The Role of Cliffhangers in Serial Entertainment: An Experiment on Cliffhangers' Effects on Enjoyment, Arousal, and Intention to Continue Watching

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Abstract

Cliffhangers are a common style element in serial entertainment. This study investigates their role in today's high-choice media environment. It is assumed that cliffhangers lead to higher arousal, increase the enjoyment of a series, and foster the intention to continue watching. This may foster binge-watching, or more generally, high-intensity viewing of TV shows. In a laboratory experiment, individuals ($N = 133$) were exposed to three to four episodes of a drama series, eventually finishing either with or without a cliffhanger. Participants' arousal, enjoyment of the show, and intention to continue watching the series were measured via self-report and psychophysiological measures (electrodermal activity and cortisol levels). The results suggest that cliffhangers lead to higher arousal, but do not increase enjoyment or the intention to continue watching.

Keywords: cliffhanger; entertainment; arousal; physiological measures; binge-watching

Public Policy Relevance Statement:

Episodes or seasons of TV shows often end with a cliffhanger. It is generally assumed that cliffhangers induce suspense and thus bind viewers to the program. We tested this assumption with an experiment and found that although cliffhangers induce suspense, they do not affect the enjoyment of a show or intention to continue watching it.

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While traditional TV viewing is bound to a schedule defined by TV stations, nowadays individuals can watch whenever, wherever, (almost) whatever, and as much as they like. This has promoted new viewing habits, such as binge-watching (Flayelle et al., 2019; Sung et al., 2018; Walton-Pattison et al., 2018) and high-intensity viewing (Ameri et al., 2019). Binge-watching is defined as a high-dosage media consumption of several episodes of the same TV series in a row, which is often driven by the commitment to watch the series until its end (Rubenking et al., 2018). High-intensity viewing describes the fast and intensive viewing of a whole season within a relatively short period of time; this can happen in more or less long-lasting sittings and thus includes, but is not restricted to binge-watching (Ameri et al., 2019). Given the prevalence of such viewing behaviors, there has been increasing scholarly attention to the reasons for and consequences of this type of media use.

Drivers for continued series consumption can be characteristics of the media user, features of a TV series, or an interaction of both (Flayelle et al., 2019). Personality traits such as a high need for cognition, high sensation seeking, and low self-control (Riddle et al., 2018; Shim & Kim, 2018; Tukachinsky & Eyal, 2018) have been identified as facilitators of intense series consumption, along with motives such as mood management, escapism, entertainment, and social interaction (Flayelle et al., 2019; Pittman & Sheehan, 2015; Rubenking et al., 2018; Rubenking & Bracken, 2018; Shim & Kim, 2018; Sung et al., 2018). Regarding TV series features, it is assumed that continuous serials with complex, multi-layered narratives trigger continued exposure, especially if they finish with an open end or a cliffhanger (Czichon & Schlütz, 2016; Schlütz, 2016).

Cliffhangers interrupt the narrative at a suspenseful point with the aim of increasing the desire to watch the next episode (Fröhlich, 2015; Michlin, 2011; Poot, 2016). Thus, they may be considered an important style element that explicitly encourages binge-watching (Flayelle et al., 2019) or high-intensity viewing. To our knowledge, it has yet to be investigated whether cliffhangers indeed lead to more suspense and a higher intention to continue watching. The suspense created by cliffhangers must be distinguished from the suspense resulting from the unfinished narration itself, which is a constitutive part of continuous serials. Thus, it remains an open question whether cliffhangers foster continued exposure. The present study aims to address this research gap through an experiment in which individuals were exposed to several episodes of a drama series, eventually finishing either with a cliffhanger or without, while the overarching narration remained unfinished in both cases. Participants' arousal, enjoyment, and intention to continue watching the series were measured via self-report and physiological measures (electrodermal activity and cortisol levels).

Studies have shown both positive and negative effects of intense viewing practices. Some studies found that binge-watching enhances the entertainment experience and increases the enjoyment of the TV series (Czichon, 2019; Erickson et al., 2019; Granow et al., 2018). On the other hand, binge-watching has been found to lead to feelings of guilt (Granow et al., 2018), addiction symptoms (Riddle et al., 2018) and problems with sleep (Exelmans & Van den Bulck, 2017). These negative effects are often related to the delay (or abandonment) of other activities due to prolonged media consumption, as well as to the arousal that results from media content. Thus, it is important to investigate what leads individuals to watch many episodes within a short time.

The Cliffhanger

Different definitions of the word *cliffhanger* are found in current lexica (see Fröhlich, 2015 for an overview). Regarding TV series, cliffhangers present an interruption of the narration at the end of a season or an episode, but also within episodes to prevent channel-surfing during commercial breaks (Michlin, 2011). Although media use habits have dramatically changed with the advent of streaming platforms, cliffhangers are still a prevalent feature. Interrupting the narration at a point where the story has not yet reached a resolution, they should motivate the audience to anticipate how the situation will resolve and how the resolution will relate to the narrative as a whole (Poot, 2016).

This anticipation of a crucial outcome of (or within) a story elicits suspense (Vorderer & Knobloch, 2000). Suspense is generally understood as an "emotional response to narrative fiction" (Carroll, 1996, p. 74), which particularly arises in response to the dramatic arc of the whole or specific parts of the narration. In both cases, the audience is not yet certain about the resolution of a particular situation or plot as a whole (Vorderer & Knobloch, 2000). Thus, a cliffhanger does not only literally portray the protagonist in a suspenseful situation, but the suspense is also mirrored in the experience of media users (Fröhlich, 2015). According to the affective disposition theory (e.g., Raney & Bryant, 2002; Zillmann, 1995), the level of suspense is influenced by how much the viewer hopes for a positive outcome for a liked character but fears a negative one (or vice versa, hopes for a negative outcome for a disliked character but fears a positive one). Hence, the more critical the anticipated outcome is perceived, the more suspense a cliffhanger elicits.

To summarize, cliffhangers can be defined as a stylistic element in serial narration that is used to create suspense by interrupting the narration at a point where viewers anticipate a critical

outcome. Cliffhangers are considered "meaningful storytelling acts that bear on the stories they interrupt" (Poot, 2016, p. 52). Thus, they should not only affect the intention to continue watching a program, but also influence the entertainment experience as a whole. Despite the widespread use of cliffhangers across different media genres, scholars have paid surprisingly little attention to the effects of this style element (Poot, 2016). To our knowledge, no studies have empirically tested whether cliffhangers have the intended effects.

Cliffhangers and Arousal

From a psychophysiological perspective, suspense can be understood as a feeling of empathic distress (Zillmann, 1996) accompanied by an increase in sympathetic activity. The sympathetic nervous system (SNS) is part of the autonomic nervous system (ANS) and responsible for the mobilization of energy to prepare an individual for action. This preparatory process leads to an increase in heart rate and arousal, which is indicated by a surge in electrodermal activity (Ravaja, 2004). The excitation transfer theory (Zillmann, 1980) proposes that arousal accumulates during exposure to a dramatic narration. The total arousal experienced at the end of the narration is then attributed to the resolution of the narration. If the outcome is favorable, this will result in relief, and the experienced distress will transform into euphoria (Zillmann, 1980). In serial narration, however, the absence of a resolution at the end of an episode prevents this experience of relief or euphoria. Furthermore, if an episode ends with a cliffhanger, the suspense it induces may lead to even higher arousal. Therefore, it can be assumed that the presence of a cliffhanger at the end of an episode leads to higher arousal than the mere openness of an unfinished narration (*H1*).

Cliffhangers and Enjoyment

Besides their effect on arousal, cliffhangers may also affect the enjoyment of the narration. While arousal can lead to enjoyment when the narration finds a favorable resolution (Zillmann, 1996), enjoyment can also be understood as a positive meta-emotion that emerges from the experience of initially negative emotions during media use (Vorderer et al., 2004). In this case, enjoyment emerges as individuals reflect on the emotions evoked by the media content, after which they label the experience as positive. Enjoyment as a meta-emotion has mostly been studied in the context of films with a sad ending, where media users appreciate their experience as meaningful (Hofer & Wirth, 2012; Oliver, 1993). In the context of open endings and cliffhangers, where resolution of the narration is missing, it seems adequate to consider enjoyment as a meta-emotion that arises when viewers value the plot twist and the induced suspense that comes along with the cliffhanger. It has been shown that spoilers (i.e., knowing the outcome of a narrative beforehand) can decrease enjoyment (Rosenbaum & Johnson, 2016). Continued suspense, on the other hand, may thus have a positive effect.

A positive evaluation of suspense induced by a cliffhanger may depend on personal preferences. First, individuals with a high propensity for sensation seeking—a personality trait that describes the need for varied, novel, and complex sensations (Zuckerman, 1994)—might particularly enjoy cliffhangers. Their optimal arousal level is generally higher than that of other people, and they prefer exciting and stimulating media content (Perse, 1996). Research showed that sensation seeking is positively related to binge-watching behavior (Shim & Kim, 2018), which might be explained by the general accumulation of arousal during prolonged media use. Second, cliffhangers induce not only suspense but also curiosity about the progress and outcome of the story. In particular, individuals with a high need for cognition may appreciate this

engagement with the open storyline (Shim & Kim, 2018) because they tend to enjoy thinking and being in a curious state (Olson et al., 1984). Thus, for individuals with a high need for cognition or sensation-seeking, the suspense that results from a cliffhanger might transform into a positive meta-emotion, which may help to explain why previous research found a positive relationship between binge-watching and these personality traits. Therefore, we assume that the presence of a cliffhanger at the end of an episode leads to higher enjoyment of a series for individuals with a high need for cognition (*H2a*) and for individuals who score high in sensation seeking (*H2b*).

Cliffhangers and Intention to Continue Watching

The effect of cliffhangers on the intention to continue watching has so far been explained with the Zeigarnik effect (Zeigarnik, 1938). Individuals remember unfinished tasks better than completed ones, which may leave them preoccupied with an unfinished narration (Fröhlich, 2015). Moreover, it has been shown that individuals feel a need to complete interrupted tasks, which is referred to as the Ovsiankina effect (Ovsiankina, 1928). This may also apply to narration that has started. While a serial narration always remains incomplete at the end of one episode (unless it is the last one), the interruption is more obtrusive in the case of cliffhangers, and may thus lead to a stronger urge for completion.

Another fruitful approach to explain why cliffhangers may lead to a stronger desire to continue watching is mood management. According to this theory, individuals generally tend to select media content to regulate their emotional states in such a way that they achieve a pleasant level of arousal and positive valence (Dillman Carpentier, 2020; Knobloch-Westerwick, 2013; Zillmann, 1988). Against this background, cliffhangers can be expected to induce levels of arousal that are perceived as too high and emotional states of negative valence such as fear. Individuals find themselves in an unbalanced state, which may lead them to continue watching in

the hope for relief. Although negative emotions are often associated with message avoidance (Böcking & Fahr, 2009), they can also prompt exposure to subsequent content because individuals expect reassurance (Nabi, 1999). In the case of cliffhangers, viewers may hope that the next episode will provide a resolution. On the other hand, the unfinished narration alone should not lead to the same arousal level and negative affective states; therefore, we can expect that cliffhangers lead to a stronger desire to watch the subsequent episode.

Moreover, it can be expected that the effect of cliffhangers on the intention to continue watching should be more pronounced for individuals with a high need for cognitive closure, because they have a stronger desire to find *any* answer compared to being left behind with confusion, ambiguity, or loose ends (Webster & Kruglanski, 1994, p. 1049). Although the unfinished narration of the series is a loose end per se, a cliffhanger is a direct representation of an open question and should thus increase the need for an answer. Based on these considerations, we postulate that the presence of a cliffhanger at the end of an episode leads to a stronger intention to continue watching the series than the mere openness of the unfinished narration (*H3a*), especially for individuals with a high need for cognitive closure (*H3b*).

Method

Design and Procedure

To test the hypotheses, a one-factorial between-subject experiment with a multi-stimuli design (Reeves et al., 2016; Slater et al., 2015) was conducted. We selected four TV series: Orphan Black, The Sinner, How To Get Away with Murder, and Sense8. All are continuous serials, represent the drama/crime genre, employ cliffhangers, and were popular at the time of data collection. We produced a video file containing three or four complete episodes of each series in a row, adding up to approximately three hours of content. This long exposure time was

chosen to allow participants to get involved with the narrative and characters, and to create an intense viewing situation. The end of the last episode was manipulated to have one version of each series ending with a cliffhanger and one version ending at a non-suspenseful point. As a control condition, we produced a compilation of three episodes of a documentary series on natural energy production[1]. Each episode portrays a different place in the world; thus, there is no continuous storyline and no cliffhangers at the end.

Participants for the experiment ($N = 133$) were recruited on campus or via social media, and invited to either the media lab or sleep lab of a Swiss university. Of these, 91 persons participated in the media lab. Based on a short screening questionnaire about their previous series use, participants were assigned to groups of 4–8 people, which included at least 1 series of our selection in common that they had not seen before. Subsequently, each group was randomly assigned to an experimental condition (cliffhanger vs. no cliffhanger) or the control condition (documentary). When there were several possible options for the choice of series, these were selected to achieve an equal number of participants across stimuli in each experimental group. Hence, while assignment to the specific shows was not random, that to the cliffhanger vs. no cliffhanger version or control group was[2].

The sessions for the experiment were scheduled in the evening, as this is when most people watch a series. The setup of the lab recreated a cinema-like situation, with comfortable

[1] Islands of the future

[2] In an experiment with a single stimulus, participants would only be eligible to participate if they had not seen the selected show before. Grouping participants according to shows they have not seen before does not lead to more homogeneity than this common inclusion criterion. Rather, by including participants based on not having seen one of the four shows, we were able to create a more diverse sample.

chairs to sit and a large projection screen. Upon arrival, participants completed the first questionnaire on a tablet to assess sociodemographic information and personality traits. Next, the sensors for physiological measurements were attached, a first saliva sample for the measurement of cortisol was taken, and participants completed a pre-exposure questionnaire. As the screening started, participants were offered a salty snack (nuts, chips) and provided with a small bottle of water. A second saliva sample was collected after the second episode. Upon completion of the last episode, participants completed a post-exposure questionnaire and then gave a third saliva sample. Finally, the participants were paid a small compensation for their participation, thanked, and dismissed. For the 42 persons who participated in the sleep lab, the procedure was identical, except that participants watched the series alone in a bedroom, where they also spent the night. Additional measures taken in the sleep lab are not relevant for the study at hand[3]. Since the different settings could have impacted the entertainment experience, we tested for interactions between conditions and settings on all dependent variables and did not find any effects. Nevertheless, the setting was included as a covariate in all the analyses. The study design was approved by the cantonal ethics board. Participants gave their informed consent before the experiment started and were debriefed at the end of the study. The dataset was shared on the Open Science Framework (OSF)[4]. An overview of the experimental conditions is provided in the online appendix.

[3] The results from the additional measures in the sleep lab will be reported in a separate publication with a different target audience.

[4] https://osf.io/xkm3t

Participants

The sample (N = 133) consisted of 93 females and 40 males, which reflects the gender distribution among psychology and communication students at the university. Participants were aged between 18 and 30 years (M = 21.06, SD = 2.36). Physiological data are only available for 111 participants because of measurement issues (i.e., a lack of data for the whole session or for the timespan used for analysis). A sensitivity analysis was conducted using G*Power (Faul et al., 2007) to establish the effect sizes that can be detected with a power of 80% given the achieved sample size and an alpha level of .05. For ANCOVAS comparing the cliffhanger and non-cliffhanger conditions (or one of these conditions and the control condition), f must be > .31 (η^2 = *.09)*. For the moderation analyses, we followed the recommendations of Perugini, Gallucci, and Costantini (2018) for interactions between dichotomous and continuous predictors. The sensitivity analysis showed that f^2 must be > .099, which corresponds to an R^2 increase of 0.09 for the interaction term. Thus, for smaller effect sizes, we can thus not be sufficiently confident to not commit a type II error.

Manipulation of the Independent Variable

To test the effects of cliffhangers against the mere unfinished narration, we manipulated the ending of the four selected TV series after approximately three hours of viewing time (three to four complete episodes depending on the episode length). For each series, we created a cliffhanger and non-cliffhanger version by stopping the narration at a different point in time. Following our definition, cliffhangers interrupt the narration at a point where viewers anticipate what will follow; thus, there is an ongoing action with a certain number of possible outcomes. The non-cliffhanger endings are interruptions at a point where an ongoing action has been completed, and the narration will resume with a new action. This opens up many possibilities,

and viewers do not have specific anticipations (see the online appendix for a description of the ending of both versions for all shows). Hence, we did not change any content, but manipulated the amount of content presented to participants. The time variation between the cliffhanger and non-cliffhanger versions of the same series ranged between 1 min 43s and 4 min 18s (total viewing time: *M* = 2 h 49 min, *SD* = 2 min 42s). The total duration of the control condition (documentary series) was 2 h 35 min.

Measures

Dependent variables.

Arousal. To capture participants' arousal, we applied self-report measures as well as physiological indicators. The *Self-Assessment Manakin (SAM) for the arousal dimension* (Bradley & Lang, 1994) was used as a self-report measure for general arousal. A "feelings thermometer" (scale ranging from 0 "totally relaxed" to 100 "highest level of distress ever experienced") was employed to assess *subjective units of distress (SUDS)* (Benjamin et al., 2010), indicating arousal combined with a negative valence. Physiological measures were used to determine participants' arousal during the viewing session. Electrodermal activity (EDA) is associated with the activation of the SNS and therefore indicates general arousal (Lang et al., 2009; Potter & Bolls, 2012; Ravaja, 2004). Participants' skin conductance was measured using a sensor on the index finger of the non-dominant hand. In the media lab, the M-MULTI-module (*Schuhfried Biofeedback Xpert*) was used and the signal was recorded at a frequency of 40 Hz. In the sleep lab, a *Brainproducts* EDA sensor recorded the EDA signal with a sampling rate of 500 Hz. The difference between an individual baseline measure of the *Skin Conductance Level (SCL)* and SCL at the end of the last episode was computed to determine the arousal the cliffhanger induced. SCL is reported in microSiemens (μS). The baseline measure is the mean value of the

measures recorded during a 40-second period before the start of the series. Participants were instructed to close their eyes, stay calm, and relax for a minute before the series started. The measure at the end of the viewing session is the mean value of SCL during the 30 seconds after the last episode ended; thus, the time we assumed participants were coping with the ending. Since two different measurement systems were used in the media and sleep lab, the mean values for the baseline and the ending were z-standardized before the data sources were combined.

A physiological indicator for arousal with a negative valence is the production of the hormone cortisol, which results from the experience of mild psychological stressors (Kirschbaum & Hellhammer, 1989; Lovallo & Buchanan, 2016). The effects of psychological stress can be measured in *salivary cortisol* with a latency of 15–20 minutes (e.g., Gentile et al., 2017). Participants' cortisol levels were measured using three saliva samples over the course of the viewing session (pre-exposure, after two episodes, and post-exposure). The last sample was collected 15 minutes after the end of the last episode to capture the effects of the manipulation. Since the first two measures were unaffected by the ending of the series, their mean value was used as a baseline. All samples were sent to the laboratory for analysis. Levels of salivary cortisol are reported in nanomoles per liter (nmol/L).

Enjoyment. Participants' enjoyment of the TV series was measured with four items on a five-point Likert-type scale. Three items were taken from Wirth et al. (2012), which indicate a positive overall entertainment experience (e.g., "All in all, I enjoyed watching the series"). An additional item measured the general evaluation of the series ("How much did you like the series overall?"). The four items were averaged to form an index with $\alpha = .94$.

Intention to continue watching. The intention to continue watching the series after the exposure was measured with two items on a five-point Likert-type scale ("How likely is it that

you will continue to watch the series?", "I really want to see the next episode in order to know how the story resolves." α = .88, Spearman-Brown = .88).

Moderating variables. The moderating variables were measured in the pre-exposure questionnaire on a five-point Likert-type scale. *Need for cognitive closure* was assessed with 15 items according to Roets and Van Hiel (2011) (e.g., "When I am confronted with a problem, I'm dying to reach a solution very quickly." α = .85). *Sensation seeking* was measured with four items taken from the UPPS-P Impulsive Behavior Scale (Cyders et al., 2014). However, the internal consistency of the scale was not satisfactory (α = .61), and eliminating items did not improve reliability. Upon closer inspection, only one item was normally distributed. Thus, we opted for a single item as an indicator for sensation seeking ("I quite enjoy taking risks"). *Need for cognition* was measured with the six-item short-scale by Lins de Holanda Coelho et al. (2018) (e.g., "I really enjoy a task that involves coming up with new solutions to problems." α = .75.)

Manipulation Check. To capture the experience of a cliffhanger as a manipulation check, we used the corresponding items of the PANAS scale (Watson et al., 1988). We constructed an index of five items that indicate feelings of suspense or distress (distressed, scared, nervous, jittery, scared, Cronbach's α = .85).

Results

Bivariate correlations of all variables are shown in Table 1, and the means and standard deviations are documented in the online appendix.

First, we conducted a manipulation check to ensure the editing of the final episode successfully created a cliffhanger vs. non-cliffhanger condition. An ANOVA was conducted employing the experimental conditions as the independent variable and PANAS items for

suspense/distress as the dependent variable. The different series (dummy coded) and setting were included as covariates. Helmert contrast coding was used to first compare the control condition (documentary series) to the experimental conditions (drama series), and then the two experimental conditions to each other (cliffhanger vs. no cliffhanger). The results confirm that the drama series generally evoked more suspense/distress than the documentary series ($M_{control}$ = 1.23, SD = 0.30), and the series with a cliffhanger induced more suspense than the series without one (M_{no_cliff}= 1.68, SD = 0.65, M_{cliff} = 2.23, SD = 0.99, $p < .001$). Thus, we consider the manipulation successful.

The first hypothesis predicted that cliffhangers would lead to more arousal than the unfinished narration. To test this hypothesis, ANOVAs were computed using different indicators of arousal as dependent variables. For the manipulation check, Helmert contrast coding was used as the independent variable, and the four series as well as the setting were introduced as controls. An overview of the results of the self-report measures of general arousal (SAM) and distress (SUDS) is presented in Figure 1. Arousal was lowest after watching the documentary series, followed by the drama series without a cliffhanger, and highest after watching the series with a cliffhanger. The mean values of arousal differed between the documentary and drama series ($p < .001$), and between the versions of the drama series with and without a cliffhanger ($p = .003$). None of the covariates had a significant effect. The results for experienced distress (SUDS) were similar (see Table 2). Both measures indicate that the presence of a cliffhanger leads to more arousal and distress than the unfinished narration itself.

[Insert Table 2 and Figure 1 about here]

In the second step, the physiological indicators for arousal (SCL) and stress (cortisol) were employed as dependent variables. Since SCL values were z-standardized, positive values

indicate an above-average increase in arousal at the end of the viewing session compared to the baseline measure. This increase can be observed for participants who were exposed to a cliffhanger version or who saw the documentary. A below average increase was found for individuals in the non-cliffhanger condition (see Figure 2). However, because of the large standard deviations, the differences between the groups are not significant: $F(2, 100) = 0.92$, $p = .40$, $\eta^2 = .02$.

For cortisol, positive values indicate an increase in cortisol levels and negative values a decrease. Note that cortisol levels vary throughout the day: in the evening, cortisol levels generally decrease. In line with Hypothesis 1, we would thus expect negative values after watching the documentary as well as the drama series without a cliffhanger and stable or even positive values after watching a series with a cliffhanger, since the induced distress should interrupt the natural cortisol decrease. The data largely support this pattern (see Figure 2). Individuals who did not see a cliffhanger demonstrated the largest decrease in cortisol levels, followed by participants who saw the documentary. For viewers who were exposed to a cliffhanger, the difference was slightly positive. While the overall effect of the cliffhanger was marginally insignificant ($F(2, 122) = 2.69$, $p = .06$, $\eta^2 = .05$), the Helmert contrast indicates a significant difference between the cliffhanger and no-cliffhanger condition ($p = .02$). However, the standard deviation for cortisol measures is very large in the cliffhanger condition. Consequently, the magnitude of cortisol reactions to the cliffhanger varies strongly between individuals. No covariate had a significant effect on SCL; however, salivary cortisol increased significantly more among participants who watched *How to Get Away with Murder* ($F(1, 122) = 4.37$, $p = .04$, $\eta^2 = .04$.)

Overall, the assumption that a cliffhanger increases arousal more than the unfinished narration itself (*H1*) is largely confirmed, but note that physiological arousal after exposure to a cliffhanger was not higher than after watching a documentary series.

[Insert Figure 2 about here]

The second hypothesis predicted that cliffhangers contribute to the enjoyment of the show, particularly for individuals with a high need for cognition or sensation seeking. To test these assumptions, moderation analyses were conducted using PROCESS Model 1 (Hayes, 2017)[5]. The experimental condition was employed as a multi-categorical independent variable, enjoyment as the dependent variable, and need for cognition or sensation seeking as the respective moderators. As in the previous analyses, Helmert contrast coding was employed to compare the different conditions, and the specific series and experimental setting were included as control variables. Tables 3 and 4 present an overview of the results. The model with need for cognition as a moderator shows that the drama series increased enjoyment compared to the documentary, but the cliffhanger did not have any effect compared to the mere unfinished narration. Further, viewers with a higher need for cognition reported no pronounced entertainment experience compared to those with a lower need for cognition. Similarly, in the model with sensation seeking, a significant difference was found between the drama series and documentary in enjoyment, but not between the versions with and without a cliffhanger. No significant effect of sensation seeking was found either. Taken together, the drama series were enjoyed more than the documentary, but the cliffhanger did not increase enjoyment, and neither did the need for cognition or sensation seeking. Thus, *H2a* and *H2b* are rejected. One of the

[5] The model was estimated with the following specifications: 5,000 bootstrap samples, mean center for construction of products, HC3 correction for standard errors.

control variables had a significant effect in both models: participants enjoyed *Orphan Black* more than the other series.

[Insert Tables 3 and 4 about here]

The third hypothesis predicted that the presence of a cliffhanger would increase the intention to continue watching the series, especially for individuals with a high need for cognitive closure. To test this assumption, a moderation analysis was conducted with need for cognitive closure as the moderator, the intention to continue watching the series as the dependent variable, and the same controls as in the previous analyses. Table 5 presents an overview of the regression coefficients. The results show a significant increase in intention to continue watching for the drama series compared to the documentary, but no increase was found between the series with and without a cliffhanger. Thus, *H3a* was not supported. The need for cognitive closure had no direct effect on the intention to continue watching, but a significant interaction was found with the type of series watched: individuals with a high need for cognitive closure showed a stronger intention to continue watching when they saw a drama series compared to seeing the documentary. Nevertheless, *H3b* is rejected because the need for closure did not affect the intention to continue watching as a result of the cliffhanger.

[Insert Table 5 about here]

Discussion

The present study aimed to investigate whether cliffhangers in drama series motivate high-intensity viewing by increasing arousal, enjoyment, and the intention to continue watching. Although our study shows a significant effect of cliffhangers on arousal, this did not translate

into more enjoyment or an increased intention to continue watching the series compared to the mere unfinished narration[6].

The results of this lab experiment contradict the common belief that cliffhangers bind the audience to a series. However, note that enjoyment and intention to continue watching were measured after watching three to four episodes of the series. This long exposure time ensured that participants had seen enough of the series to become familiar with the cast and story, which is an important prerequisite to test if the cliffhanger or openness of the overarching narration drives the intention to continue watching. Moreover, it was necessary to model high-intensity viewing or binge-watching in terms of the duration and number of episodes. However, regarding the intention to continue watching, this setting restricted us to measuring the intention to continue the series at some point in the future. Cliffhangers might be more impactful for the immediate continuation of a viewing session. As per mood management theory (Zillmann, 1988), it can be assumed that the experience of high arousal at the end of an episode will foster continuation when individuals expect that subsequent content will regulate their mood. When viewers have to interrupt a viewing session, other influences regulate their mood and affective states may lose their explanatory power for the continuation. Rather, other factors such as the overall evaluation of the viewing session might influence the decision to continue watching a show. Future research should on one hand investigate the effect of arousal on immediate continuation, and on the other, explore the drivers of continued exposure over longer periods. Furthermore, the level of suspense induced by the cliffhanger was relatively low. While this could be a measurement issue (the PANAS scale measures emotional states in real life, but not

[6] There is also no indirect effect of the cliffhanger via suspense on enjoyment and intention to continue. See the online appendix Table A4.

specifically for mediated experiences), future research should consider the intensity of cliffhangers. Specifically, different types of cliffhangers such as a threat or an unexpected turn of events might lead to different levels of suspense and thus affect the decision to continue watching. Also, future research could measure suspense by directly asking how suspenseful the story is perceived instead of trying to capture the emotional reactions associated with this state.

For enjoyment, the forced exposure situation might have limited entertainment experience. We addressed this by carefully selecting series that were very popular at the time of the study; nevertheless, future research could use a selective exposure design or select stimuli based on more extensive pre-testing. However, these restrictions affected all conditions the same way and might therefore not account for the non-effect of the cliffhanger. Since the effect of arousal on entertainment is based on the misattribution of arousal that has accumulated over the whole viewing session (Zillmann, 1980), it must be considered that the mere variation of the last few minutes of a show after an exposure time of nearly three hours is not sufficient to affect the evaluation of the whole show.

Although the cliffhanger had no effect on enjoyment and intention to continue watching, the presence of a cliffhanger at the end of the viewing session increased arousal. This is an important finding, since the negative effects of binge-watching on sleep quality have been attributed to pre-sleep arousal (Exelmans & Van den Bulck, 2017). Our study can contribute to a more nuanced understanding of this finding; not binge-watching series per se, but watching series that end with a cliffhanger increases arousal. While cortisol levels decreased for individuals watching the documentary or the drama series without a cliffhanger, this natural rhythm was interrupted in the cliffhanger condition.

A closer examination of this effect of cliffhangers on arousal indicates that the observed patterns differ between self-report measures and physiological indicators. While individuals who saw a documentary reported feeling calm after nearly three hours of watching, their general physiological arousal (SCL) was as high as for those who watched a drama series with a cliffhanger. It remains unclear whether increased general physiological arousal can be attributed to cliffhangers, since other forms of watching TV may result in similar arousal levels. Taking a different perspective, it could be concluded that watching a drama series without a cliffhanger is beneficial, as physiological arousal after watching was low, even when compared to watching a documentary. However, it remains a question for future research if physiological or self-reported arousal is responsible for media effects on well-being and sleep.

Contrary to our expectations, sensation seeking, need for cognition, and need for cognitive closure did not moderate the effects of cliffhangers on enjoyment or the intention to continue watching. Nevertheless, these personality traits might have long-term effects that we were not able to capture with this design. Individuals with a high need for closure might learn over time that a certain series regularly employs cliffhangers, and therefore dislike it. Individuals high in sensation seeking or with a pronounced need for cognition might particularly enjoy a show that repeatedly provides suspense and unexpected plot twists.

The present study has some further limitations. Because of the time-consuming and complex multi-channel data collection, the number of participants in this study was relatively low. The sensitivity analysis revealed that we could only be confident of detecting significant effects with medium effect sizes, while many media effects are small (Lang, 2013). Thus, we can assume that some tendencies found in the data (e.g., regarding arousal) were not significant as a result of the small sample size. Future research needs to replicate these findings with larger and

more diverse samples. Second, although we employed a multi-stimuli design (Reeves et al., 2016), our results can only be generalized to drama-crime series. Future research could include different types of series. In addition, we only used one stimulus in the control condition, which was selected to control for exposure to television in general. Future research could use serial narration with a closed end instead of non-fictional content, and also employ a multi-message approach in this condition. It should also be noted that the study was conducted in two locations. While we control for this and did not find any significant effects, this may still present a limitation. Relatedly, participants in the media lab were first assigned to a group/slot, and the random assignment to a condition was then for the whole group, thus randomization occurred on a group-level and not individually.

Despite these limitations, this study makes an important contribution to the research on high-intensity viewing. The findings suggest that cliffhangers at the end of an episode do not seem to drive intense viewing behaviors. However, they increase arousal, which has been associated with poor sleep quality (Exelmans & Van den Bulck, 2017). Media users are advised to terminate their viewing sessions at a calm point in the narrative rather than at the designated end of an episode to avoid negative impacts when watching series on streaming platforms.

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Tables

Table 1

Correlation Matrix

	Sensation seeking	Need for closure	Need for cognition	Cliff-hanger	Suspense	SUDS	SAM	Cortisol difference	SCL difference	Enjoyment	Intention to continue watching	Series: HTGAWM	Series: The sinner	Series: OB	Setting: Media Lab
Sensation seeking	1														
Need for closure	-.204*	1													
Need for cognition	-0.122	-.276**	1												
Cliffhanger	-0.123	.185*	-0.002	1											
Suspense (manipulation-check)	-0.151	.294**	0.009	.521**	1										
SUDS	-0.121	.331**	-0.044	.505**	.716**	1									
SAM	0.04	.177*	0.004	.506**	.705**	.696**	1								
Cortisol difference	-0.003	0.072	-0.146	0.162	.225*	0.129	0.164	1							
SCL difference	0.138	0.047	0.022	-0.01	-0.084	-0.057	-0.072	-0.106	1						
Enjoyment	-0.046	0.062	0.063	.530**	.369**	.302**	.488**	0.167	-0.119	1					
Intention to continue watching	0.023	0.156	0.07	.598**	.414**	.348**	.476**	0.169	-0.032	.811**	1				
Series: HTGAWM	0.1	0.067	-0.045	.262**	0.071	0.055	0.082	.183*	0.04	.189*	.252**	1			
Series: The Sinner	-0.059	0.065	-0.032	.291**	.303**	.181*	0.123	-0.119	0.075	.199*	.269**	-0.165	1		

Series: Orphan Black	-0.112	0.154	0.094	.380**	.190*	.218*	.282**	0.127	-0.122	.352**	.324**	-.174*	-.209*	1	
Setting: Media Lab	-0.093	.303**	-.529**	0.168	0.154	.171*	0.078	-0.036	0.039	0.026	0.018	0.102	.172*	-0.06	1

* < .05, ** < .01

Table 2

Helmert contrast for the effect of the experimental manipulation on SUDS

	***M* difference**	***SE***	***p***	**LLCI**	**ULCI**
Documentary vs. drama series	-16.50	5.06	0.001	-26.51	-6.50
No cliffhanger vs. cliffhanger	-16.76	4.25	0.000	-25.17	-8.34

R^2 = .28; $M_{control}$ = 16.27, $M_{nocliff}$ = 26.02, M_{cliff} = 43.28

Table 3

Enjoyment predicted by experimental condition and need for cognition

	b	***SE***	***p***	**LLCI**	**ULCI**
constant	3.11	0.20	0.00	2.72	3.51
documentary vs. drama series (X1)	1.08	0.27	0.00	0.54	1.62
no cliffhanger vs. cliffhanger (X2)	0.01	0.24	0.97	-0.46	0.48
need for cognition	0.06	0.13	0.67	-0.20	0.32
X1 * need for cognition	0.10	0.23	0.66	-0.36	0.56
X2 * need for cognition	-0.39	0.29	0.19	-0.97	0.19
Series: HTGAWM	0.44	0.43	0.30	-0.41	1.29
Series: The Sinner	0.42	0.33	0.20	-0.23	1.06
Series: Orphan Black	0.72	0.29	0.01	0.15	1.29
Setting: Sleeplab	-0.14	0.21	0.50	-0.55	0.27

R^2 = .39; Series: Sense8 is the reference category; need for cognition is reverse coded.

Table 4

Enjoyment predicted by experimental condition and sensation seeking

	b	***SE***	***p***	**LLCI**	**ULCI**
constant	3.10	0.20	0.00	2.71	3.48
documentary vs. drama series (X1)	1.03	0.28	0.00	0.47	1.59
no cliffhanger vs. cliffhanger (X2)	-0.00	0.24	0.99	-0.48	0.48
sensation seeking	0.02	0.10	0.87	-0.18	0.21
X1 * sensation seeking	-0.15	0.18	0.41	-0.51	0.21
X2 * sensation seeking	-0.03	0.27	0.92	-0.56	0.51
Series: HTGAWM	0.53	0.45	0.24	-0.36	1.42
Series: The Sinner	0.45	0.35	0.20	-0.264	1.13
Series: Orphan Black	0.75	0.29	0.01	0.17	1.34
Setting: Sleeplab	-0.15	0.19	0.41	-0.53	0.22

R^2 = .39; Series: Sense8 is the reference category

Table 5

Intention to continue watching predicted by experimental condition and need for closure

	b	***SE***	***p***	**LLCI**	**ULCI**
constant	2.58	0.25	.00	2.09	3.07
documentary vs. drama series (X1)	1.46	0.30	.00	0.88	2.05
no cliffhanger vs. cliffhanger (X2)	0.12	0.30	.69	-0.47	0.71
need for closure	0.13	0.17	.44	-0.20	0.47
X1 * need for closure	0.60	0.28	.03	0.05	1.14
X2 * need for closure	-0.46	0.51	.37	-1.48	0.55
Series: HTGAWM	0.72	0.52	.17	-0.32	1.76
Series: The Sinner	0.69	0.37	.06	-0.04	1.42
Series: Orphan Black	0.70	0.37	.06	-0.04	1.44
Setting: Sleeplab	-0.26	0.20	.19	-0.65	0.13

R^2 = .47; Series: Sense8 is the reference category

Figures

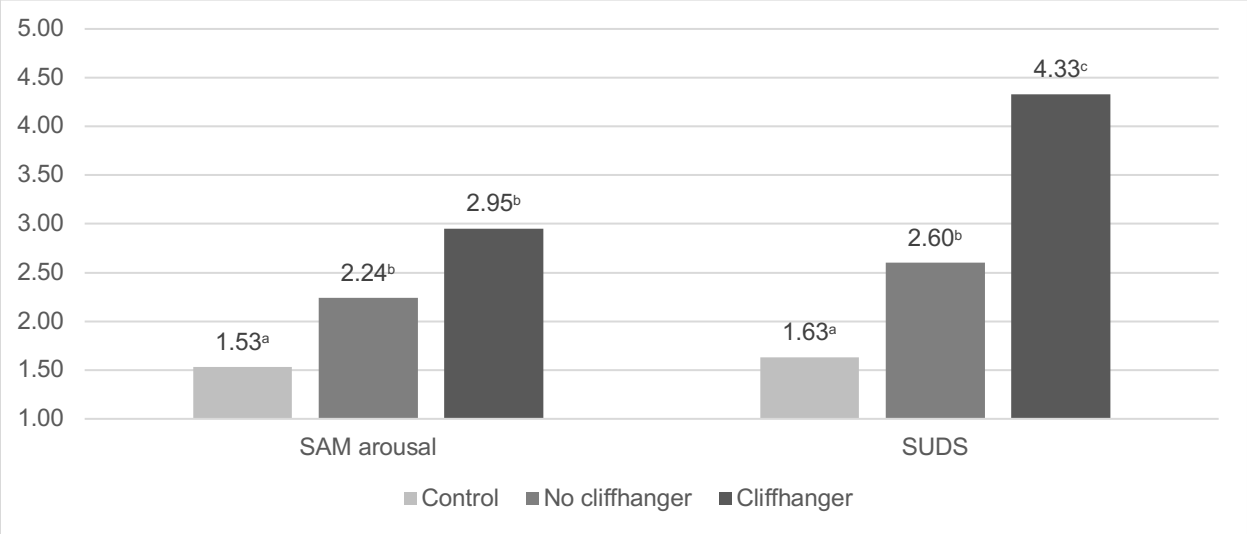

Figure 1. Self-report measures of arousal (mean values). Values with different indicators are significantly different from each other.

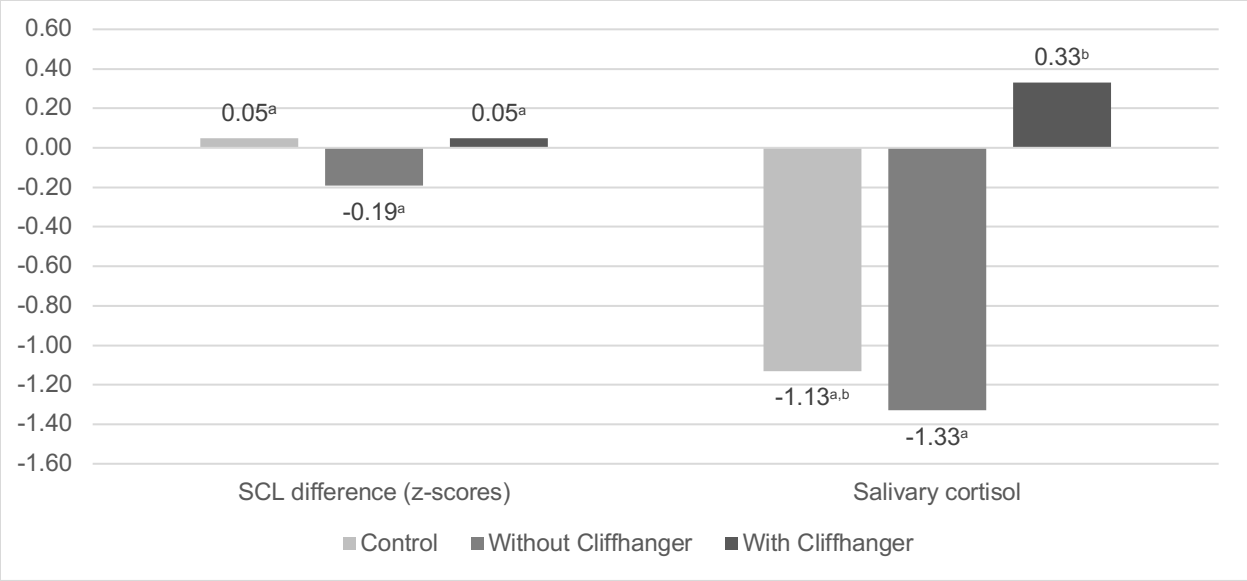

Figure 2. Physiological measures of arousal (mean values). Values with different indicators are significantly different from each other.