



Case Report

When the valence of unconditioned stimuli evolves over time: Evaluative conditioning with good-ending and bad-ending stories



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ABSTRACT

In most evaluative conditioning studies, the valence of the unconditioned stimuli is stable. We examined what happens when dramatic stories, of which the valence evolves over time, are used as unconditioned stimuli. In three experiments, we tested the hypothesis that the conditioning effect of stories depends on the valence of the ending, even when the beginning is of the opposite valence. Experiment 1 ($N = 61$) used a 2×3 within-participants design. Unknown consumer brands were paired with either good-ending or bad-ending stories, and the presentation of the brands was either before the beginning, before the ending, or after the ending. On both an implicit and an explicit attitude measure, we found that brands paired with good-ending stories were liked more than brands paired with bad-ending stories, and this effect was largest for brands presented after the ending. In Experiment 2 ($N = 131$), the explicit attitude results were replicated in a larger sample. In Experiment 3 ($N = 127$), the order of story segments was reversed such that the ending was told before the beginning. The conditioning effect was replicated and as in Experiment 1 and 2, the conditioning effect was largest for brands presented after the ending (now told first). We discuss the theoretical as well as practical implications of these findings.

1. Introduction

A large part of our knowledge and opinions about the world comes from stories. Novels, religious parables, news stories, and personal experiences are all examples of stories that may entertain as well as inform us. The idea that people can learn from stories is not new (cf. Green & Brock, 2000; Van Laer, De Ruyter, Visconti, & Wetzels, 2014). However, in this research we look at this issue from a novel perspective, namely, an evaluative conditioning perspective. Evaluative conditioning (EC) refers to a change in liking of a stimulus due to pairing it with another, typically positive or negative, stimulus (De Houwer, 2007; Gast, Gawronski, & De Houwer, 2012). EC represents a model of how people develop likes and dislikes in daily life (De Houwer, Thomas, & Baeyens, 2001). Likes and dislikes, in turn, are important drivers of human behavior, as people tend to approach objects they like, and avoid objects they dislike.

EC has been a thriving research topic in the past decades (for reviews see De Houwer, 2007; De Houwer et al., 2001; Gast et al., 2012). In a typical EC study, a neutral conditioned stimulus (from now on called CS, or its plural, CSi) is paired with a positive or negative unconditioned stimulus (US, USi), after which the liking of the CS is measured. Evidence for EC is found when the liking of the CS has

shifted in the direction of the US with which it was paired. The modality of the USi differed widely across EC studies. Visual stimuli were most common (e.g., pictures of liked or disliked objects or persons), but verbal, auditory, and taste/flavor stimuli were also common (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010). Despite the different modalities, the USi had in common that they were typically stable in terms of positive or negative valence.

To complement these previous studies, we investigated whether stories can function as USi in a conditioning experiment. A story is a sequence of related events leading to a transition from an initial state to a later state or outcome (Bennett & Royle, 2004). As this definition illustrates, the valence of a story is not stable; it rather evolves from one valence to the next. We think it is important to investigate this issue because in daily life people often learn through sequences of related events that together form a story. For example, a person may wake up one morning with a terrible headache, not sure if she can pull off a presentation later that day. She may decide to take some vitamins. If her presentation goes excellent, her liking of the vitamins may increase, as they are associated with the positive outcome. If her presentation goes disastrous, her liking of the vitamins may decrease, as they are associated with the negative outcome.

Here, we examined stories with a dramatic structure. This is a

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typical structure for traditional (e.g., parables, plays) and modern (e.g., advertisements, movies) cultural expressions. In the last centuries, scholars have proposed different views on the essential elements of dramatic structure. The Greek philosopher Aristotle (335 BCE/2015) advanced a three-part view consisting of the protasis (introduction), epitasis (the middle part, describing trials and tribulations of the protagonist), and catastrophe (resolution). Later, the German playwright Freytag (1863/1895) proposed a five-part view consisting of exposition, rising action, climax, falling action, and dénouement. Despite somewhat differing views on the essential elements, there is consensus that a dramatic story at least includes a protagonist, a basic conflict, and an outcome (Bennett & Royle, 2004). As the protagonist and outcome seem self-evident, we only explain the basic conflict in more detail. The basic conflict refers to a complication, dilemma, or struggle the protagonist(s) must resolve. It is a critical feature of any dramatic story. Consider, for example, the classic Romeo and Juliet story without a conflict. Romeo and Juliet would fall in love, their respective clans would immediately support their relationship, and they would get married. End of story. As the example illustrates, removing the conflict eliminates the drama. Moreover, the basic conflict dictates what constitutes a good or a bad ending. A good ending generally means the successful resolution of the basic conflict, while a bad ending generally means the unsuccessful resolution of the basic conflict.

Although stories evolve from one valence to the next, it makes sense to say that the outcome strongly determines its overall valence. Indeed, research shows that the ending is decisive in people's retrospective valence appraisal (Dalakas, 2006; Diener, Wirtz, & Oishi, 2001; Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). Kahneman et al. (1993), for example, showed that people evaluate a longer painful experience with a relatively pleasant ending as more positive than a shorter painful experience without a relatively pleasant ending. As the proverb says: All's well that ends well. Therefore, one may predict that a good-ending story may function as a positive US, while a bad-ending story may function as a negative US. Consequently, we predicted that associating a CS with a good-ending story increases the liking of that stimulus, while associating a CS with a bad-ending story decreases the liking of that stimulus. However, an open question was whether the size of this EC effect depends on the timing of CS presentation, that is, whether the CS is presented at the beginning, before the end, or after the end of the story. This question pertains particularly to stories, as their valence progresses from a somewhat negative state (the basic conflict) to a negative or positive outcome.

A first possibility is presenting the CS at the beginning of the story. Most EC studies presented the CS before the US, so-called "forward conditioning". Forward conditioning fits an expectancy-learning account of EC, which holds that EC is based on the expectation that the CS predicts the US (Lipp & Purkis, 2005). Early EC studies indeed found stronger effects when the CS preceded instead of followed the US during the learning phase (Hammerl & Grabitz, 1993; Stuart, Shimp, & Engle, 1987). Later studies however, found no difference between these two conditions (Gast, Langer, & Sengewald, 2016; Kim, Sweldens, & Hütter, 2016; Mallan, Lipp, & Libera, 2008), nor did an extensive meta-analysis across 214 EC studies (Hofmann et al., 2010). In summary, although the evidence is mixed, EC researchers generally assume that EC is facilitated by presenting the CS before the US. This implies that presenting the CS before the beginning of the story should increase EC.

A second possibility is presenting the CS shortly before the story ending. This way, it is closer to the positive or negative outcome. Modern views on EC predict that greater temporal proximity between the CS and the US increases EC (e.g., Gawronski & Bodenhausen, 2006; De Houwer, 2014). However, there is no consistent evidence to support this claim. A recent study found some evidence that EC is larger with closer temporal proximity of the CS and US (Gast et al., 2016), but only when the CS and US were of a different modality (i.e., visual and sound). The meta-analysis by Hofmann et al. (2010), in contrast, found no evidence that temporal proximity moderates EC. Summarizing,

although consistent evidence is lacking, presenting the CS shortly before the end may facilitate EC because of the close temporal proximity to the valenced outcome.

A third possibility is to present the CS after the story ending, so-called "backward conditioning". It represents the structure of many TV advertisements. Indeed, a field study reported in Baker, Honea, and Russell (2004) indicated that 24% of the TV advertisements in the USA present the brand at the very end, whereas only 6% present it at the beginning of the advertisement. However, it is likely that this convention is not based on principles of conditioning, but on the intuition of creative directors of advertising agencies. In fact, an experiment by Baker et al. (2004) showed that TV advertisements were more effective in changing brand attitudes when the brand was revealed at the beginning rather than the end of the advertisements, which suggests that CSi should be presented early instead of late in the story to facilitate EC. However, the custom in most TV advertisements is still to reveal the brand at the end, perhaps for good reasons.

The present experiments had two goals. First, to investigate whether good-ending stories and bad-ending stories can serve as USi in a conditioning experiment. We predicted that associating CSi with good-ending stories would increase CS liking compared to associating CSi with bad-ending stories. Second, to explore whether EC depends on the timing of CS presentation. We compared three timing conditions: CS presentation before the beginning, before the end, or after the end of the story, without having clear a priori predictions about the consequences for EC. In Experiment 1, we measured EC using an implicit and explicit attitude measure; in Experiment 2 and 3 we only used an explicit attitude measure.

We disclose all measures, manipulations, and exclusions, as well as the method of determining the final sample size. Sample sizes were determined before any data analysis.

2. Experiment 1

2.1. Method

2.1.1. Participants and design

We used a stopping rule of a minimum of 60 participants with more participants being included if they could be recruited in the allotted period. The sample consisted of 61 Dutch students (34 females), $M_{\text{age}} = 21.95$ years ($SD = 3.31$). The study used a 2(story ending: good vs. bad) \times 3(timing: before beginning vs. before end vs. after end) within-participants design. Correlations between the levels of the within-participant variables can be found in the Supplementary Online Material.

2.2. Materials

2.2.1. Stories

There were 10 good-ending and 10 bad-ending stories generated by the authors (see Supplementary Online Material for all stories). The stories had two segments. The beginning segment introduced a protagonist who experienced a conflict or struggle. The end segment presented either a good outcome or a bad outcome. The stories described different struggles, for example related to finance, health, or social relations. An example of a good-ending story is: "Herman's company went bankrupt ten years ago and he had to sell his house and car. Today, he is celebrating the five-year anniversary of his new profitable enterprise." An example of a bad-ending story is: "Bram's successful enterprise has been struck seriously in the economic crisis. He has had to fire all of his personnel and today he has finally been declared bankrupt."

Fifty Amazon M-Turk workers rated English versions of the 40 story segments on a scale from -3 (Very Negative) to 3 (Very Positive). Of good-ending stories, beginnings were rated as negative ($M = -1.78$, $SD = 0.53$), while ends were rated as positive ($M = 2.36$, $SD = 0.56$). Of bad-ending stories, beginnings were rated as negative ($M = -1.10$,

$SD = 0.52$), and ends were also rated as negative ($M = -1.82$, $SD = 0.57$). One-sample t -tests indicated that all means differed significantly from zero at $p < .001$.

2.2.2. Conditioned stimuli (CSi)

Six photos of existing foreign mineral water brands were used (see Supplementary Online Material for all CSi). Pilot testing among a small subsample ($N = 10$) of the local student population suggested that the brands were unknown to the population. A priori explicit attitudes towards them ranged from 3.75 to 4.50 on a 7-point scale ranging from 1 (negative) to 7 (positive), indicating that the brands did not elicit extremely positive or negative a priori reactions.

2.2.3. Procedure

Participants worked in individual cubicles in a controlled lab setting. All instructions, stimuli, and measures were provided via a pc. Participants were first asked to indicate their current level of thirst and their frequency of buying bottles of mineral water on 7-point Likert scales ranging from 1 (not thirsty at all) to 7 (very thirsty), and 1 (not often at all) to 7 (very often), respectively. The mean level of thirst was 4.31 ($SD = 1.40$) and the mean buying frequency was 2.41 ($SD = 1.85$). As we did not observe systematic relations between thirst, buying frequency, and conditioning, we will not discuss these variables further.

2.2.4. Conditioning phase

Participants were informed that they would see short stories, together with brands of mineral water. They were asked to try to visualize the stories as lively as possible, and to imagine how they would feel if they were there. They were asked to look at the stories and brands carefully as they would later receive questions about them.

Then, participants were presented with 60 conditioning trials presented in random order. There were six different trials, representing the conditions of the 2×3 design (see Fig. 1 for overviews of each trial). All stimuli were presented screen-centered. Good Ending/Before Beginning trials began with the presentation of a CS, which was replaced by a blanc screen, which was replaced by the beginning of a good-ending story, which was replaced by a blanc screen, which was replaced by the end of a good-ending story, which was replaced by a blanc screen. The inter-trial-interval was 2000 ms. Good Ending/Before End and Good Ending/After End trials were similar, except that the CSi were presented later in the sequence (see Fig. 1). The Bad Ending-trials were constructed similarly.

Across the 60 trials, each CS was presented 10 times, always with good-ending stories or bad-ending stories, and always before the beginning, before the end, or after the end. On each presentation of a CS, a story from the list of good-ending or bad-ending stories was randomly selected. The assignment of CSi to trial types was counterbalanced between participants using six counterbalance conditions (see Supplemental Online Material for the counterbalance schemes).

2.2.5. Implicit attitude measure

Participants completed the affective priming task (Fazio, Sanbonmatsu, Powell, & Kardes, 1986). They were presented with unambiguously unpleasant or pleasant words (e.g., abuse, disaster, honest, paradise), and were asked to categorize them into 'unpleasant' and 'pleasant' categories by pressing the 'E' or 'I' on the keyboard, respectively, as quickly and accurately as possible. Before each target word appeared, one of the CSi was shortly presented on the same screen location. If priming with a CS speeds up responses to positive target words and/or slows down responses to negative target words, this indicates a positive implicit attitude¹ towards the CS. Conversely, if

priming with a CS speeds up responses to negative target words and/or slows down responses to positive target words, this indicates a negative implicit attitude towards the CS.

Each trial started with the presentation of a CS for 200 ms, followed by a 100 ms interval, after which a target word was presented. The target word remained on screen until the participant had responded. An incorrect response was followed by a red cross for 500 ms. The inter-trial-interval was 2500 ms. Each of the six CSi was presented eight times, four times followed by an unpleasant target word, and four times followed by a pleasant target word, for a total of 48 trials. There were 48 target words, 24 unpleasant and 24 pleasant. Each trial presented a different target word.

The affective priming task was preceded by a practice task of 48 trials to familiarize participants with the 48 target words. In the practice task the CSi were replaced by a baseline prime: '***'.

2.2.6. Explicit attitude measure

Participants rated each CS three items, in this order: "How attractive do you find this brand?", "Does this brand appeal to you?", and "How much do you like this brand?" on Likert scales ranging from 1 (not at all) to 7 (very much). CSi were presented in random order. The explicit attitude was calculated by averaging the results of the three items (Cronbach's alphas per CS ranged from .920 to .961).

2.2.7. Exit questions

Participants answered demographic questions and were given the opportunity to provide remarks about the study.

2.3. Results

2.3.1. Implicit attitude

Response latencies longer than 1000 ms (7,8%), shorter than 300 ms (0,9%), and response latencies associated with incorrect responses (4,4%) were removed from the data (see Gawronski, Deutsch, Mbirkou, Seibt, & Strack, 2008).² We conducted a log-transformation to obtain normally distributed data. Statistical analyses were performed on the log-transformed data, but for ease of interpretation we report the non-transformed means. For each CS, we calculated difference scores between the mean response latencies to unpleasant target words and the mean response latencies to pleasant target words. These difference scores represent the implicit attitude towards the CS. According to the counterbalance conditions, we converted the scores to obtain implicit attitudes for each cell of the 2×3 design.

The implicit attitude results are displayed in Fig. 2. Positive deviations from zero indicate positive implicit attitudes, and negative deviations from zero indicate negative implicit attitudes. A conditioning effect is observed if the implicit attitude in the Good Ending-condition is more positive than the implicit attitude in the Bad Ending-condition. The conditioning effect was significant in the After End-condition, $t(58) = 2.40$, $p = .020$, $d = 0.31$, but not in the Before End-condition, $t(59) = 0.86$, $p = .393$, $d = 0.11$, or the Before Beginning-condition, $t(58) = -0.40$, $p = .688$, $d = -0.05$.

The pattern of results suggested that the conditioning effect in the After End-condition was larger than in the other two timing conditions. To test this, we conducted a 2×3 repeated measures ANOVA with a difference contrast testing the After End-condition against the mean of the two other timing conditions. This revealed a significant interaction-effect, $F(1, 58) = 4.65$, $p = .035$, $d = 0.57$. Thus, on an implicit level, CSi associated with good-ending stories were evaluated more positively than CSi associated with bad-ending stories, but only when they were presented after the end.

¹ Fazio and Olson (2003) argued that the measure is implicit, but the attitude itself is not necessarily implicit. We adhere to this view, but for ease of presentation we use the term 'implicit attitude'.

² The literature describes various procedures for removing outliers. In the Supplemental Online Material we report the main results with alternative outlier procedures.

Trial type	Sequence of stimulus presentation					
	CS		GOOD1		GOOD2	
Good Ending/Before Beginning	3000 ms	1000 ms	8000 ms	1000 ms	8000 ms	1000 ms
	GOOD1		CS		GOOD2	
Good Ending/Before End	8000 ms	1000 ms	3000 ms	1000 ms	8000 ms	1000 ms
	GOOD1		GOOD2		CS	
Good Ending/After End	8000 ms	1000 ms	8000 ms	1000 ms	3000 ms	1000 ms
	CS		BAD1		BAD2	
Bad Ending/Before Beginning	3000 ms	1000 ms	8000 ms	1000 ms	8000 ms	1000 ms
	BAD1		CS		BAD2	
Bad Ending/Before End	8000 ms	1000 ms	3000 ms	1000 ms	8000 ms	1000 ms
	BAD1		BAD2		CS	
Bad Ending/After End	8000 ms	1000 ms	8000 ms	1000 ms	3000 ms	1000 ms

Fig. 1. Overview of each trial type. GOOD1 = Beginning of good-ending story; GOOD2 = End of good-ending story; BAD1 = Beginning of bad-ending story; BAD2 = End of bad-ending story.

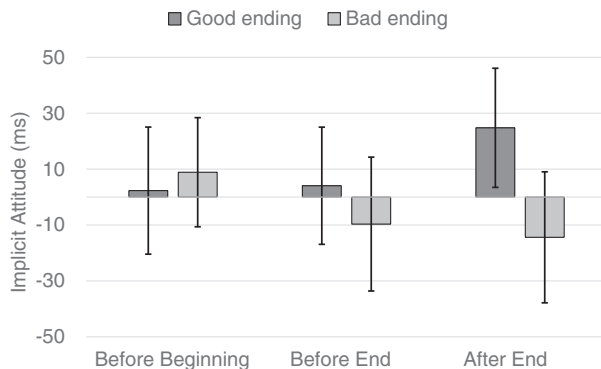


Fig. 2. Implicit attitudes as a function of story ending and timing of CS presentation in Experiment 1. Error bars represent 95% confidence intervals.

2.3.2. Explicit attitude

The explicit attitude results are displayed in Fig. 3. The conditioning effect was significant in the After End-condition, $t(60) = 4.23$, $p < .001$, $d = 0.54$ and the Before End-condition, $t(60) = 2.13$, $p = .037$, $d = 0.27$, and marginally significant in the Before Beginning-condition, $t(60) = 1.71$, $p = .093$, $d = 0.22$. The pattern of results again suggested that the conditioning effect in the After End-condition was larger than in the other two timing conditions. We again ran a 2×3 repeated measures ANOVA with a difference contrast testing the After End-condition against the other two timing conditions. This

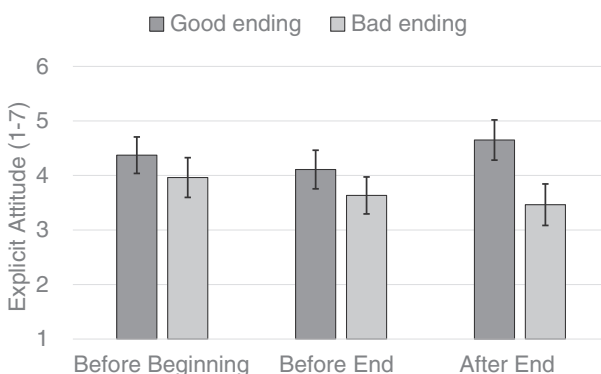


Fig. 3. Explicit attitudes as a function of story ending and timing of CS presentation in Experiment 1. Error bars represent 95% confidence intervals.

revealed a significant interaction-effect, $F(1, 60) = 4.16$, $p = .046$, $d = 0.53$. Thus, also on an explicit level, conditioning was strongest for CSi presented after the end.

The results of Experiment 1 confirmed that CSi associated with good-ending stories are liked more than CSi associated with bad-ending stories. Furthermore, the effect was largest for CSi presented after the end. Experiment 2 aimed to replicate Experiment 1. As it was conducted in the less-controlled environment of Amazon M-Turk, we opted for a large sample of at least 120 participants.

Prior to the data collection, the sample size, hypotheses, experimental design, and analyses were registered on [AsPredicted.org](https://aspredicted.org/43gj5.pdf) (<https://aspredicted.org/43gj5.pdf>).

3. Experiment 2

3.1. Method

3.1.1. Participants and design

One-hundred-and-thirty-one M-Turk workers (69 females), $M_{age} = 39.89$ years ($SD = 12.06$), participated. The study used a $2(\text{story ending: good vs. bad}) \times 3(\text{timing: before beginning vs. before end vs. after end})$ within-participants design.

3.1.2. Materials and procedure

The materials and procedure were identical to Experiment 1, except that the implicit attitude measure and the questions about thirst and buying frequency were omitted, and the counterbalancing was improved (see Supplemental Online Material for the counterbalance scheme). Furthermore, the experiment was translated from Dutch to English.

3.2. Results

The explicit attitude results are displayed in Fig. 4. The conditioning effect was significant in the After End-condition, $t(130) = 3.76$, $p < .001$, $d = 0.33$, and the Before End-condition, $t(130) = 3.67$, $p = .037$, $d = 0.32$, but not in the Before Beginning-condition, $t(130) = 0.30$, $p = .764$, $d = 0.03$. In line with Experiment 1, a $2(\text{story ending: good vs. bad}) \times 3(\text{timing: before beginning vs. before end vs. after end})$ repeated measures ANOVA testing the After End-condition against the mean of the other two timing conditions showed a significant interaction effect, $F(1, 130) = 4.07$, $p = .046$, $d = 0.35$.

However, the results suggested that the conditioning effect in the Before End- and After End-conditions was about equally large, and

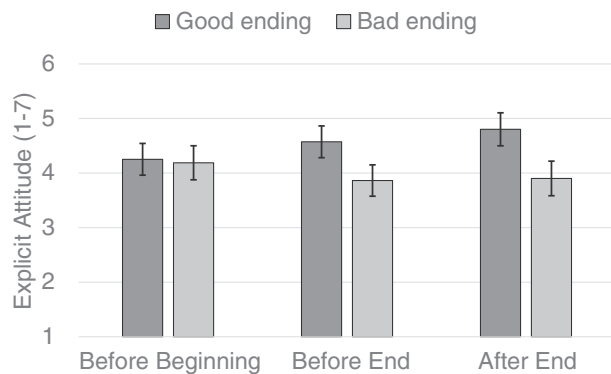


Fig. 4. Explicit attitudes as a function of story ending and timing of CS presentation in Experiment 2. Error bars represent 95% confidence intervals.

larger than the conditioning effect in the Before Beginning-condition. Therefore, we ran an additional 2×3 repeated measures ANOVA testing the mean of the Before End and After End-conditions against the Before Beginning-condition. The interaction was significant, and the effect size was larger, $F(1, 130) = 11.24, p = .001, d = 0.59$. Thus, an appropriate conclusion for Experiment 2 is that the conditioning effect was larger in the Before End and After End-conditions than in the Before Beginning-condition.

Experiment 1 and 2 provided evidence that stories can function as unconditioned stimuli, and the ending mediates conditioning. However, a third experiment was needed to critically test these assumptions. Based on Experiment 1 and 2, we cannot conclude that the storylines are important. Since both story segments were valenced, it is also possible that they functioned as separate negative and positive USi. If closer temporal proximity between the CS and US results in stronger conditioning, the differential pairing with negative and positive story segments in the timing conditions could explain the pattern of results observed. This is best explained by looking at the good-ending stories:

After End-CSi were closely preceded by positive USi, and more distantly by negative USi. Hence, positive conditioning was observed;

Before End-CSi were closely preceded by negative USi and closely followed by positive USi. Hence, weaker or no positive conditioning was observed;

Before Beginning-CSi were closely followed by negative USi, and more distantly by positive USi. Hence, no positive conditioning was observed;

A similar argument could be made for the bad-ending stories.

To explore the validity of this alternative explanation, we ran a third experiment in which we reversed the order of the story segments. Thus, for the good-ending stories, we first told the positive end, and then the negative beginning (e.g., “Today, Herman is celebrating the five-year anniversary of his new profitable enterprise. Herman’s company had gone bankrupt ten years ago, and back then he had to sell his house and car.”). Bad-ending stories were reversed in the same way. If the alternative explanation is valid, we should find (again for the good-ending stories):

Strongest positive conditioning for Before End-CSi, as they are closely followed by positive USi, and more distantly by negative USi;

Weaker or no positive conditioning for After End-CSi, as they were closely preceded by positive USi, and closely followed by negative USi;

No positive conditioning for After-Beginning-CSi, as they were closely preceded by negative USi, and more distantly by positive USi.

Note that the condition names (Before End, After End, After Beginning) refer to beginning and end segments of stories, not to the presentation order within trials. For example, the After End-CS was shown earlier in the trial than the After Beginning-CS.

Prior to the data collection, the sample size, hypotheses, experimental design, and analyses of Experiment 3 were registered on [AsPredicted.org](https://aspredicted.org/32wc6.pdf) (<https://aspredicted.org/32wc6.pdf>).

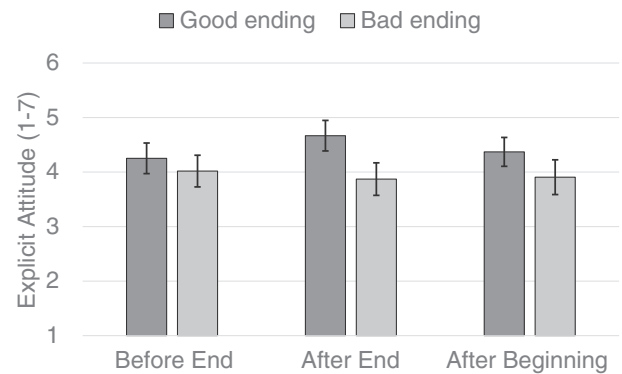


Fig. 5. Explicit attitudes as a function of story ending and timing of CS presentation in Experiment 3, in which story segments were reversed (end-beginning). Error bars represent 95% confidence intervals.

4. Experiment 3

4.1. Method

4.1.1. Participants and design

One-hundred-and-twenty-seven M-Turk workers (76 females), $M_{\text{age}} = 41.47$ years ($SD = 11.78$), participated. The study used a $2(\text{story ending: good vs. bad}) \times 3(\text{timing: before end vs. after end vs. after beginning})$ within-participants design.

4.1.2. Materials and procedure

The procedure was identical to Experiment 2, except that all stories were told in reversed order. Some additional adjustments were made to the stories to retain clarity and comprehensibility, but these were minimized to allow for comparisons between Experiment 2 and 3 (see Supplemental Online Material for all stories).

4.2. Results

The results are displayed in Fig. 5. The conditioning effect was not significant in the Before End-condition, $t(126) = 1.30, p = .195, d = 0.12$, but it was in the After End-condition, $t(126) = 3.72, p < .001, d = 0.33$, and the After Beginning-condition, $t(126) = 2.29, p = .024, d = 0.20$. The pattern suggested that the conditioning effect was larger in the After End-condition than in the other two timing conditions. A 2×3 repeated measures ANOVA with a difference contrast testing the After End-condition against the mean of the other two timing conditions was marginally significant, $F(1, 126) = 3.80, p = .054, d = 0.35$.

These results are incompatible with the alternative explanation that the separate story segments drive the results. This is again best explained by the good-ending stories. The alternative explanation predicted the strongest effect for the Before End-CS; instead it was weakest. The alternative explanation predicted a weaker or no effect for the After End-CS; instead it was strongest. The alternative explanation predicted no effect for the After Beginning-CS; instead there was a significant effect. The results are more in line with the original account that the storyline (particularly the ending) mediates conditioning. The valence of the beginning did not exert much effect.

Furthermore, as in Experiment 1 and 2, conditioning was strongest in CSi presented immediately after the end. We return to this issue in the Discussion.

5. Discussion

Three experiments showed that dramatic stories, of which the valence evolves over time, can serve as unconditioned stimuli. The conditioning effect depends mostly on the valence of the ending, even

when the beginning is of the opposite valence. This effect was strongest for CSI presented immediately after the ending, and weaker for CSI preceding the ending or following the ending more distantly. These results concur with findings that when CSI are paired with two USi of opposing valence, the USi which is presented closest in time and space to the CS exerts the strongest effect (Rydell & Jones, 2009). Furthermore, in our experiments, backward conditioning produced stronger effects than forward conditioning. This diverges from the common procedure in conditioning research to present the CS before the US (see also Gast et al., 2016; Kim et al., 2016; Mallan et al., 2008). We can only speculate about the reason why the conditioning effect was stronger for CSI following than preceding the ending. Perhaps the positive feeling elicited by stories is not activated immediately but somewhat later, making it closer in time to the CS presented afterward. More research is needed to understand this effect.

One limitation of the current experiments may be that all stories had a negative beginning. This procedure was based on the notion that stories typically start with a problem or struggle (Bennett & Royle, 2004). However, it would be interesting for future research to vary the valence of the beginning, to see whether it moderates conditioning. There is reason to believe it does. The positive ending may be evaluated more positively when it contrasts with a negative beginning, and a similar argument can be made for a negative ending with a positive beginning. Furthermore, research shows that people identify more with characters who struggle than with characters who thrive (Kim et al., 2008). Because identification increases the affective reaction to a story, it may also increase conditioning. To explore this issue, follow-up experiments may test all possible combinations of positive and negative beginnings and endings.

These findings may shed new light on learning from experience in daily life. The results suggest that a positive or negative outcome of a story particularly affects the liking of objects observed immediately afterwards. For example, winning an important sales pitch may affect your liking of a beer you drink afterwards. Conversely, seeing your favorite soccer team losing the World Cup final may decrease your liking of the TV program you see immediately afterwards. These results also have implications for advertising and marketing. Narrative advertisements (i.e., advertisements that resemble short films, with a protagonist, a dramatic plot, and an ending) are an increasingly popular format on TV and Internet. In 1998, a content analysis of American prime time TV advertising found that 25% of all ads had a narrative structure (Escalas, 1998). Our findings suggest that narrative advertisements should end positively, and that brands should be presented immediately after the good ending.

Summarizing, we found that stories provide a fruitful context for conditioning research. We found that the good or bad ending is decisive for the direction of the conditioning effect, and it mainly affects the evaluation of objects presented immediately afterwards. Future research may clarify the cause of this timing effect.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jesp.2017.08.006>.

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