	**0.43**	1		
11. Guilty	1.99	1.37	**−0.13**	−0.08	**0.44**	0.1	**−0.16**	0.05	**−0.21**	**−0.13**	**0.26**	**0.38**	1	
12. Sad	1.88	1.3	**−0.16**	0.06	**0.32**	0.1	−0.11	0.02	**−0.33**	**−0.41**	**0.35**	**0.48**	**0.59**	1

Note: The trait self-control scale ranges from 13 to 65. Planned = binary variable; Interfered = scale from 1 to 5; Automaticity = 4 item index ranging from 4 to 20; Start time = time when binge-watching started in 10-min blocks starting from 0.00am; Duration = duration of the binge-watching episode in 10-min units; Emotions (rated on a scale from 1 to 7) refer to affective experiences during the binge-watching session (average of phases 2 and 3). Bold numbers indicate statistical significance at p < 0.05.

Table 2
Linear regressions examining the association between trait self-control and affect levels before and after the inclusion of potential mediating factors assessing whether the binge-watching session was planned, interfered with other goals, and was characterized by automaticity.

VARIABLES	(1) Relaxed	(2) Relaxed	(3) Happy	(4) Happy	(5) Tired	(6) Tired	(7) Bored	(8) Bored	(9) Guilty	(10) Guilty	(11) Sad	(12) Sad
Trait self-control	0.00282	0.00154	0.00936	0.00814	−0.0244*	−0.0162	−0.0281**	−0.0173	−0.0232**	−0.00971	−0.0260***	−0.0176*
	(0.0107)	(0.0107)	(0.0108)	(0.0106)	(0.0125)	(0.0128)	(0.0114)	(0.0109)	(0.0101)	(0.00904)	(0.00954)	(0.00929)
Binge planned		0.0572		−0.133		−0.187		−0.407**		−0.303*		0.0127
		(0.149)		(0.159)		(0.199)		(0.178)		(0.161)		(0.157)
Binge interfered		−0.156**		−0.140*		0.213**		0.398***		0.498***		0.286***
		(0.0785)		(0.0813)		(0.0991)		(0.0934)		(0.0845)		(0.0803)
Binge automatic		0.107		0.0652		0.0326		−0.0812		−0.0753		0.00507
		(0.0653)		(0.0771)		(0.0954)		(0.0926)		(0.0758)		(0.0767)
Constant	5.118***	5.147***	4.712***	4.917***	4.693***	4.020***	4.858***	4.156***	3.158***	2.108***	3.063***	2.213***
	(0.558)	(0.644)	(0.649)	(0.681)	(0.745)	(0.837)	(0.732)	(0.756)	(0.626)	(0.616)	(0.727)	(0.689)
Observations	247	247	247	247	247	247	247	247	247	247	247	247
R-squared	0.072	0.096	0.145	0.160	0.166	0.189	0.134	0.231	0.117	0.261	0.121	0.171

Note: All models are adjusted for the start-time and duration of the binge-watching episode and participant age, gender, country of origin (United Kingdom, United States, Germany, other), marital status (single, married, divorced, other), and whether the participant was recruited via prolific academic or social media. ***p < 0.01, **p < 0.05, *p < 0.1.
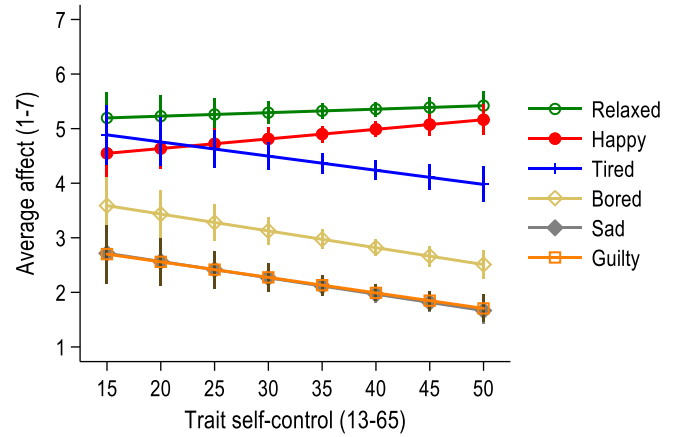
Fig. 1. Average reported affect levels (from 1 = *not at all*, to 7 = *very much*) while engaged in a binge-watching session as a function of trait self-control with 95% confidence intervals.

guilt, and 31% of the effect on sadness. In summary, those with higher levels of trait self-control experienced less intense negative feelings than others whilst binge-watching and this was in part because binge-watching was less likely to interfere with their long-term goals.

4.4. The changing experience of binge-watching over time

We tested how affect ratings changed over the four phases (before, first half, second half, and after binge-watching) using multilevel linear regressions predicting the affect ratings by phase, controlling for the same covariates as above as well as trait self-control. The results are presented in Table 3 in the columns with odd numbers and illustrated in Fig. 2. The complete regression results are in Supplementary Material S5. The results suggest that feelings of happiness and relaxation were high and increased slightly, sadness remained low, guilt was low and increased, tiredness remained the same initially and then increased, and boredom decreased throughout and remained lower afterwards (the time of the binge-watching episode is controlled for in these analyses). The changes in experiences were most pronounced for tiredness (people were particularly tired in the second half and after binge-watching) and boredom (people were particularly bored before binge-watching). The feeling guilt increased significantly throughout the phases.

To test whether the change of experience over the four phases differed for people with different levels of trait self-control, we specified multilevel linear models that also included the interaction term between the continuous variable trait self-control and the categorical variable for the four phases (see Table 3, columns with even numbers). The results show significant interaction terms for happiness and guilt. To illustrate these interactions, we separated the sample into three groups with different degrees of trait self-control (low = at least 1 SD below the mean, n = 43; medium, n = 161; high = at least 1SD above the mean, n = 43). This is a common way to probe interaction effects graphically (Bauer & Curran, 2005). We then ran separate regressions for each group and plotted the associations between the four phases and the feelings happiness and guilt in these phases for each regression separately in Fig. 3a and b, respectively. The difference in terms of happiness across trait self-control are largest before binge-watching and are smaller once binge-watching has started. People high in trait self-control remain at low levels of guilt throughout the four binge-watching phases. But people with lower levels of self-control developed higher levels of guilt at the later stages of the binge-watching episode.

Table 3
Multilevel linear regressions predicting experiences by phase and self-control and their interaction.

VARIABLES	(1) Relaxed	(2) Relaxed	(3) Happy	(4) Happy	(5) Tired	(6) Tired	(7) Bored	(8) Bored	(9) Guilty	(10) Guilty	(11) Sad	(12) Sad
Phases (base = before the binge-watching session)												
First half	0.700***	0.791*	0.522***	1.359***	-0.377***	-0.819*	-1.551***	-2.007***	0.0607	-0.127	-0.312***	-0.871**
	(0.0925)	(0.425)	(0.0730)	(0.368)	(0.0894)	(0.451)	(0.123)	(0.687)	(0.0577)	(0.270)	(0.0687)	(0.372)
Second half	0.628***	0.433	0.490***	1.040**	0.291**	-0.347	-1.227***	-1.691**	0.409***	0.872***	-0.243***	-0.668
	(0.117)	(0.539)	(0.0872)	(0.451)	(0.125)	(0.617)	(0.140)	(0.713)	(0.0853)	(0.336)	(0.0776)	(0.408)
After	0.381***	-0.0284	0.296***	0.423	1.158***	0.316	-1.097***	-0.954	0.668***	1.685***	-0.0121	-0.0711
	(0.133)	(0.626)	(0.0988)	(0.519)	(0.150)	(0.722)	(0.140)	(0.723)	(0.108)	(0.495)	(0.0848)	(0.442)
Trait self-control (TSC)	0.00643	0.00309	0.0176*	0.0275**	-0.0259**	-0.0385**	-0.0308**	-0.0359**	-0.0284***	-0.0200**	-0.0300***	-0.0368***
	(0.00968)	(0.0147)	(0.00958)	(0.0121)	(0.0113)	(0.0150)	(0.0102)	(0.0158)	(0.0100)	(0.00982)	(0.00947)	(0.0131)
Interactions (base = Before * TSC)												
First half * TSC		-0.00237		-0.0218**		0.0115		0.0119		0.00490		0.0146
		(0.0106)		(0.00877)		(0.0108)		(0.0172)		(0.00671)		(0.00921)
Second half * TSC		0.00508		-0.0143		0.0167		0.0121		-0.0121		0.0111
		(0.0133)		(0.0109)		(0.0154)		(0.0177)		(0.00819)		(0.00984)
After * TSC		0.0107		-0.00332		0.0220		-0.00373		-0.0265**		0.00154
		(0.0158)		(0.0127)		(0.0183)		(0.0175)		(0.0119)		(0.0109)
Constant	4.208***	4.336***	4.058***	3.679***	4.212***	4.693***	6.785***	6.980***	3.002***	2.679***	3.103***	3.364***
	(0.540)	(0.693)	(0.617)	(0.695)	(0.675)	(0.788)	(0.628)	(0.738)	(0.609)	(0.618)	(0.723)	(0.804)
Observations	988	988	988	988	988	988	988	988	988	988	988	988
Number of groups	247	247	247	247	247	247	247	247	247	247	247	247

Note: All models are adjusted for the start-time and duration of the binge-watching episode and participant age, gender, country of origin (United Kingdom, United States, Germany, other), marital status (single, married, divorced, other), and whether the participant was recruited via prolific academic or social media. Robust standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.
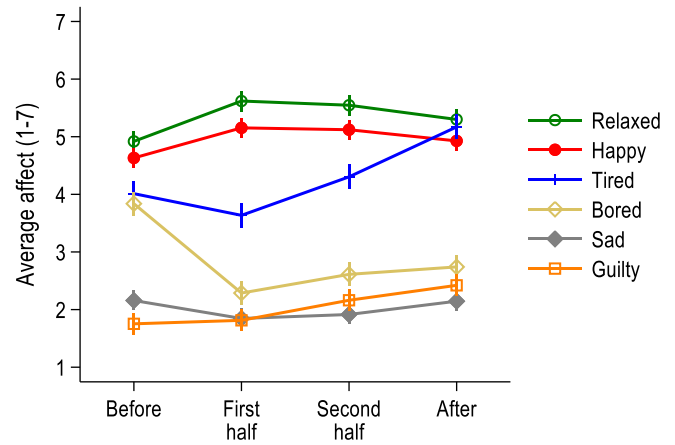

Fig. 2. Experiences by binge watching phase with 95% confidence intervals.
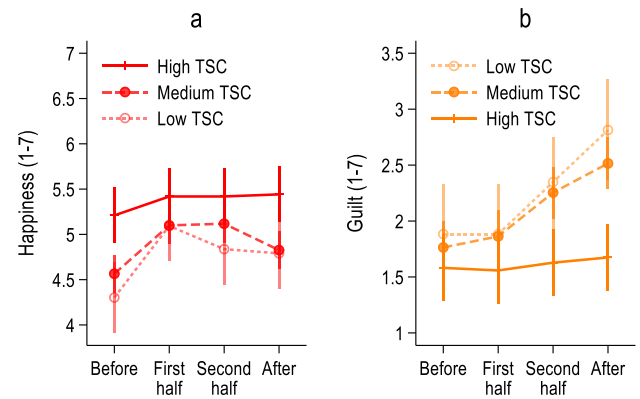

Fig. 3. Happiness (Panel a) and guilt (Panel b) by phase by trait self-control (TSC) with 95% confidence intervals.

5. Discussion

5.1. Contributions

This study finds that binge-watching is on average an activity associated with high levels of positive emotions (relaxation and happiness) and low levels of negative emotions (boredom, guilt, and sadness). However, this was not universally the case. People with low levels of trait self-control experienced higher levels of tiredness, boredom, guilt, and sadness when binge-watching compared to more self-controlled participants. This is in line with research suggesting that binge-watching is sometimes the result of a self-control failure (a guilty pleasure) and at other times a planned guilt-free activity (e.g., Flayelle, Maurage, et al., 2020; Ort et al., 2021; Pittman & Steiner, 2021; Riddle et al., 2017).

The study adds to this literature by investigating specific elements of self-control and showing that, for example, unplanned binge-watching sessions were associated with raised levels of guilt and boredom and the presence of conflict with other goals appeared to impair the experience of binge-watching. Almost 40% of the relationship between trait self-control and feelings of boredom, guilt, and sadness experienced during binge-watching could be explained by having a goal conflict. For those with low self-control, binge-watching interfered substantially more with higher order goals and this increased interference was associated with negative feelings.

For those high in self-control, however, binge-watching did not appear to interfere with the completion of other activities or tasks as

much, and because of this their enjoyment was less likely to be tempered by negative feelings like guilt and sadness. This insight is consistent with a recent discussion in psychology conceptualizing trait self-control not only as an ability to *resist* temptation, but also as the ability to *avoid* temptation by organizing lives in ways that reduce the occurrence of intrapersonal conflicts that might lead to self-control failures (Ent, Baumeister, & Tice, 2015; Fujita, 2011). In this study, people with high trait self-control seemed to have organized their binge-watching so that it did not interfere markedly with their higher order goals, suggesting that self-control is a pro-active as well as a re-active strategy.

In addition, our examination of dynamic changes in affect showed that those with low and medium self-control experienced a rapid increase in feelings of happiness on initiating their most recent binge-watching session and increased feelings of guilt afterwards. This finding extends previous research on binge-watching that suggests that binge-watching may lead to both increased subjective well-being as well as feelings of guilt (Granow et al., 2018) and research suggesting that it is important to consider the evolving nature of the experience of binge-watching from start to after the binge-watching session (Williams et al., 2019).

The study also contributes to the literature by demonstrating a non-invasive method for obtaining detailed data about the last time people binge-watched rather than relying on reports about typical behavior. Measuring binge-watching situationally in a specific instance rather than on the general level increases the temporal resolution, can help in overcoming memory biases, and allows to measure situation-specific variables (Grube, Schroer, Hentzschel, & Hertel, 2008; Kahneman et al., 2004).

There are practical implications of this study. Of the three different self-control processes examined (whether binge-watching is planned, whether it interferes with higher order goals, and whether it is continued automatically), only interference mediated the association between trait self-control and feelings during binge-watching. Whilst low trait self-control was related to automatically continuing to watch TV shows, the automaticity of binge-watching was unrelated to how people felt. As such, binge-watching may not give rise to negative feelings and self-conscious emotions such as guilt where the person is unaware of losing control. This finding may be informative for providers of video on demand services. It seems that facilitating the automatic continuation of binge-watching does not worsen the experience that binge-watchers have. However, service providers should be careful to avoid enticing viewers into binge-watching sessions that interfere with higher order goals. It might be sensible to develop user interfaces that prompts viewers to avoid binge-watching where continuing to watch interferes with a higher order goal.

5.2. Limitations and future work

When interpreting the results, a number of limitations should be kept in mind. First, the data are based on self-reports about the last time people had binge-watched. Such self-reports might be influenced by memory biases. We limited the sample population to individuals who had binge-watched in the previous week, but several days might be a too long time to recall specific feelings. Moreover, biases related to social desirability and the hypothetical nature of the questions might affect the results. Moreover, if people cannot recall accurately how they felt during the last binge-watching episode and, for example, answer based on how they think they must have felt, our results might not fully reflect participants' experiences. Since these limitations are relevant for all reconstruction studies, we refer to the existing literature discussing them at length (Diener & Tay, 2014; Lucas, Wallsworth, Anusic, & Donnellan, 2021).

We also note that all presented findings are correlational, and associations should not be interpreted causally. Future work can experimentally examine the extent to which binge-watching interferes with higher order goals and test whether changes in the strength of the

association between trait self-control and the experiences while binge-watching can be observed. Since we did not pre-register the study, it should be viewed as a study that generates (rather than tests) hypotheses. Extensions of the study could include other important factors that we have not elicited, such as the notion of binge-worthiness (Jenner, 2017), motivations to binge-watch (Sung et al., 2018), and whether the experience is better characterized as occasional binge-watching or part of a regular binge-watching routine. For example, the seven elements of the Binge-Watching Engagement and Symptoms Questionnaire (engagement, positive emotions, desire-savoring, pleasure preservation, binge-watching, dependency and loss of control) by Flayelle, Canale, et al. (2019) could be related to everyday experiences of binge-watching. Moreover, future research could also analyze the content viewed during their last session as qualitative research suggests that some series are more "binge-worthy" than others (Flayelle, Maurage, & Billieux, 2017).

In terms of the detail of the data, we analyzed four distinct phases, which proved feasible in the context of examining relevant variables for the current study but might mask some of the more intricate changes that occurred throughout the binge-watching episode. Future studies could attempt to elicit experiences more often. Moreover, future studies employing the event reconstruction method can compare momentary affect ratings as we elicited them and compare them with overall cognitive evaluations of the binge-watching experience. Finally, our data does not allow us to make statements about whether people with high or low trait self-control engage in binge-watching more or less frequently, because we sought to examine binge-watching experiences only amongst those who had recently engaged in this activity.

6. Conclusions

The findings of the current study suggest that for those with low self-control binge-watching represents a self-regulatory challenge where the short-term temptation to watch multiple episodes of a TV show tends to conflict with long-term goals and obligations. This conflict in part explains why low self-control was associated with increased negative feelings while binge-watching. Our findings suggest that for those with low self-control, binge-watching could be characterized as a guilty pleasure where initial increases in happiness on initiating viewing are followed by a rise in feelings of guilt after the binge-watching session.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chbr.2022.100220.

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