Narrative Retellings Preserve Happiness and Sadness

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Abstract

Frederic Bartlett, who pioneered the research on serial reproduction in 1932, suggested that the stereotypical or schematic form of narratives consists in rationalization, meaning a causal connection within a story. We conducted the largest retelling experiment to date with two different studies that both reach the conclusion that retelling of narratives is focused on the preservation of the story's degree of happiness and sadness, even when many other aspects related to story coherence and rationalization deteriorate. These findings suggest that the happiness and sadness of a story operate as an anchor of stability for both reception-and-encoding and for retrieval-and-reproduction.

Keywords: Sentiment; emotion; happiness; sadness; narrative; serial reproduction; cultural evolution;

story recall

Significance Statement

Story retelling transmits cultural information across social networks. Understanding retelling is valuable because it occurs naturally in many domains including gossip, social media, journalism, education, science, and religion. We conducted the largest serial reproduction experiment to date, using dozens of participant-generated stories and researcher-generated across three retellings with thousands of content ratings and a total of 19,086 retellings. Our novel statistical model with Bayesian estimation shows minimal decline or compression in happiness and sadness across retellings, despite many other changes. The standard model (Bartlett, 1932) posits that narrative retelling increases rationalization. We suggest instead that retelling of narratives is focused on happiness and sadness when other goals for retelling are not given.

Introduction

Narratives are a central element of culture and its preservation over time. To study narrative communication, we created the largest study to date of repeated retelling with 19,086 story retellings and 12,840 participants in the format of the telephone game (serial reproduction) to analyze changes that occur in retelling over multiple generations. We ask: What provides stability in the process of narrative communication? What aspects of a story are transmitted with accuracy and provide the foundation for the reproduction of the overall story?

Today's standard model of narrative reproduction derives from Frederic Bartlett who suggested that the stereotypical form of retelling is based on "rationalization" (Bartlett, 1932; Bergman & Roediger, 1999; Mandler & Johnson, 1977; Mesoudi & Whiten, 2008). Bartlett describes rationalization as a high degree of "connexion between parts," the absence of "incoherent" links, and "ease" of processing so that "it could be accepted by the observer" (Bartlett, 1932: 84-86). As a stimulus, he used a Native American story that was unfamiliar to his English subjects, one that involved culturally unfamiliar or magical events. Bartlett's participants responded to the absence of rational connection by omitting the unclear elements or inventing reasons for the events. Thus, in the absence of coherence, retellings show rationalization. However, it is not clear what happens in everyday communication with stories that are culturally consistent and coherent.

Serial retelling reveals a variety of changes, including increasing of racial bias (Kashima, 2000), risk (Jagiello & Hills, 2018; Moussaïd, Brighton, & Gaissmaier, 2015), social aspects of information (Mesoudi, Whiten, & Dunbar, 2006; Stubbersfield, Tehrani, & Flynn, 2015), bizarre story elements (Barrett & Nyhof, 2001), and strong emotions (Heath, Bell, & Sternberg, 2001), while decreasing amount of information (Griffiths, Lewandowsky, & Kalish, 2013), and optimizing clustering of events (Norenzayan, Atran, Faulkner, & Schaller, 2006). In contrast, few studies address stability in retelling. But based on Breithaupt et al. (2018)'s finding that surprise is well preserved in retelling, we hypothesize that emotions are likely candidates as anchors of stability.

Emotions are among the most basic impressions people have of social interactions, and emotions guide decision making and motivate behavior (Reber, 2016). Emotions also play a central role in recall (Posner & Snyder, 2004; Strongman & Russell, 1986), including the enhancement of recall (Bower, 1981; Doerksen & Shimamura, 2001). Narratives are especially well suited for emotional communication (Hogan, 2011) and might be the most effective means of communicating specific emotions (Dunlop, Wakefield, & Kashima, 2008; Nabi & Green, 2015).

Furthermore, emotions can enable story (re)construction. Communicating emotions cannot be accomplished by repeating a single word or single-story element, but rather involves complex story construction and world building (Herman, 2004). For example, retelling surprise involves hindsight knowledge of a specific arrangement of a before-and-after that includes the creation of an expectation in a recipient that then, surprisingly, is not met (Tobin, 2018). Likewise, emotions may be enhanced by emotional flow (Nabi & Green, 2015); for example, a sad event may depend on descriptions of prior happy states.

We focus on happiness and sadness since they are universally understood as discrete personal emotions tied to specific events. Yet, they are also closely related to the universal assessment of valence (positive/negative) and core affect (Nabi, 2010; Russell & Barrett, 1999). There are additional reasons to suspect a privileged role for happiness and sadness for the memory and reconstruction of narratives. Happiness and sadness are also commonly connected with the resolution of a narrative arc in the form of

a happy or sad ending, which provides an emotional account of the overall desirability of the previous events. This emotional account of the previous events we call "verdict." The happy ending thus is not just a story that happens to end on a positive note, but rather provides meaning to the previous sequence of events by implying that happiness is the deserved outcome of the previous events. Other emotions can have this function in narratives, as well. For example, triumph operates as a positive verdict (Hwang et al., 2016).

Hence, the happiness and sadness of a story situation is not the same as the characters' emotions or the emotion the story audience actually feels (Mar, Oatley, Djikic, & Mullin, 2011)~~,~~ though all may be similar in magnitude. Instead, the happiness and sadness of a story also involves an overall appraisal of, or a verdict on, the story situation. Hence, we reason that happiness and sadness are decisive for story memory and reconstruction.

We hypothesize that happiness and sadness should be transmitted with relatively little change from iteration to iteration, while other measures, including those related to Bartlett's rationalization, would show more fluctuation and decay for stories that are already coherent.

For emotion ratings, we did not rely on semi-automatic sentiment detection software, but recruited participants to evaluate each of our original and retold stories and collected data concerning several categories of story measures. These measurements and a novel model of trend (with parameters estimated by Bayesian methods) allow us to compare stability and change of emotions, rationalization, and other narrative effects and features.

Study 1: Participant-generated Stories

To compare transmission of emotions with elements of rationalization we asked participants to write mildly happy, happy, mildly sad, or sad stories. Then we asked other participants to retell these stories. Each of the retellings was then given to another set of participants who retold them. In this fashion we generated three consecutive retellings of each original story with a total of 116 story chains that include 348 retellings. Then, we asked different participants to rate all story versions, as explained below.

Participants

We used 1,039 workers from Amazon's Mechanical Turk, all with a previous human information task (HIT) approval rate of at least 99% and who resided in the United States. We paid participants at an approximate rate of $6/hour. Our participants reported an average age of 38, 45% female.

Story Generation

We asked participants to generate "mildly happy," "happy," "mildly sad," or "sad" stories in writing and specified that stories should be between 120 and 160 words in length and that they should avoid using the words "happy" or "sad." Of the generated stories, we excluded defective texts that were not in English, that were gibberish, that ended midsentence, or that were copied from the instruction pages of our study. In total, we collected 154 starting stories (79 created as "happy" or "mildly happy" stories and 75 created as "mildly sad" or "sad" stories).

Story Retelling

We gave each participant three stories to retell, all from the same stage of retelling (original, first, or second). The restriction to the same stage meant that the three presented stories had similar lengths, as lengths tended to decline with retellings. Using a variation of Kashima (2000), we asked people to "tell the story to another person in your own words." 38 of the original 154 chains contained at least one defective retelling and were rejected leaving us with 116 complete story chains. Of these, 58 were created as "happy" or "mildly happy" and 58 as "mildly sad" or "sad" stories. Like previous research, we ended after three iterations of retelling since results stabilized markedly after the first iterations (Barrett & Nyhof, 2001; Breithaupt et al., 2018); Eriksson and Coultas (2014) used four iterations in their study of information deterioration but registered virtually no difference between the third and fourth iterations.

Story Ratings

Each rater received 6 stories of the same emotion and retelling iteration in random order. Each version was rated by an average of 7 raters, using a slider that recorded and displayed numbers from 0 to 7 to one decimal, such as "4.1". The number 0 had labels such as "not happy"/"disagree" and the number 7 "very happy"/"agree." Participants evaluated seven criteria for each story: 1) How happy is this situation? 2) How sad is this situation? 3) The story feels well connected and coherent. 4) The story builds up toward the end. 5) While I was reading the narrative, I could easily picture the events in it taking place. 6) The story bores me. 7) I enjoyed the story. Questions 3-5 were chosen to address aspects of Bartlett's rationalization, with questions 3 and 4 targeting connection and coherence, and question 5 addressing the "ease" of processing. Question 5 was adapted from Green & Brock (2000).

Statistical Analysis

People strongly preferred to set the slider very near an integer-marked position. Therefore, we converted slider responses to the nearest integer and treated the responses as ordinal values from 1 to 8. Complete details of data and data analysis are provided at https://osf.io/68y7h/.

After visually inspecting mean ratings plotted as a function of retelling, the pattern could be reasonably described as an exponential compression toward a spine. The spine is linear, with its intercept indicating the typical rating of original stories and its slope indicating the typical upward or downward trend of the rating across retellings. Each specific story begins at a distinct deflection above or below that spine. Then with retellings the trends for each story exponentially compress toward or away from the spine at the same rate. We are primarily interested in the slope and compression as the key indicators of trend across retellings.

In principle the spine can be outside the particular stories that happen to be used, but in practice it is difficult to estimate the spine without additional constraints (see https://osf.io/68y7h/ for details). Therefore, the intercept of the spine is set so that the story deflections sum to zero, implying the spine is constrained to fall in middle of the stories that happen to be used.

As in conventional regression models, our model is intended as a useful descriptive model of the trend in the observed data. The model is not intended to be extrapolated far beyond the observed data. The model is not a process model, but see the final discussion for an informal process model.

The linear spine and compression toward it are occurring on a latent metric scale, not the manifest ordinal scale. We used a conventional ordered-probit model which assumes that people's ratings are distributed normally on the latent scale. The latent scale gets mapped to ordinal responses by cutting it at thresholds. The probability of each ordinal value is the cumulative normal probability within its interval. For more

information about ordered probit models (Kruschke, 2015: chapter 23; Liddell & Kruschke, 2018). Complete details of the model are provided at https://osf.io/68y7h/.

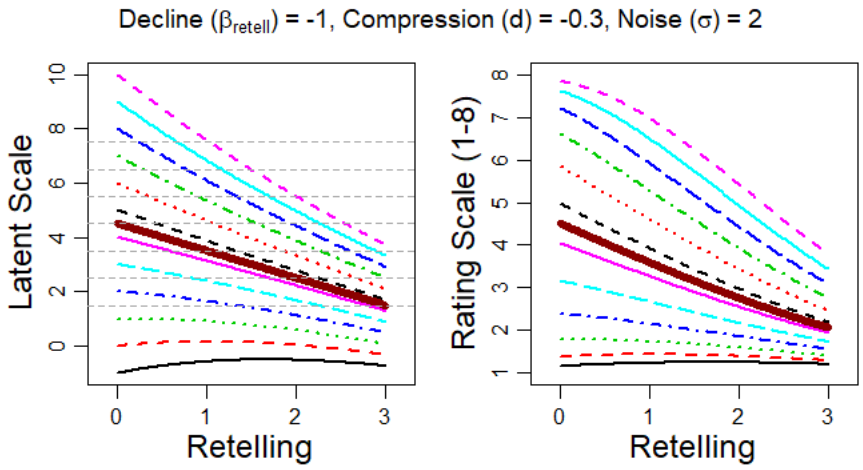


Fig. 1: An example of trends generated by the model. Left panel: Latent scale with exponential decay of individual stories (various colors and dashes) toward linear spine (thick solid). Right panel: Resulting trends on the rating scale when passed through a thresholded cumulative normal response function.

An example of the trends predicted by the model is displayed in Fig. 1. The left panel shows the latent scale with exponential decay of individual stories toward a linear spine. The right panel shows the resulting ratings. This example uses extreme values of the parameters, as annotated at the top of figure, in order to clearly show decline and compression. Fits to actual data involve much less extreme values of the parameters.

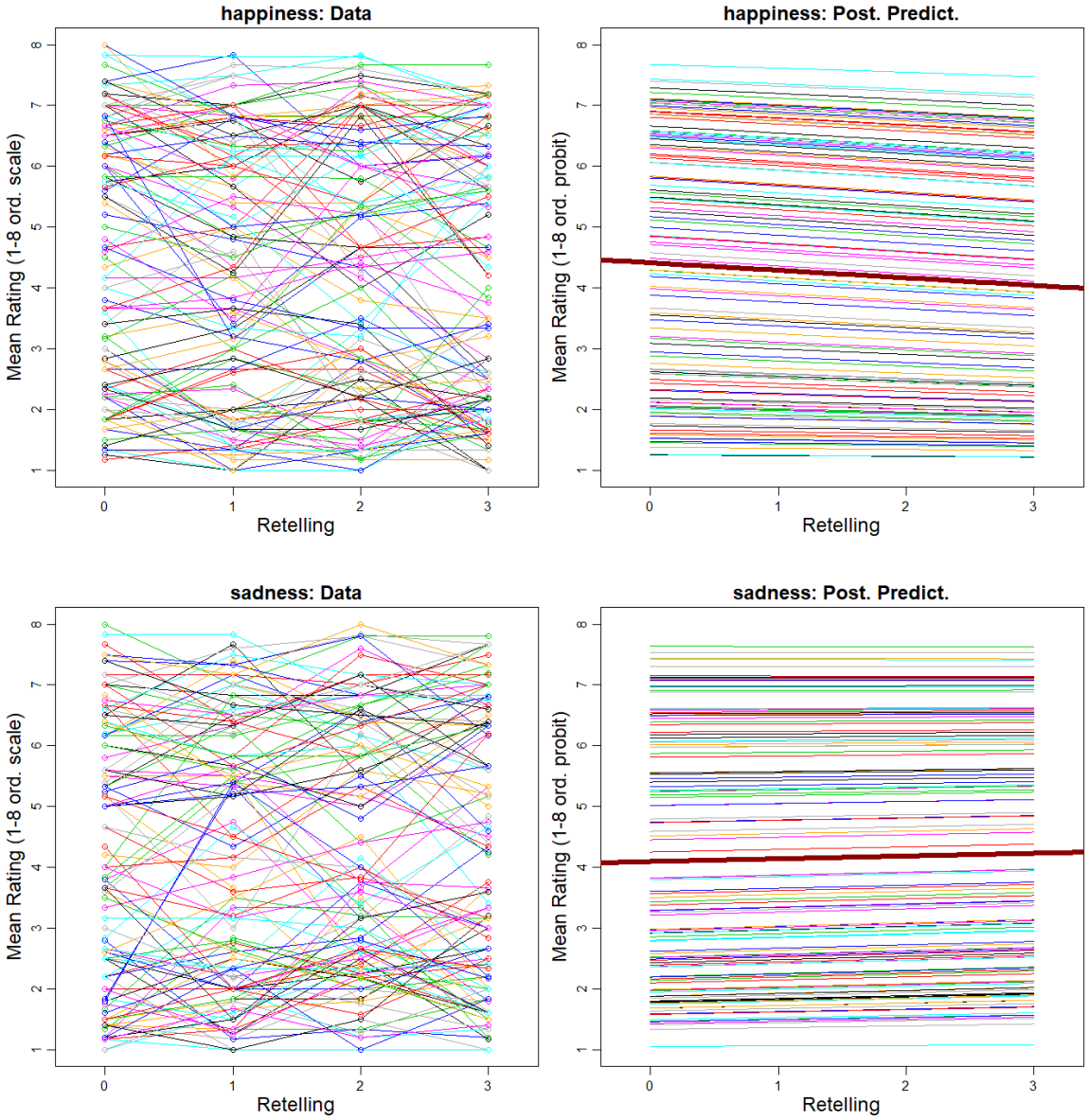
Interpreting the Magnitude of Slope and Compression

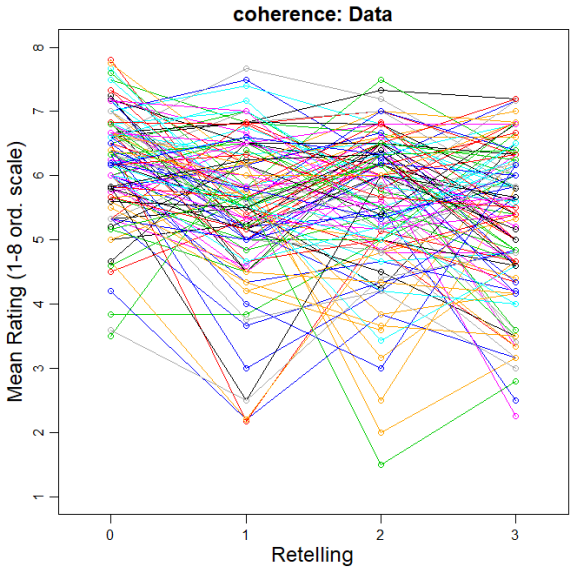
We have no claims that slope or compression should be exactly zero, therefore null-hypothesis significance testing is superfluous. But we are interested in which values of slope and compression are small relative to the magnitude of the noise, as is typical for measures of effect size (e.g., Cohen's effect size for difference of means (Cohen, 1988). The noise in our model is indicated by the standard deviation from the normal distribution on the latent scale. We therefore report the slope as standard deviations per retelling. Similarly, for the change due to compression we report the standard deviations per retelling for a story that has an original rating 2 latent-scale units away from the spine. Complete details are provided at https://osf.io/68y7h/.

We propose that a change of 0.1 standard deviations of noise per retelling may be considered negligible. The value 0.1 is half the magnitude declared by Cohen (1988) to be a "small" difference for typical data in the social sciences. Therefore, when interpreting the magnitude of slope or compression, if the credible interval of the parameter falls entirely more than 0.1 away from zero, we can consider the value to be credibly non-negligible. If the credible interval of the parameter falls entirely within 0.1 of zero, we consider the value to be negligible. Otherwise, when the credible interval includes both negligible and non-negligible values, we remain undeclared. Because our goal is estimation and description, not testing of null values, we treat these descriptors heuristically and not as strict decision rules (Kruschke, 2018).

Results

Fig. 2 shows the data and model fits. The left panels show the data for the ratings: Each dot is the mean of the ordinal ratings, treated as if they were metric values 1-8. The right panels show the estimated trends from the model. Also plotted is the spine, as a heavy brownish-red line.

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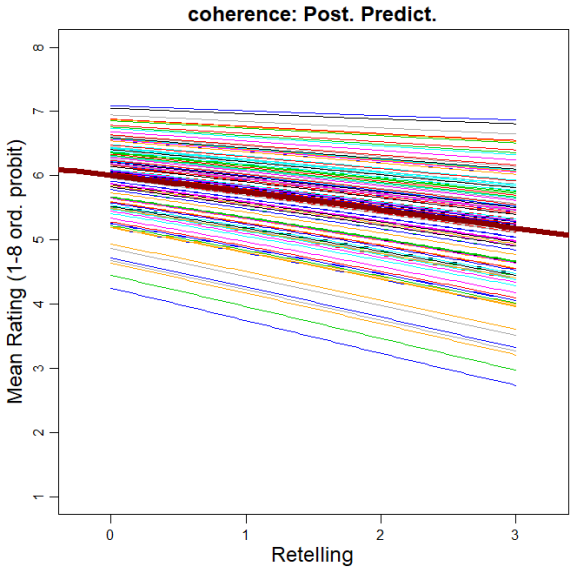
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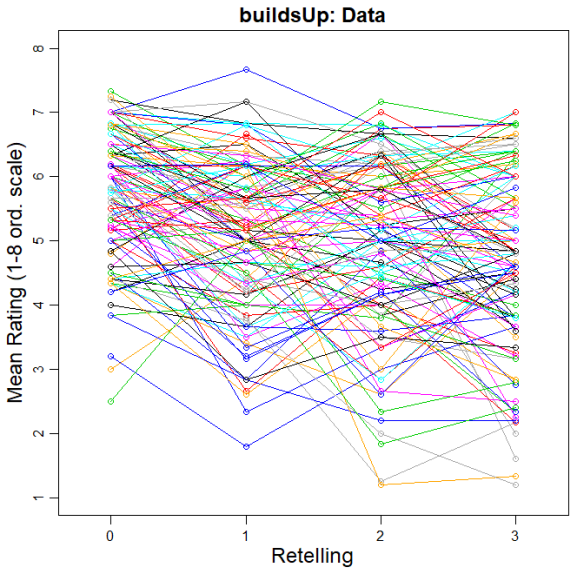
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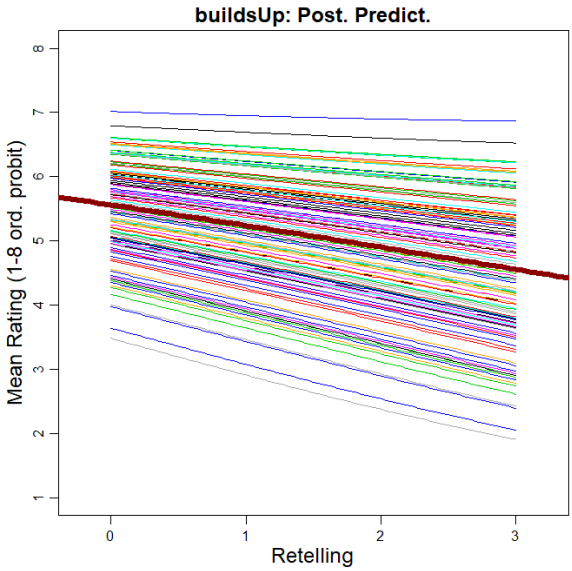
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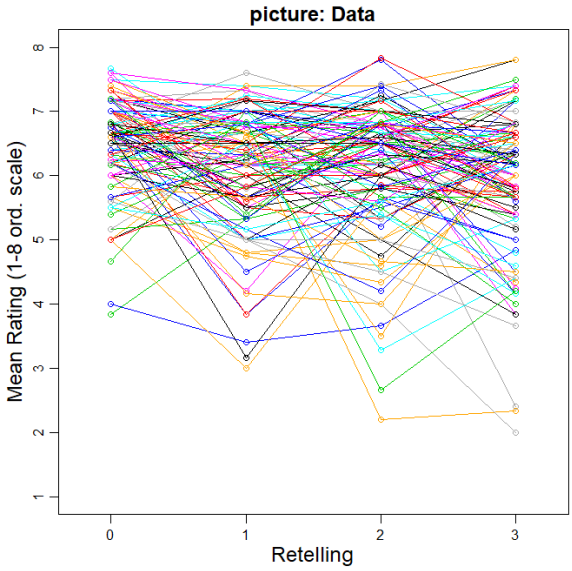
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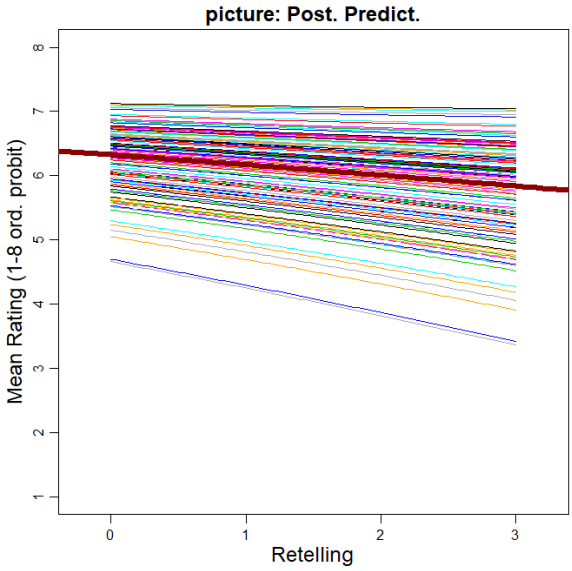
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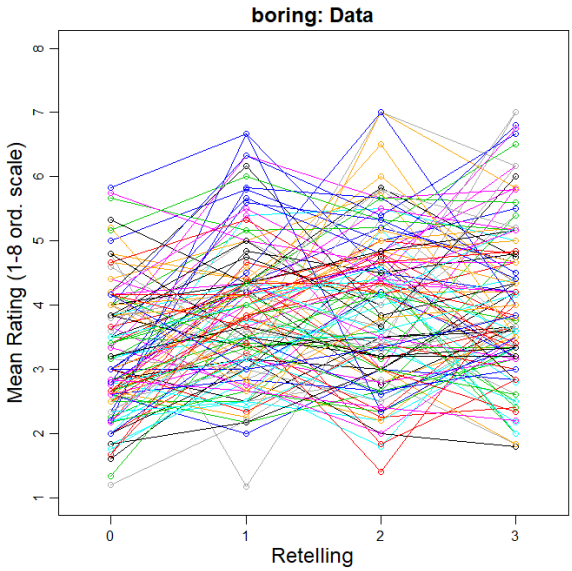
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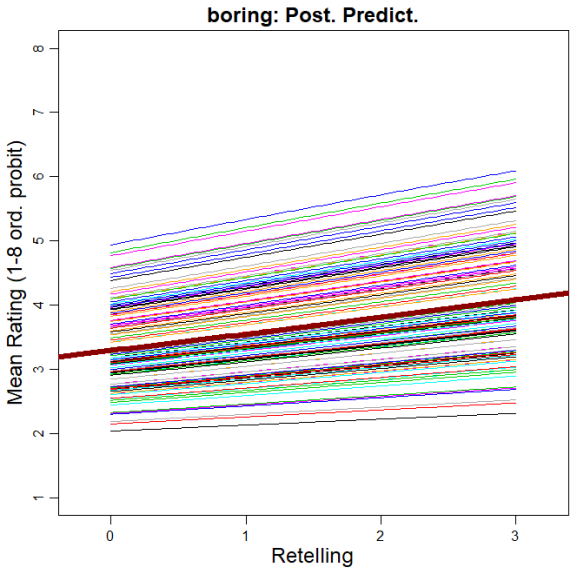
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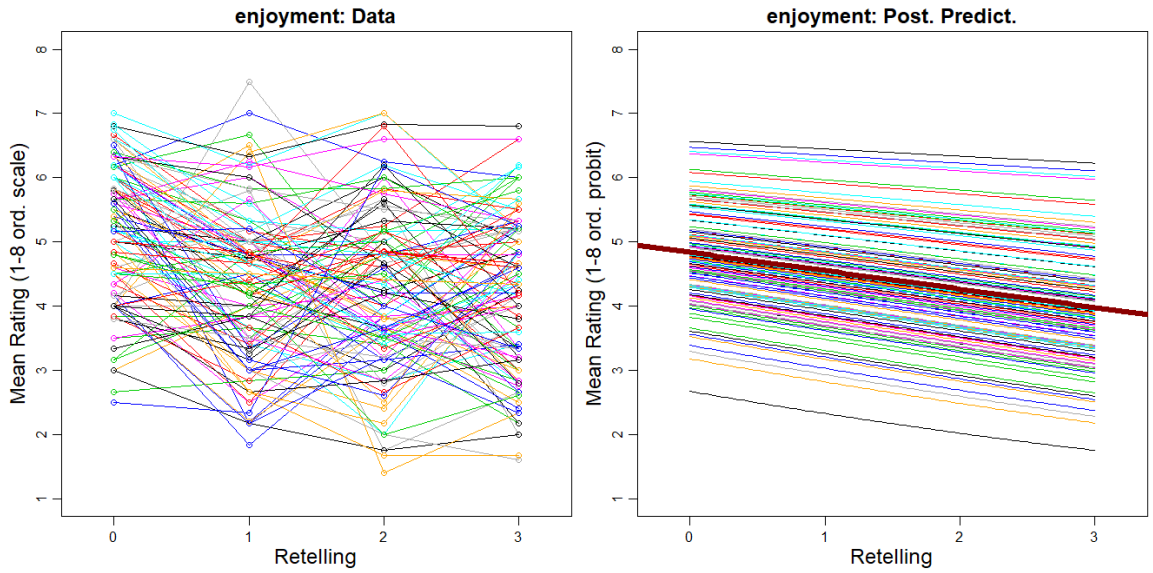


Fig. 2: The ratings and trends of Study 1.

Table 1: Estimates of slope and compression parameters for Study 1.

Rating	Slope	Lower bound	Upper bound	Compression	Lower bound	Upper bound
Happiness	-0.07	0.11	-0.03	-0.02	-0.06	0.01
Sadness	0.02	-0.01	0.06	-0.01	-0.05	0.02
Coherence	-0.16	-0.20	-0.13	0.10	0.01	0.19
Build up	-0.19	-0.22	-0.15	0.12	0.04	0.20
Picture	-0.10	-0.14	-0.07	0.10	0.01	0.20
Boringness	0.13	0.10	0.17	0.06	-0.01	0.14
Enjoyment	-0.15	-0.19	-0.11	0.06	-0.02	0.14

Note. Slope is measured as standard deviations per retelling. Compression is measured for a story starting 2 units away from the spine. Lower and upper bounds are for 95% HDI of posterior distribution.

Fig. 2 and Table 1 show the Bayesian estimates of slope and compression. **Happiness** and **sadness** both show negligible changes for either slope or compression and are highly stable across retellings. The three factors related to rationalization (**coherence**, **build up to the end**, and **ability to picture**) show a notable decline and a small but non-zero expansion across stories. The slope for **boringness** showed notable increase, while the slope for **enjoyment** showed clear decline.

Story Length Across all stories, the retellings shrank considerably in length. Original stories had an average of 149.9 words, first retelling 73.1, second retelling 54.0, and third retelling only 43.1. First-retelling stories shrank to 48.8% of the original lengths and third-retelling stories shrank to only 28.8% the length of the original. Despite that shrinkage, happiness and sadness remained stable.

Sample Story In the original version of Story 38, someone rescued a spider and brought it outside to the garden in a box. There is moment of aesthetic beauty in which the spider seemed to disappear when the

box is turned upside down in the garden: “That is when I tilted the box to the side and noticed the spider repelling from the box on his web! I smiled and then slowly lowered it to the ground and freed it in the grass” (happiness rated as 4.9; coherence 5.8).

After three retellings, the entire story reads: “I tried to direct a spider out of my office, giving it a chance to leave. It stuck around and I actually started to like it more and now we're friends” (happiness rated as 5.6, coherence as 5.0).

The transport into the garden no longer takes place. The only trace of the disappearance episode is the metaphor “it stuck around”, with different context and meaning. The retelling transformed the rescue of a spider into a friendship, thereby changing the plot (moving from one coherent story to a rather different coherent story), but keeping the positivity/happiness.

Study 2: Researcher-generated Stories

Study 2 asks whether the findings of Study 1 can be generalized to other emotions, and so we compared happiness and sadness to other emotions namely disgust and embarrassment, and the affect of risk (with an emotional valence between fear and thrill). An additional limitation of Study 1 is that it did not allow us to compare specific story elements between the different stories since each basic story is vastly different from any other basic story. For these reasons, we created 5-8 variations of basic stories that provide varying degrees of emotion from low to high, while maintaining the large majority of the text identically. In this fashion, we generated 18,738 retellings.

Participants We used a total of 11,801 of participants on Amazon’s Mechanical Turk for the following pretests and main experiments. Participants reported an average age of 36, 53% female.

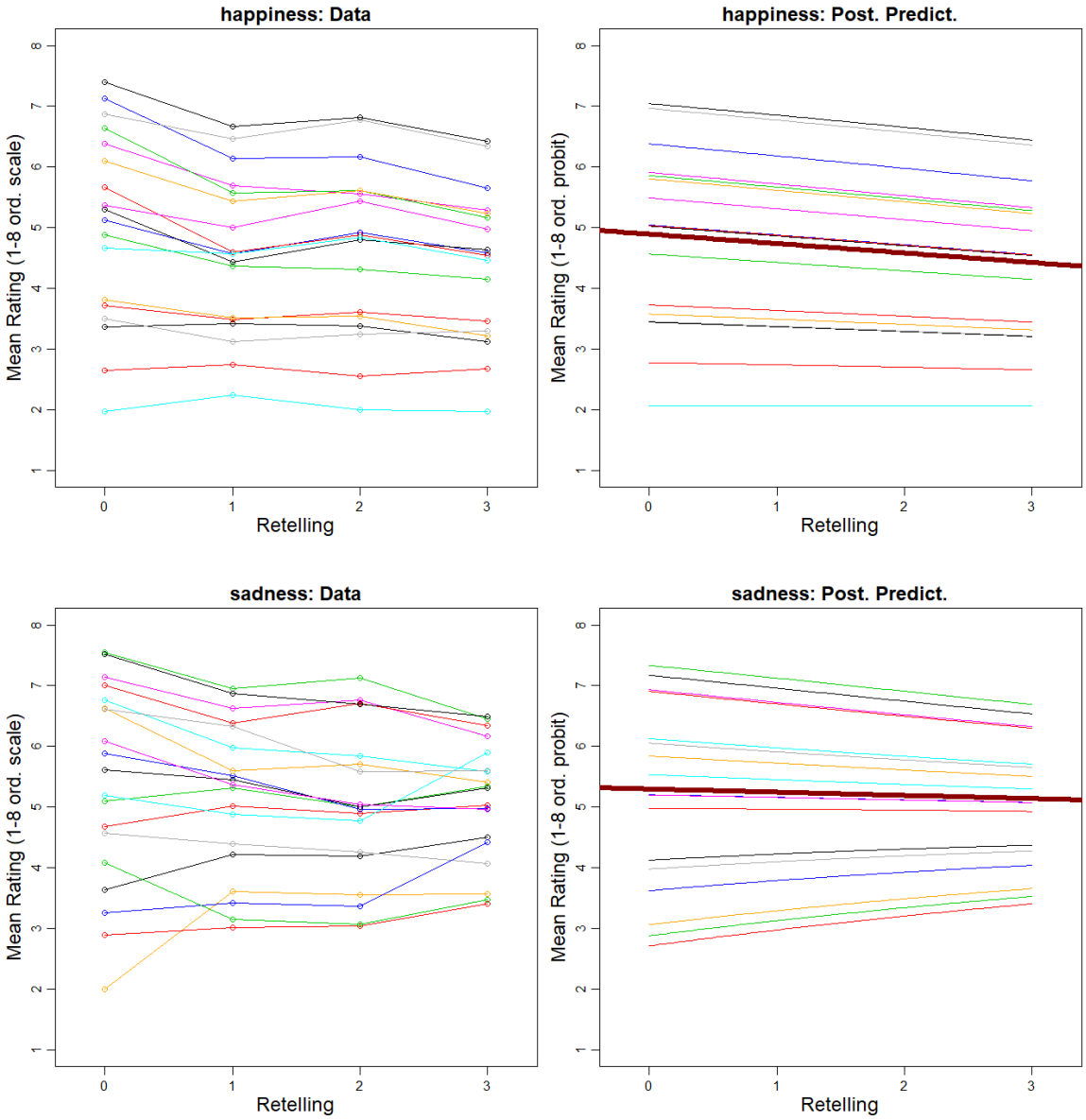
Story Generation We used 3 basic stories for each emotion and created different endings of one or two sentences. The variations differed in the strength of the emotion for the overall story, from low to high emotion. For example, in one story a student is lonely in college and has her computer stolen, until a turn to the positive occurs at the end (happy). This turn to the positive could be just slightly happy, for example, an improvement in weather (rated as 2.64) to very happy by falling in love (rated as 5.26).

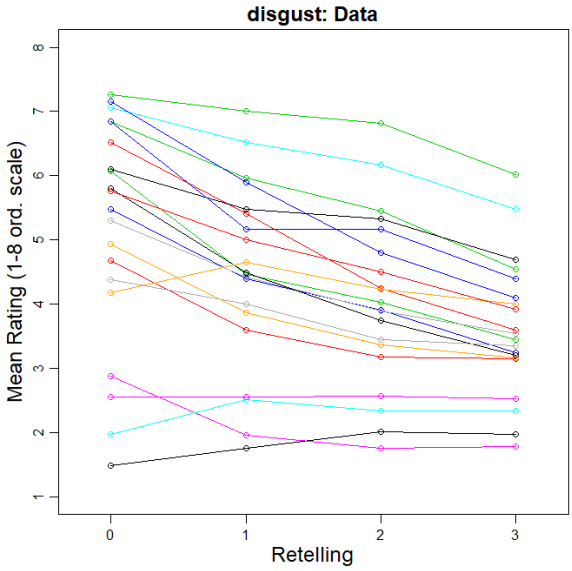
Pretest We asked participants to rate the degree of emotion on a scale from 0 to 7 as in Study 1 and selected 5-8 variations for each story that provided a gradation of degrees. *In toto*, we used 15 story sets and 97 variations (39 from happiness and sadness).

Story Retelling Each participant retold three stories, in fully randomized order, meaning each participant received three story variations each from a different emotion. Participants received stories from within the same iteration, such as only second retellings, with the same instructions as in Study 1. Again, we did not prompt participants to pay attention to emotions. Following these procedures, each of the 97 original variations was retold an average of 29.1 times for a total of 2,821 first iterations (1,113 happiness/sadness). The second iteration of retelling created an average of 2.7 second retellings for each first retellings for a total of 7,401 second iterations (2,958 happiness and sadness). For third retellings, we generated 8,516 third iterations (3,448 happiness/sadness) for a total of 18,738 retellings.

Story Ratings We routed the resulting 18,738 retellings to 5,234 participants to evaluate the stories. Each rater received 15 stories in random order with the same emotion and from the same iteration (first, second or third). Participants evaluated intensity of emotion. Each first retelling was rated by an average of 5.62 raters, each second retelling by 3.27 and each third retelling by 4.52.

Results

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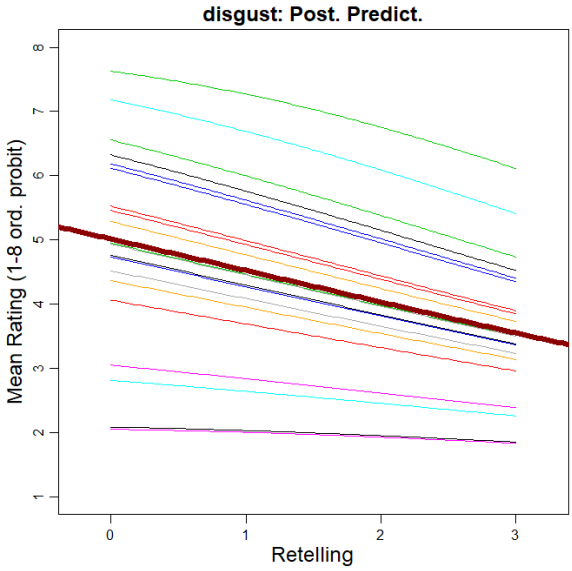
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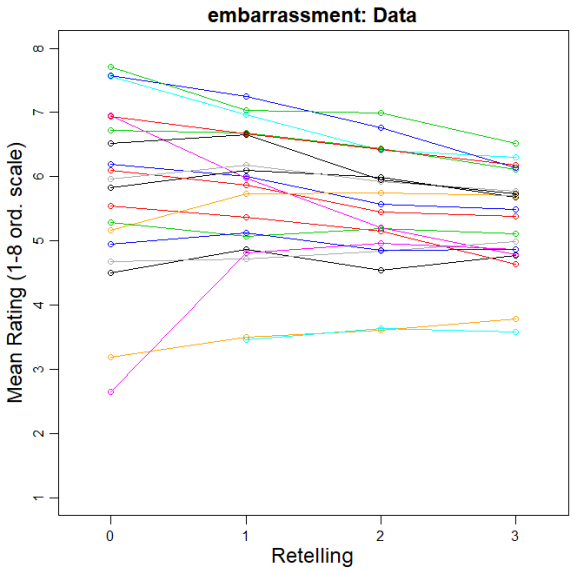
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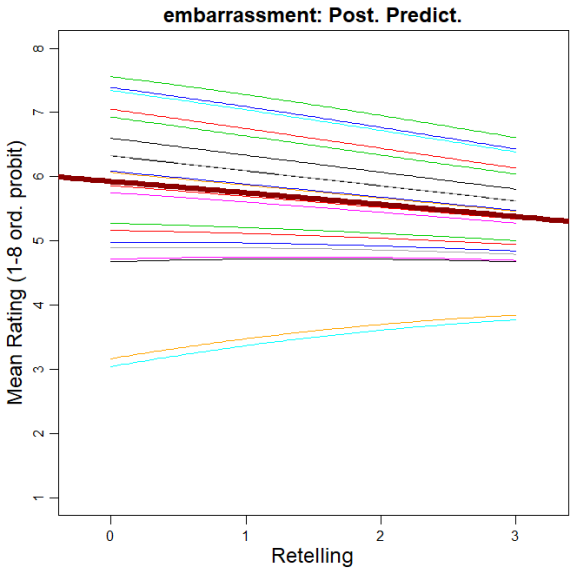
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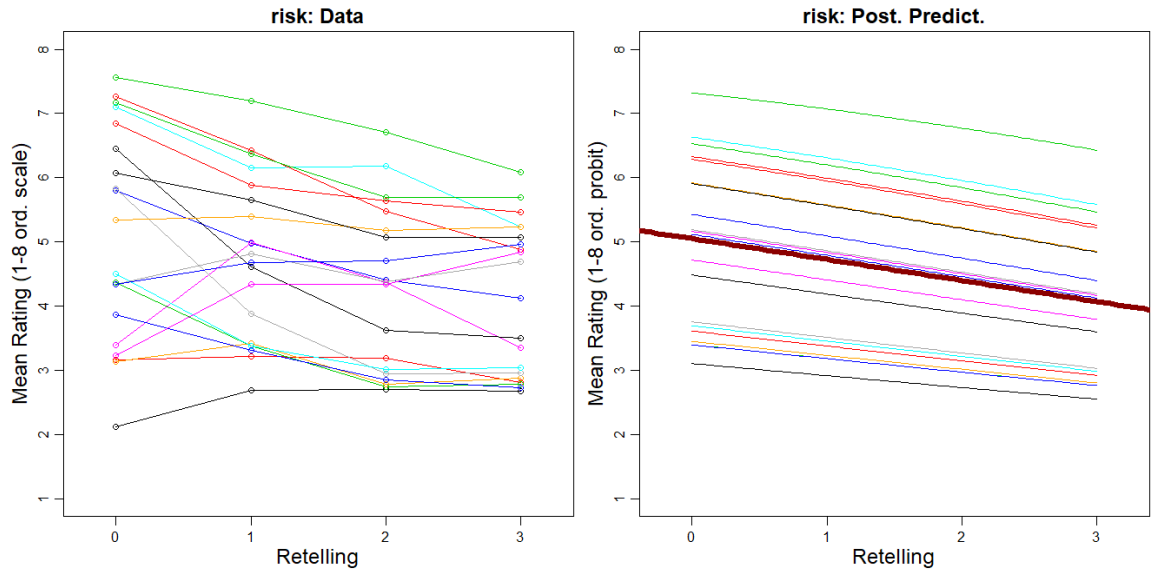

Fig. 3. The ratings and trends of Study 2.

Table 2: Estimates of slope and compression parameters for Study 2

Rating	Slope	Lower bound	Upper bound	Compression	Lower bound	Upper bound
Happiness	-0.09	-0.11	-0.07	-0.06	-0.08	-0.04
Sadness	-0.03	-0.05	-0.01	-0.12	-0.14	-0.10
Disgust	-0.22	-0.24	-0.20	-0.09	-0.11	-0.07
Embarrassment	-0.10	-0.12	-0.08	-0.17	-0.20	-0.14
Risk	-0.16	-0.18	-0.14	-0.05	-0.08	-0.03

Note. Slope is measured as standard deviations per retelling. Compression is measured for a story starting 2 units away from the spine. Lower and upper bounds are for 95% HDI of posterior distribution.

Fig. 3 and Table 2 show the Bayesian estimates of slope and compression. For **happiness,** both slope and compression had HDIs that excluded zero but were slight in magnitude. **Sadness** had a negligible change in slope and a compression which is barely non-negligible according to our heuristic. For **disgust**, the declining slope is clearly non-negligible. For **embarrassment**, the slope is small, while compression is non-negligible. For **risk**, the declining slope is clearly non-negligible but not as steep as for disgust, while compression is negligible.

Story Length: The average length of the original stories was 182.7 words. In the first iteration, this dropped to 87.2 words, to 65.6 in the second and 50.2 words in the third retelling, meaning the third iteration has a length of 27.5% of the original.

Neither of the experiments reported in this article was formally preregistered. The data and the materials are available online at https://osf.io/68y7h/.

Discussion

In retelling, we observed strong abbreviation and omissions, and some inventions, but high accuracy in happiness and sadness preservation. Emotional content, (particularly, happiness and sadness) is transmitted across retellings with high stability in comparison with coherence, build-up, picturability, boringness, enjoyment and other emotions, such as disgust. That is, the *preservation of emotion* is prioritized over rationalization, i.e. story coherence, build up, and ease of picturing, even though emotion retelling is effortful, requiring retellers to (re)create story situations. Participants retold emotions even though they received no instructions to pay attention to emotions

While emotions like happiness and sadness have not been tested in serial reproduction and are understudied in narratives (Nabi & Green, 2015), our findings are generally supported by research on emotion recall (Bower 1981; Doerksen & Shimamura, 2001; Posner & Snyder, 2004; Strongman & Russell, 1986). But our findings challenge certain elements of Bartlett (1932) and other studies of narrative recall. For example, following Bartlett (1932), Mandler & Johnson (1977) proposed a schema theory of story recall: Ideal schemas are causally coherent and the closer a story is to the ideal schema, the more accurate recall will be. In contrast, our data indicate a considerable decay of story coherence in retelling, even at high levels of coherence. Furthermore, it is not clear how schema theory can explain the preservation of degree of emotion while causal coherence decays. Our data do not indicate that story processing does not involve causal schemas. Rather, based on our findings, we have to consider the possibility that affect preservation, and in particular happiness and sadness preservation, is a more fundamental process of narrative retelling than schema preservation.

To explain the special role of emotions (particularly happiness and sadness) for retelling we offer the following model for narrative reproduction. Like Mandler and Johnson (1977) we propose a two-phase model with a receive-and-encode phase and a retrieve-and-reproduce phase. In the initial reception, the narrative sequence of events culminates in an impression of overall emotion (or emotion-related affects, such as risk) and their magnitudes. In the second phase of reconstruction, the emotion guides the selection, (possible) invention, and assembly of those story elements needed for a reconstructed story with preserved emotion (Fig. 4). That is, in the reproduction phase, those story elements that can bring about the emotion are lassoed in.

We suggest that emotions in narratives function as verdicts of the outcomes of actions and events in the receive-and-encode phase. Happiness rewards good behavior, lucky events, and goal-accomplishment, while sadness at the end of a story can indicate failure or a lack of finding a positive resolution. A bad outcome can also indicate deserved punishment (Flesch, 2007). In general, our model of the emotion-as-verdict can offer a link of the preservation of happiness and sadness with moral communication.

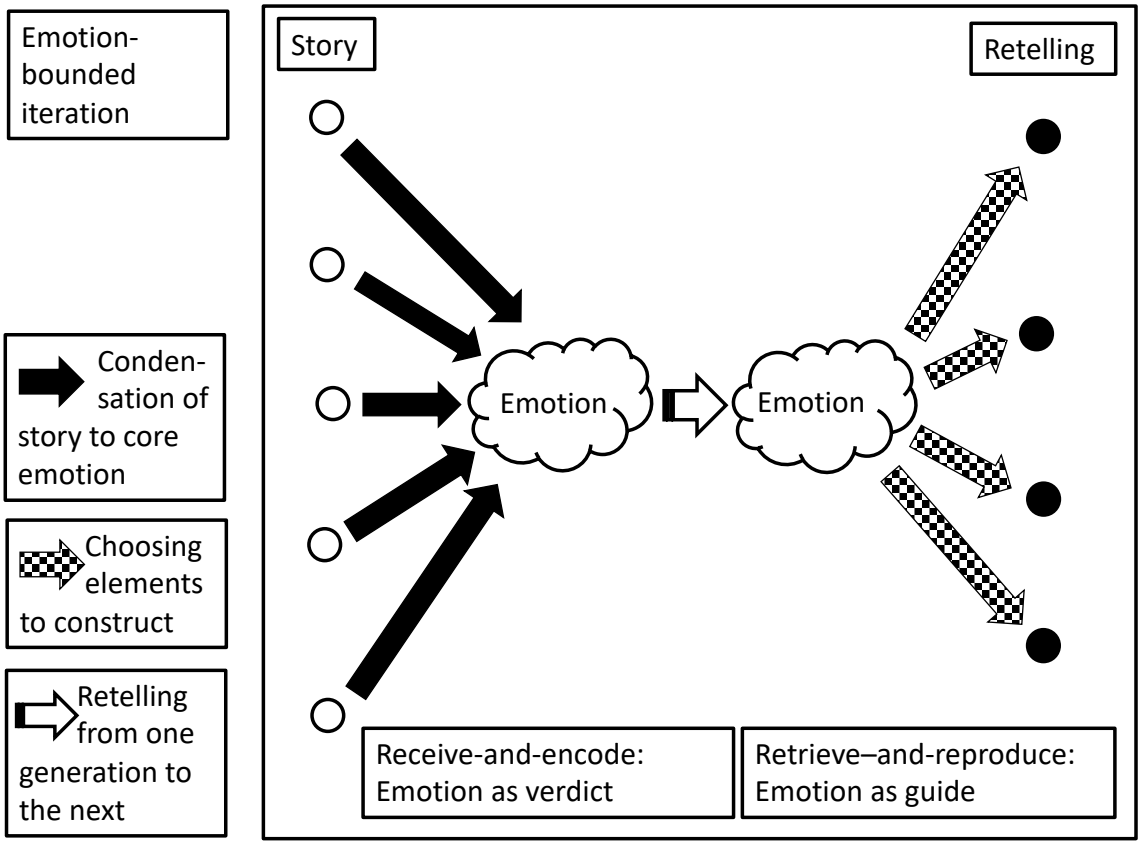

Fig. 4: Proposed model of emotion-bounded iteration.

In the retrieve-and-reproduce phase, these emotions-as-verdicts guide transmission, the goal of which is to (re)create elements that will explain the verdict. Emotions connected to an overall verdict in stories may be valuable to the audience in part because they signal (or direct attention toward) the aspects of the story that call for approach or avoidance responses. For example, happiness may signal an approach response via attraction to a character or via attention to a good situation. Sadness may signal a potential approach response via compassion for a sad character. This approach-signaling can follow a yet-unresolved story where compassion may move the narrative to a more positive outcome. Or, sadness may signal a potential avoidance response via warning of a bad situation. Surprise, which is also well transmitted (Breithaupt et al., 2018), may be important to alert the audience to new information.

It is possible that with some negative emotions, such as embarrassment, retellers see it as a sufficient goal to preserve and communicate midlevel negativity in order to signal general avoidance. This has consequences for stigma communication (Smith, 2007): Even a relatively small moment of embarrassment can be passed on at a midlevel magnitude.

The transmission of disgust and risk require further investigation. The communication of both are typically associated with a warning dimension to alert others (Jagiello & Hills, 2018; Moussaïd, Brighton, & Gaissmaier, 2015; Strohminger, 2014), but this warning function might have been overpowered by other factors in our study. With disgust, the anticipated discomfort of offending the audience or the

experimenters might have played a role in its attenuated transmission. With risk, it is possible that our stories were perceived as carrying a positive valence of thrill (Breakwell, 2014) and thus exhibited a transmission pattern in some ways closer to happiness.

Beyond empirical findings, our studies are novel in two other ways: The stories from Study 1 were generated by participants; and the analysis used a new trend model (with Bayesian estimation of parameters). Both may be useful for future studies of serial reproduction.

Our study has several limitations. Future research might examine a broader range of emotions, including complex narrative emotions (Bilandzic, Kinnebrock, & Klingler, 2020); oral retellings (Marsh, 2007); and delayed recall and long-term memory (Bartlett 1932; Norenzayan, Atran, Faulkner, & Schaller, 2006). Future research could also manipulate the goals for retelling to accentuate audience functions, such as warning the audience, providing coherent stories, or to entertain (Marsh, 2007).

Finally, we speculate that story retelling likely has played a significant role in the stability of human culture from one generation to the next by preserving information about a wide range of practices, transmitting specific knowledge, and guiding attention (Varnum & Grossmann, 2017). Finely tuned happiness and sadness communication signals verdicts concerning choices for behavior, including approach and avoidance behavior. Emotion communication, it appears, is as relevant as rationalization and understanding plot causality, if not more so. People need to know to which degree a situation will make them happy or sad, and whether others are in a good or bad spot. Narratives not only show how we would feel in a specific situation, but also how one can get into it or avoid it.

Acknowledgments

[redacted]

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