Journal of Health Communication
International Perspectives

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uhcm20

The Facts or the Story? It Takes Both to Sensitize People About Unknown Health Hazards

Yi-Lun Jheng, Sander Van de Cruys, Leen Catrysse, Heidi Vandebosch, David Gijbels & Karolien Poels

To cite this article: Yi-Lun Jheng, Sander Van de Cruys, Leen Catrysse, Heidi Vandebosch, David Gijbels & Karolien Poels (11 Dec 2023): The Facts or the Story? It Takes Both to Sensitize People About Unknown Health Hazards, Journal of Health Communication, DOI: 10.1080/10810730.2023.2290549

To link to this article: https://doi.org/10.1080/10810730.2023.2290549

Journal of Health Communication, 00: 1–12, 2023

ISSN: 1081-0730 print/1087-0415 online
DOI: https://doi.org/10.1080/10810730.2023.2290549

Routledge
Taylor & Francis Group

The Facts or the Story? It Takes Both to Sensitize People About Unknown Health Hazards

YI-LUN JHENG [1,2], SANDER VAN DE CRUYS [3], LEEN CATRYSSE [4], HEIDI VANDEBOSCH [2], DAVID GIJBELS [1,3], and KAROLIEN POELS [2,3]

[1]*Department of Training and Education Sciences, University of Antwerp, Antwerp, Belgium*
[2]*Department of Communication Studies, University of Antwerp, Antwerp, Belgium*
[3]*Antwerp Social Lab, University of Antwerp, Antwerp, Belgium*
[4]*Department of Online Learning and Instruction, Faculty of Educational Sciences, Open Universiteit, Heerlen, the Netherlands*

Communicating about new or unknown health risks is challenging because it requires audiences to engage with and process novel and often complex health information. This study examines how texts can convey awareness and increase knowledge about health risks people are unaware of. The focus is on how text genre (narrative, expository, and mixed-genre) affects relevant emotional (arousal, transportation) and cognitive outcomes (knowledge and risk severity), measured using both online (electrodermal activity) and offline self-report measures. Mixed-effects model analyses revealed that narrative texts exhibit the highest self-reported arousal, transportation, and risk severity. Additionally, transportation mediates the relationship between text genre and risk severity. Ultimately, mixed-genre texts produced significantly higher arousal peaks and confidence ratings on knowledge posttests compared to expository texts. Taken together, the findings suggest that narrative texts perform better at raising awareness, whereas mixed-genre texts seem more effective in learning. The implications for health risk communication are discussed.

Raising public awareness of health-related knowledge is a cornerstone of health communication (Nutbeam, 2000). Health messages have been used to convince the public of adopting healthy lifestyles (Gray & Harrington, 2011) but also to communicate about other health prevention such as vaccination and cancer screenings (Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013; O'Keefe & Nan, 2012). Aside from acute and fatal health risks (e.g., COVID-19) that can easily stir the public's attention and trigger their emotions, building public awareness and knowledge about largely unknown or even invisible health risks that carry long-term consequences is an ongoing challenge. Examples of such risks are air pollutants and environmental hazards (Ramírez, Ramondt, Van Bogart, & Perez-Zuniga, 2019). Written texts are widely used to persuade people about health risks (Shen, Sheer, & Li, 2015). Texts can be easily embedded into various media, including books, pamphlets, websites, and digital platforms, making health information widely accessible to a variety of audiences. Engagement with health messages is a crucial predictor of perceived risk, change in knowledge, attitudes, and behaviors (Murphy, Frank, Moran, & Patnoe-Woodley, 2011). Therefore, understanding how texts can engage readers when processing unknown health information is essential, yet understudied.

Narratives and expository texts are typical forms of health communication (Hinyard & Kreuter, 2007). Narratives are texts that tell stories, anecdotes, or testimonials. In contrast, expository texts are referred to as didactic texts (Wise, Han, Shaw, McTavish, & Gustafson, 2008), informational texts (Liebfreund, 2021), non-narrative texts (Liu & Yang, 2020), statistical evidence-based texts (De Wit, Das, & Vet, 2008) or argument-based texts (Krakow, Yale, Jensen, Carcioppolo, & Ratcliff, 2018). In general, the significance of narratives in health communication has been highlighted as they facilitate emotional connections with identifiable characters and have the potential to overcome resistance (Kreuter et al., 2007). Narratives have been found to be more effective in shaping attitudes toward health behaviors compared to non-narrative formats (Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013). However, it is important to acknowledge that there are numerous studies with conflicting results, including those that reveal narratives are not found to be more persuasive than expository information (Gray & Harrington, 2011; Limon & Kazoleas, 2004) or yield opposite results (Greene & Brinn, 2003; McKinley, Limbu, & Jayachandran, 2017).

Research linking text genre to comprehension shows mixed findings as well. Some research suggest narratives enhance inferential comprehension and memory (Clinton et al., 2020; Mar, Li, Nguyen, & Ta, 2021), while others

Address correspondence to Yi-Lun Jheng E-mail: Yi-Lun.Jheng@uantwerpen.be;

Karolien Poels Department of Communication Studies, University of Antwerp, Antwerp, Belgium. E-mail: karolien.poels@uantwerpen.be

show contradicting views or no differences between narrative and expository texts (Wannagat, Steinicke, Tibken, & Nieding, 2021; Wolfe & Mienko, 2007). A meta-analysis revealed that expository texts seem to be associated more with cognitive responses, whereas narrative texts are associated more with affective responses (Zebregs, van den Putte, Neijens, & de Graaf, 2015). Moving beyond single-genre texts, it appears ecologically valid and promising to juxtapose narratives with expository texts. Narratives are primarily written to entertain and emotionally engage readers; thus, it may be particularly useful for communicating science to non-experts (Dahlstrom, 2014). In parallel, expository texts can supply dense factual information since oversimplifying stories might hinder scientific reasoning (Dahlstrom & Scheufele, 2018 Despite these insights, the influence of narrative, expository, and the combination of both on risk perception and comprehension of unknown health risks is not conclusive.

The current study attempts to address three gaps. First, while most studies focused on emotionally loaded health topics, such as pandemic influenza (Bekalu, Bigman, McCloud, Lin, & Viswanath, 2018; Ye, Li, & Yu, 2021) or cancers (Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013), the impact of text genres on outcome variables may vary depending on the health topics. Narratives might not be as effective for COVID-19 communication due to the stress experienced during the pandemic (Hwang, Borah, Choi, & Ghosh, 2022). Conversely, narratives may effectively engage audiences when addressing less visible health topics that people are often unaware of but can have long-term harmful effects. Thus, the importance of studying these unknown health risks cannot be underestimated. Second, findings concerning *mixed-genre* texts are limited and partly contradictory (Hall, 2015; Nan, Dahlstrom, Richards, & Rangarajan, 2015; Okuhara, Ishikawa, Okada, Kato, & Kiuchi, 2018), requiring further research to replicate and examine their effects on both emotional and cognitive outcomes. Lastly, previous studies comparing different formats have predominantly relied on self-reported measures of emotions (Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013; Rickard, Yang, Liu, & Boze, 2021). However, combining psychophysiological measures can help mitigate bias and subjectivity in assessing emotions and are capable of capturing real-time, dynamic emotional responses during exposure to the health message. Electrodermal activity (EDA) is a reliable physiological marker of sympathetic arousal, which has been linked to changes in emotional experiences.

Hence, a primary objective of this study is to investigate how narrative, expository, or mixed-genre texts differ in the level of emotional response, risk perception, and text comprehension. We aim to unravel the impact of text genres on emotional arousal, risk perception, and text comprehension with both online (electrodermal activity) and offline self-report measures. Two research questions are central in this study: (1) How do narrative, expository and mixed-genre texts on unknown health risks affect emotional arousal and risk perception? (2) How do narrative, expository and mixed-genre texts affect text comprehension?

Literature Review

Defining Text Genres

Mixed-genre texts are known as combined texts (Hall, 2015) or hybrid texts (Pappas, 2006). Mixed-genre texts, meaning narratives coupled with fact-based information as a form of multi-genre texts, have shown to be a promising approach to combat messages advocating health avoidance (e.g., anti-vaccine messages) (Shelby & Ernst, 2013). In this study, we defined a mixed-genre text as "a single document that integrates two genres of texts, namely narrative and expository texts."

The Influence of Text Genre on Emotions and Risk Perception

Emotions dominate the powerful nature of narratives. Numerous empirical studies in the field of communication have shown that narrative formats elicit higher emotional arousal than informational formats (Chang, 2008; Zebregs, van den Putte, Neijens, & de Graaf, 2015). Narrative forms of communication may evoke various emotions (e.g., empathy/sympathy with the protagonist, curiosity (toward detective stories)) (cf. the EESN-model, Bilandzic, Kinnebrock, & Klingler, 2020). Narratives may use more emotional vocabulary and evoke the reader's emotions and thoughts for the characters (Mar, Oatley, Djikic, & Mullin, 2011), thus texts including narratives are expected to cause higher arousal.

Arousal and valence are crucial dimensions of emotional experiences (Barrett, 1998). Arousal is a feeling of deactivation (calm) or activation (excited) whereas valence refers to the assessment of positive (pleasantness) or negative (unpleasantness) feelings. Emotions can be measured through self-reported subjective feelings (e.g., Self-Assessment Manikin developed by Bradley and Lang (1994) Arousal-Valence Space created by Russell (1980) or objectively (e.g., by looking at biomarkers as physiological correlates). Electrodermal activity (EDA) is a psychophysiological measure of engagement, known as a biomarker of emotional arousal (Bradley & Lang, 2000). EDA refers to changes in the electrical conductance of the skin, which are associated with the activations of sweat glands. Emotional words or pictures is associated with greater skin conductance responses (SCR) than neutral stimuli (Sequeira, Hot, Silvert, & Delplanque, 2009). In the context of texts, online psychophysiological measures pick up subtle embodied changes in arousal (Potter & Bolls, 2012) and capture participants' moment-to-moment emotional responses toward written language (Thompson, Mackenzie, Leuthold, & Filik, 2016). Accordingly, the following hypothesis is proposed (see Figure 1 for the tested hypotheses):

H1: Narrative and mixed-genre texts will elicit greater emotional arousal than expository texts as measured by both a self-report questionnaire and EDA.

Through narratives—presentations of concrete event(s) experienced by character(s) in a particular setting (De Graaf, Sanders, & Hoeken, 2016)—people learn vicariously and are immersed through processes of transportation (Green & Brock, 2000). The process of absorption into a story

(transportation) involves entering the world of the story plot in a psychological sense (generating mental imagery), paying close attention to the text content (cognitive engagement), and becoming emotionally involved with the events and protagonists in the narrative (emotional engagement) (Green & Brock, 2000). Individuals who possess a greater sense of immersion in a narrative experience stronger emotional reactions (Green, Chatham, & Sestir, 2012).

Risk perception is crucial to health communication since it dictates how people prioritize and manage risks (Paek & Hove, 2017). Individuals' emotional experiences while reading and the degree to which they immerse themselves in texts (transportation) may influence their perception of health risks. Greater transportation is associated with higher perceived vulnerability to a health disease (e.g., skin cancer) in the future (Dillard, Ferrer, & Welch, 2018). Compared to the non-narrative condition, increased transportation while reading narratives decreases the temporal distance between a person and a health threat, thereby facilitating a negative attitude toward the health issue (e.g., e-cigarettes) (Liu & Yang, 2020).
Based on the theoretical accounts and previous findings, we hypothesize that:

H2: Narrative texts will generate higher perceived risk than expository texts.

H3: Transportation will mediate the relationship between narrative texts and risk perception.

The Influence of Text Genre on Text Comprehension

Comprehension is a complex process of extracting meaning from information (McNamara & Magliano, 2009). Studies often measure objective knowledge with multiple choice questions (Murphy, Frank, Moran, & Patnoe-Woodley, 2011) or true/false questions (Bekalu, Bigman, McCloud, Lin, & Viswanath, 2018), though, few examine confidence in answers under different text conditions. While participants answer true/false questions correctly, they may not be certain of their answers. Subjective confidence ratings (certainty about one's own knowledge) offer a distinct lens for evaluating learning outcomes, being associated with short-term recognition memory performance (Yokoyama et al., 2010) and serve as a reliable indicator of long-term memory for narrative stimuli, with high confidence levels in answers being more sensitive than recall measures (Furman, Dorfman, Hasson, Davachi, & Dudai, 2007).

Narratives seem easier to comprehend and to remember than expository texts for several reasons. Firstly, narrative language closely resembles everyday life language (Bruner, 1986; Medina & Pilonieta, 2006), whereas expository texts often contain technical terms unfamiliar to readers (Graesser, McNamara, & Louwerse, 2003). Therefore, the lexical and syntactic features of narrative texts are generally easier to comprehend compared to expository texts (Clinton et al., 2020). Secondly, narratives with recognizable characters and events of causality enable readers to understand motivations, goals, and anticipate possible actions. Comprehending narratives involves constructing rich situation models (Graesser, Singer, & Trabasso, 1994). A meta-analysis study found higher inferential comprehension for narrative texts compared to expository texts (Clinton et al., 2020). Moreover, texts mixing genres may aid in text comprehension in several ways. First, personal stories embedded within mixed-genre texts can reduce readers' resistance (Ratcliff & Sun, 2020) and stimulate their engagement, curiosity, and suspense (Knobloch, Patzig, Mende, & Hastall, 2004); subsequently, expository sections offer structured arguments for further inquiry. Second, we suppose that integration may be a crucial mechanism for comprehending mixed-genre text. A coherent mental representation can be formed by integrating narratives and expository information.
In light of the discussion above, our final hypothesis is that:

H4: Mixed-genre texts will lead to higher comprehension scores compared to narrative or expository texts.

Methodology

Participants

Fifty-four Dutch-fluent undergraduate or postgraduate students (39 female, mean age = 24.17) were recruited. A statistical power analysis (G*Power 3.1.9.4) was performed based on the effect size from the study of Gray and Harrington (2011), comparing the effect of text genres in a less emotionally charged context (engage in regular exercise). The effect size f = 0.18 with alpha = 0.05 and power = 0.80 projected the total sample size needed is $N = 54$. This sample size is also comparable to those in previous studies examining reading tasks using psychophysiological measures, such as Meer, Breznitz, and Katzir (2016) ($N = 39$) and Mason et al. (2020) ($N = 48$). This study is part of a larger research project in which multimodal data was recorded. In this study, we focus on the EDA data and self-report data. The study protocol was approved by an independent ethical committee and all participants signed the informed consent form prior to the experiment. All participants received cinema tickets for a total value of 20 euros.

Materials

Texts

We conducted a pretest (See Supplemental Material) with a survey of 150 university students (98 female, mean age = 21.05) to choose the health topics that participants deem relevant but are (yet) largely unknown. We ultimately selected three health risks (Acrylamide, Volatile Organic Compounds, and Radon), classified as air pollutants and environmental hazards. All texts comprised three paragraphs with the average length of 293 words ($SD = 37$).

For instance, we organized our mixed-genre text into three paragraphs: narrative, expository, and narrative. Initially, a protagonist is described, along with an unexpected health risk that he/she faces (tension). The second, expository passage introduces the health risk in a scientific manner. Throughout the last paragraph, the protagonist illustrates how he/she takes preventive measures against the health risk (resolution). Sentiment analysis with Textblob, a Python-based

natural language processing (NLP) library, controlled the valence of texts. The polarity of texts was considered as neutral [−0.01 to 0.13].

Measures

Emotions

We adopted both self-report instruments and a real-time process, EDA measure to assess emotional arousal. The 9-point Self-Assessment Manikin (SAM) scale, a visual emotion scale, measured valence and arousal (Bradley & Lang, 1994). The median value for valence and arousal were 5 and 3, respectively. Dynamic emotional arousal was measured with EDA. Two Ag–AgCl electrodermal conductance electrodes (8 mm diameter) were placed on the participants' non-dominant index and middle fingers, connected with the wireless GSR device (Shimmer 3-GSR+ kit) attached to the wrist of their non-dominant hands with a wrist strap. To analyze the EDA data, we used the MATLAB toolbox Ledalab (Benedek & Kaernbach, 2010). We first downsampled the recordings from 128 Hz to 64 Hz and applied a low pass filter of 5 Hz. The standard trough-to-peak (TTP) method yielded the metric, namely EDA peaks. In educational research, EDA peaks are commonly used to count the number of significant skin conductance responses during learning phases (Horvers, Tombeng, Bosse, Lazonder, & Molenaar, 2021).

Transportation

We used the transportation scale–short form (TS–SF) developed by Appel, Gnambs, Richter, and Green (2015) to measure the level of being immersed in a story. It was a 6-item, 7-point short version transportation scale, which was composed of cognitive, emotional, and imaginative assessments ($M = 4.64$, $SD = 1.05$). The items demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.78$).

Risk Perception

Risk perception comprised risk severity (e.g., How serious do you think the health risk is?) and risk susceptibility (e.g., How likely do you think it is that you or someone you know will be affected by the health risk?) (Rimal & Morrison, 2006). Items were measured on a 5-point scale. The median risk severity and susceptibility values were both 4.

Knowledge Questions

Knowledge questions were used as a measure of text comprehension, containing both questions of prior knowledge and post-knowledge. The prior knowledge test included both yes–no questions and open-ended questions for each health topic (e.g., Have you ever heard of Acrylamide? Write down everything you know about Acrylamide). A correct answer for the prior knowledge test was awarded a point, and an incorrect answer was awarded zero points. Across all health topics, participants' prior knowledge was low: the overall average prior knowledge score was 7%, confirming that we were investigating unknown health risks. Regarding the post-knowledge, we referred to the prior work by Trevors and Kendeou (2020) on the two-tiered approach to measuring post-knowledge. The first tier was a True/False question (4 questions per topic) (e.g., Acrylamide is a food process contaminant that occurs when foods are heated above 100°C and in high humidity conditions. True or False?), where answering a question correctly was scored as a point and answering a question incorrectly was scored as zero points. After the True/False questions, we also included a 7-point confidence rating by asking participants about "How confident are you in your answer?". The second-tier test consisted of open-ended questions (4 questions per topic), which were scored as two points for correct answers, one point for partially correct responses, and zero points for incorrect answers. Two raters coded all explanation questions to ensure the reliability of scoring the explanations. There was substantial agreement between raters (Cohen's Kappa = 0.76)

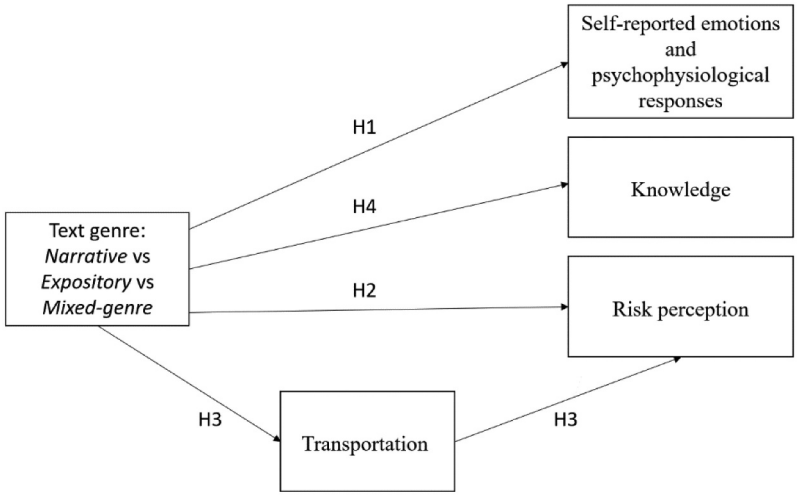

Figure 1. Visualization of the tested hypotheses.

(Landis & Koch, 1977). The mean values were as follows: True/False questions ($M = 3.26$, $SD = 0.78$), open-ended explanation questions ($M = 3.72$, $SD = 1.76$), and confidence rating ($M = 4.97$, $SD = 1.15$).

Design and Procedure

This study adopted a within-subjects design, in which each participant read three texts (narrative, expository, mixed-genre) about unknown health risks. By exposing each participant to all conditions, we can more accurately isolate and account for any inherent individual variations, resulting in a more precise assessment of the effects of the independent variable. Figure 2 shows the flow of the experiment. After participants arrived in the laboratory and were informed about the study purpose and task, they signed informed consent voluntarily. They were then asked to fill out a prior-knowledge questionnaire. Afterward, two electrodes were placed on their fingers to measure skin conductance. The experiment was run on a laptop, which had an iMotions Platform (V9.0) installed, integrating facial detection, GSR (Shimmer), and eye-tracking (Tobii X3–120) data.

Before the presentation of text stimuli, a white screen with a cross in the middle was shown for 2 minutes. Participants were required to read texts on three unknown health risks, each in a different genre. They were randomly assigned to one of the 36 sets, with both sequences of health topics and sequences of text genres counterbalanced. Each text was presented on a single page. Participants were allowed to read the text at their own pace ($M = 5.39$ minutes). Immediately after they read a text, they were asked to fill out the SAM scale, transportation scale, and risk perception. After they finished all three texts and associated questions, they were asked to complete the post-knowledge questionnaire on all three health topics. The experiment took approximately one hour to administer.

Analysis

Self-reported variables with continuous data were analyzed with linear mixed-effects models (LMMs) and the EDA peaks were analyzed with generalized linear mixed-effects models for count data (GLMM) with the *lme4* package (version 1.1–28, Bates, Maechler, Bolker, & Walker, 2015) in R software (version 4.1.2, R Core Team, 2023). For the single-item self-reported variables with ordinal data, we used cumulative link mixed models fitted with the *clmm2* function in *ordinal* package (version 2022.11–16, Christensen, 2022). In all mixed models, participant was considered a random effect, and text genre was considered as a fixed effect. Mixed-effects models were used with the participant as random effect since each participant read three texts and measures related to those texts are not completely independent. Due to our interest in comparing the outcome variables of three genres, a post-hoc analysis was carried out. The multiple comparisons of means with Bonferroni correction were calculated using the *emmeans* package (version 1.7.4–1, Lenth, 2022. A mediation analysis was performed with PROCESS Model 4 in SPSS (V 4.1) with 5,000 bootstrapped resamples (Hayes, 2018). All anonymous data, analysis scripts, and materials are openly available on the Open Science Framework, OSF (https://osf.io/j8hqu/?view_only=0ecaaa5108f84bf2801a0f50d105b486).

Results

H1: *Narrative and mixed-genre texts will elicit greater emotional arousal than expository texts as measured by both a self-report questionnaire and EDA.*

Descriptive statistics for self-reported responses and psychophysiological responses are presented in Table 1 and Table 2. An analysis of

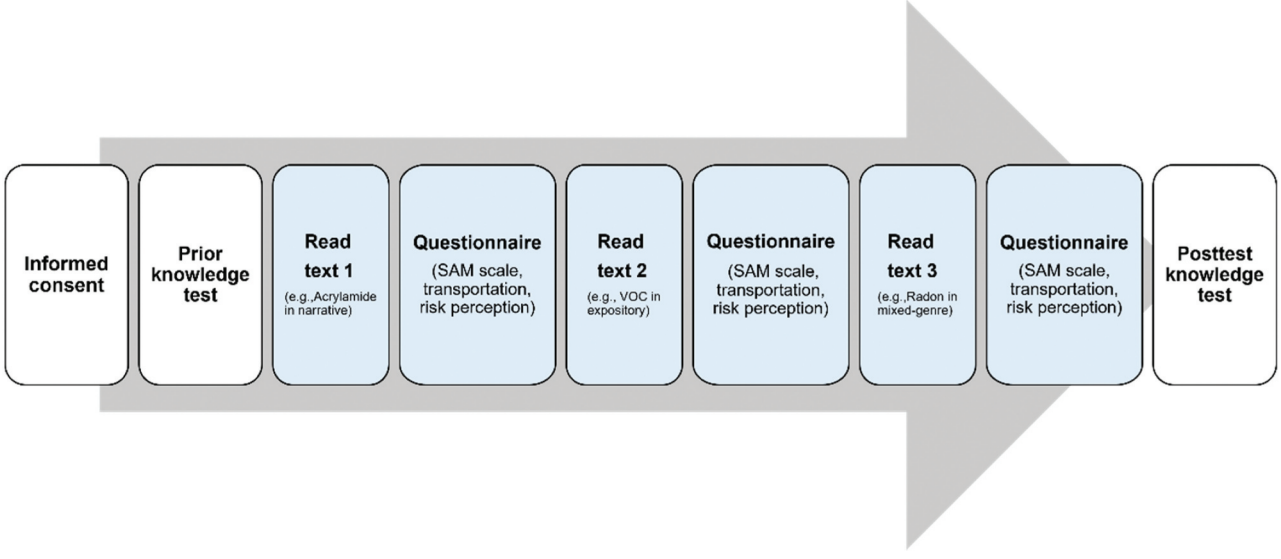

Figure 2. Experimental procedure. Blue blocks indicate that psychological responses were recorded during the experiment.

mixed-effects models and comparisons of conditions are presented in Table 3 and Table 4, respectively. In terms of the subjective self-reported emotions, texts did not differ in emotional valence of the SAM scale. However, there was a main effect of text genre on emotional arousal, showing that narrative texts ($M = 3.81$, $SD = 1.73$) evoked overall higher self-reported arousal than expository texts ($M = 3.13$, $SD = 1.60$), $p = .017$ (Figure 3a). Regarding the objective measurement, EDA peaks of mixed-genre texts were significantly higher than those of expository texts, $p = .027$ (Figure 3b).

H2: Narrative will generate higher perceived risk than expository texts.

The average score of the transportation scale differed between text genres (Figure 3c). Readers reported significantly higher levels of immersion in both narrative texts ($M = 4.98$, $SD = 0.96$) and mixed-genre texts ($M = 4.81$, $SD = 0.99$) compared to expository texts ($M = 4.12$, $SD = 1.02$), $p < .001$ for both comparisons, but did not differ from each other (narrative texts and mixed-genre texts), $p = 1.00$. Concerning risk perception, narrative texts elicited higher levels of risk severity ($M = 4.06$, $SD = 1.02$) than expository texts ($M = 3.54$, $SD = 0.93$), $p = .007$ (Figure 3d).

H3: Transportation will mediate the relationship between narrative texts and risk perception.

To elucidate the mechanism by which narratives affect risk severity, a mediation analysis was performed to assess the mediating role of transportation in the relationship between text genres and risk severity (Table 5). Transportation was found to be a significant mediator between text genre and risk severity for narrative versus expository conditions (indirect effect, $B = -.38$, $SE = .10$, 95% CI = [−.59, −.20]). The total effect of text genres on risk severity was significant ($B = -.52$, $SE = .19$, CI[−.89, −.15]). However, text genre was a non-significant predictor of risk severity when controlling for transportation, $B = -.14$, $SE = .18$, 95% CI[−.49, .21]. The result reveals that transportation fully mediates the relationship between text genre and risk severity.

H4: Mixed-genre texts will lead to higher comprehension scores compared to narrative or expository texts.

Again linear mixed-effects models (LMMs) were performed on post-knowledge, by using participant as a random effect and text type as a fixed effect (Table 3 and Table 4). Results show that although scores of both True/False questions and explanation questions in mixed-genre conditions were higher than those of the narrative and expository conditions, results did not reach statistical significance. It was found that the average confidence rating for mixed-genre texts ($M = 5.17$, $SD = 1.04$) was significantly higher than that of the expository texts ($M = 4.73$, $SD = 1.33$), $p = .021$ (Figure 3e).

Discussion

It is vital to understand how unknown health risks are communicated through different genres of health messages. The first step of informational campaigns addressing longer-term goals of action is to raise awareness and knowledge of health risks, especially those that are largely unknown, since behaviors are determined by knowledge and attitude (Bettinghaus, 1986). Therefore, this study aims to investigate whether and how different text genres affect emotional responses, risk perceptions, and text comprehension, in the context of unknown health risks.

Our findings confirm the hypothesis that narrative texts elicited higher self-reported emotional arousal than expository texts, even with the use of less emotional-loaded and

Table 1. Means, standard deviations (SD), minimums and maximums for **multiple item measures** across text genres

	Narrative				Expository				Mixed-genre			
	M	*SD*	*Min*	*Max*	*M*	*SD*	*Min*	*Max*	*M*	*SD*	*Min*	*Max*
Transportation	4.98	.96	2.50	6.83	4.12	1.02	1.83	6.50	4.81	.99	1.83	6.83
EDA peaks	3.41	4.64	0	19	3.02	3.65	0	13	3.96	4.82	0	20
True/False	3.17	.69	1	4	3.20	.94	1	4	3.41	.69	2	4
Open-ended explanation	3.61	1.75	0	8	3.48	1.72	0	8	4.07	1.79	0	8
Confidence rating	5.01	1.01	2.25	6.75	4.73	1.33	1.25	7.00	5.17	1.04	2.50	6.75

Table 2. Medians, minimums and maximums for **single item measures** across text genres

	Narrative			Expository			Mixed-genre		
	MD	*Min*	*Max*	*MD*	*Min*	*Max*	*MD*	*Min*	*Max*
Valence	5	1	9	5	2	9	5	2	9
Arousal	4	1	7	3	1	7	3	1	7
Risk susceptibility	4	2	5	4	1	5	4	1	5
Risk severity	4	2	5	4	2	5	4	1	5

Table 3. Parameter estimates of the random and fixed effects for self-reported emotions, EDA, transportation, risk perception and knowledge post-test

Self-Reported Emotions And EDA

	Valence				Arousal				EDA			
Random effects	Variance	*SD*			Variance	*SD*			Variance	*SD*		
Participant	2.69	1.64			3.09	1.76			2.96	1.72		
Fixed effects	*β*	*SE*	*z*	*pr(>|z|)*	*β*	*SE*	*z*	*pr(>|z|)*	*β*	*SE*	*z*	*pr(>|z|)*
Intercept	–	–	–	–	–	–	–	–	.13	.28	.46	.645
TextGenreMixed	.13	.35	.38	.706	.76	.37	2.07	**.038**	.27	.10	2.62	**.009**
TextGenreNarrative	−.45	.35	−1.28	.201	1.01	.37	2.76	**.006**	.12	.11	1.13	.260
Model fit	Marginal R^2		Conditional R^2		Marginal R^2		Conditional R^2		Marginal R^2		Conditional R^2	
	.010		.456		.028		.499		.004		.839	

Transportation And Risk Perception

	Transportation				Risk susceptibility				Risk severity			
Random effects	Variance	*SD*			Variance	*SD*			Variance	*SD*		
Participant	.11	.33			.23	.47			.00	.00		
Residual	.87	.93			–	–			–	–		
Fixed effects	*β*	*SE*	*t*	*pr(>|t|)*	*β*	*SE*	*z*	*pr(>|z|)*	*β*	*SE*	*z*	*pr(>|z|)*
Intercept	4.12	.13	30.53	**<.001**	–	–	–	–	–	–	–	–
TextGenreMixed	.69	.18	3.86	**<.001**	.08	.35	.24	.808	.51	.35	1.47	.143
TextGenreNarrative	.87	.18	4.82	**<.001**	.28	.35	.82	.415	1.12	.37	3.05	**.002**
Model fit	Marginal R^2		Conditional R^2		Marginal R^2		Conditional R^2		Marginal R^2		Conditional R^2	
	.126		.222		.004		.068		.060		.060	

Knowledge Post-Test

	True/False				Open-ended explanation				Confidence rating			
Random effects	Variance	*SD*			Variance	*SD*			Variance	*SD*		
Participant	.19	.44			.83	.91			.12	.34		
Residual	2.03	1.42			2.25	1.50			.20	.45		
Fixed effects	*β*	*SE*	*t*	*pr(>|t|)*	*β*	*SE*	*t*	*pr(>|t|)*	*β*	*SE*	*t*	*pr(>|t|)*
Intercept	1.31	.20	6.45	**<.001**	3.48	.24	14.57	**<.001**	−.03	.08	−.40	.688
TextGenreMixed	.29	.27	1.07	.289	.59	.29	2.05	**.042**	.24	.09	2.74	**.007**
TextGenreNarrative	−.27	.27	−.97	.333	.13	.29	.45	.654	.17	.09	1.95	.054
Model fit	Marginal R2		Conditional R2		Marginal R2		Conditional R2		Marginal R2		Conditional R2	
	.023		.108		.021		.286		.030		.393	

The baseline category is the TextGenreExpository.

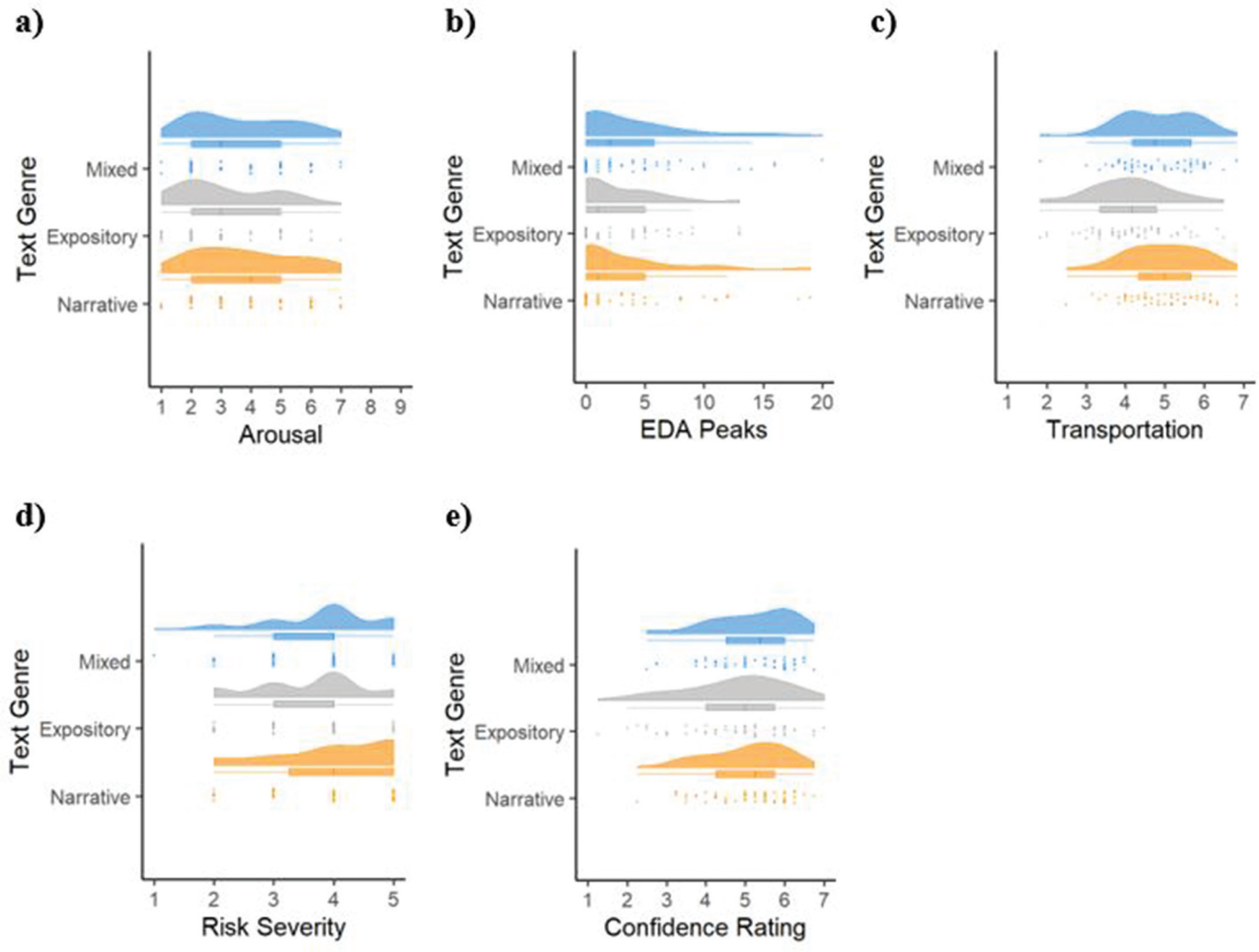

Figure 3. Violin graphs showing significant differences in self-reported arousal (a), EDA peaks (b), transportation (c), risk severity (d), and confidence rating (e) across text genres.

unknown health topics. In line with previous communication literature, narratives are inherently more engaging than expository texts (Dahlstrom, 2014). Additionally, our findings show that individuals perceived health risks explained in narratives as more severe than those explained in expository texts. Transportation plays a role in mediating the relationship between text genres and risk severity. In narratives, concrete examples of how characters faced risks increase the ease with which readers form vivid mental images. Consequently, narrative texts promote personal

Table 4. Parameter estimates of the multiple comparisons of means for text genres within SAM arousal, EDA, Transportation, risk severity and confidence rating (post-hoc bonferroni correction)

	Arousal				EDA				Transportation				Risk Severity				Confidence Rating			
	B	*SE*	*Z*	*pr(>|z|)*	*B*	*SE*	*z*	*pr(>|z|)*	*B*	*SE*	*z*	*pr(>|z|)*	*B*	*SE*	*z*	*pr(>|z|)*	*B*	*SE*	*z*	*pr(>|z|)*
Expository – Mixed-genre	−.76	.37	−2.07	.114	−.27	.10	−2.62	**.027**	−.70	.18	−3.86	**<.001**	−.51	.35	−1.47	.308	−.24	.09	−2.74	**.021**
Expository – Narrative	−1.01	.37	−2.76	**.017**	−.12	.11	−1.13	.780	−.87	.18	−4.82	**<.001**	−1.12	.37	−3.05	**.007**	−.17	.09	−1.95	.163
Mixed-genre – Narrative	−.25	.36	−.71	1.000	.15	.10	1.50	.399	−.17	.18	−.96	1.000	−.61	.36	−1.68	.212	.07	.09	.80	1.000

Table 5. Mediation analysis

	Total effect (text genre → risk severity)			Direct effect (text genre → risk severity)			Indirect effect of text genre on risk severity			
									Percentile bootstrap 95% confidence intetrval	
	coefficient	t-value	p-value	coefficient	t-value	p-value	coefficient	SE	Lower	Upper
Narrative vs Expository	−.52	−2.78	.01	−.14	−.77	.44	−.38	.10	−.59	−.20
Narrative vs Mixed-genre	−.26	−1.39	.17	−.18	−1.10	.28	−.08	.09	−.26	.08
Expository vs Mixed-genre	.26	1.39	.17	−.05	−.27	.79	.31	.09	.14	.50

IV: text genre; M: transportation; DV: risk severity

relevance and raise subjective judgments about the perceived negative outcomes (De Wit, Das, & Vet, 2008).

Arousal can be gauged objectively and subjectively and both ways may reflect different aspects of arousal (Venkatraman et al., 2015). The EDA of individuals reading mixed-genre texts was significantly higher than that of individuals reading expository texts, indicating that mixed-genre texts may be more emotionally engaging from a psychophysiological perspective. The average EDA peaks in narrative conditions were higher than those in expository conditions, but the difference did not reach significance. However, participants self-reported greater emotional arousal after reading narratives relative to reading expository texts. In spite of the fact that participants rated emotional arousal higher after reading narratives, stronger physiological responses were observed while reading mixed-genre texts as compared to expository conditions. This may seem puzzling, but it is important to emphasize that these are no interchangeable measures. Specifically, the self-response emotion rating is implemented after participants have finished reading a text, to measure *experienced* arousal, however, it is a retrospectively reported summary measure, possibly confounded by a memory and/or response bias. EDA, on the other hand, is a continuous measure that directly gauges physiological arousal, but it is affected by cognitive effort as well (Critchley, 2002). Hence, it is possible that a heightened EDA response for mixed-genre texts may reflect the fact that those texts require a more complex process of integrating an emotional narrative with the cognitively demanding expository information.

In terms of text comprehension, the third hypothesis is partially confirmed. Readers who read mixed-genre texts tended to score somewhat higher on both True/False and open-ended explanation questions than readers of narrative and expository texts, but this difference did not reach a significance. However, the confidence ratings on knowledge questions were significantly higher when participants read mixed-genre texts compared to expository texts. One could argue that individuals exposed to multi-genre formats cognitively and emotionally invested more effort into understanding text content than individuals exposed to expository messages. The effort they exerted in extracting information from multiple genres may have resulted in more confidence in their answers to knowledge posttest. Even though our knowledge questions were likely not sensitive enough to pick up the differences in terms of knowledge with explanation questions, the increased confidence might be indicative of superior knowledge. Subjective confidence rating has shown to be a valuable index of memory, and in some cases, is even more reliable than recall measures (Furman, Dorfman, Hasson, Davachi, & Dudai, 2007).

Limitations and Directions for Future Research

The findings of the current study indicate the potential and unique power of mixed-genre texts. We opted to insert the informational part between the two paragraphs of a narrative arc. However, narratives can be incorporated into expository in a variety of ways, such combining both an introduction section (either in narrative or expository format) with a subsequent informational section (Mensink, Kendeou, & Rapp, 2021). Future research can probe further into how the integration of narratives in expository texts can optimize the processing of the information and enrich learning outcomes.

In the current study, a meaningful difference in EDA peaks was found in participants exposed to different text conditions. However, some participants showed negligible EDA responses consistently. Some are more prone to experience engagement than others. Future research could investigate the relationship between skin conductance responses and personality traits, such as individual differences in trait transportability (Mazzocco, Green, Sasota, & Jones, 2010). Additionally, the medium (texts) we used, although ecologically relevant, might be another limitation, when seeking to investigate arousal and engagement. The emotion and engagement through texts are likely much more subtle, for example, because this medium makes it harder to suspend the participants' impression of participating in an experiment. Print narratives produced lower levels of cognitive and emotional involvement than narrative videos (Walter, Murphy, Frank, & Baezconde-Garbanati, 2017). Also, integrating target information naturally into a story is as much a matter of art (craft of writing compelling stories) as it is a matter of science (conveying best-informed medical knowledge). More interdisciplinary collaboration (art-science) may be beneficial for this field. The advancement of large language models (LLM), such as GPT, may also be useful for text generation in the future. Overall, the possibilities and

limitations of applying EDA to the reading process of text materials should be explored further. Aside from that, it may be interesting to look at a more fine-grained temporal analysis of the EDA signal or to analyze more subtle fluctuations in the EDA signal that are related to text reading and to dynamics in emotions across a narrative arc.

Moreover, transportation has been found to potentially induce belief change through several mechanisms, including reducing counterarguing, establishing connections with characters, and enhancing perceptions of realism (Green & Brock, 2000). However, an in-depth assessment of these immediate outcomes of transportation was precluded in this study due to the long duration of the entire laboratory experiment. Future studies should comprise a more comprehensive assessment of the immediate effects of transportation, thereby elucidating the mechanisms through which narrative (vs expository) texts can sway people's beliefs within the context of communicating unknown health risks. Last but not least, it's worthwhile capturing the long-term outcomes, such as delayed-recall responses, longer-lasting changes in risk perception, or even tracking their active behavior in dealing with health risks, as these are ultimately our outcomes of interest in health communication.

Conclusion

A burgeoning body of studies has compared the effectiveness of story-based (narrative) messages with fact-based (expository) messages. Mixed-genre texts, however, seem ecologically valid and could be a promising way to communicate health risks. This work investigated the impact of text genres on emotional responses, risk perception and text comprehension. We found narrative texts can elicit higher transportation, self-reported emotional arousal, and risk perception than expository texts. In contrast, participants rated higher levels of confidence on knowledge questions and had greater EDA responses when reading mixed-genre texts compared to expository texts. A narrative message embedded in the mixed-genre text appears to be more emotionally engaging for participants in terms of psychophysiological responses, which may indicate that the content is more attention-grabbing than the text with only expository information. During the processing of mixed-genre texts, participants likely put more effort into reading and have more confidence in the resulting knowledge. In general, the use of narratives in communication can be more effective at raising awareness of health risks through transportation, whereas mixed-genre text seems to be more effective in enhancing text comprehension.

The present study offers novel insights into how the use of multiple genres within a single text can affect the psychophysiological responses of participants to health issues, and increase readers' confidence in text-based learning. Our findings may inform both communication scholars and education researchers when designing health messages for persuading audiences and developing learning materials for educational purposes.

Acknowledgement

We express our gratitude to Camilla Catarci Carteny and Kevin Lamote, experts in biology and biomedical sciences, for verifying the information within the texts.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the University Research Fund (BOF) of the University of Antwerp under Grant 27182.

Supplementary Material

Supplemental data for this article can be accessed online at https://doi.org/10.1080/10810730.2023.2290549

ORCID

Yi-Lun Jheng http://orcid.org/0000-0002-5152-4192
Sander Van de Cruys http://orcid.org/0000-0003-4831-7800
Leen Catrysse http://orcid.org/0000-0003-1537-1632
Heidi Vandebosch http://orcid.org/0000-0001-6779-3170
David Gijbels http://orcid.org/0000-0001-8369-9213
Karolien Poels http://orcid.org/0000-0002-5276-0293

References

Appel, M., Gnambs, T., Richter, T., & Green, M. C. (2015). The transportation scale–short form (TS–SF). *Media Psychology*, *18*(2), 243–266. https://doi.org/10.1080/15213269.2014.987400

Barrett, L. F. (1998). Discrete emotions or dimensions? The role of valence focus and arousal focus. *Cognition & Emotion*, *12*(4), 579–599. https://doi.org/10.1080/026999398379574

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Bekalu, M. A., Bigman, C. A., McCloud, R. F., Lin, L. K., & Viswanath, K. (2018). The relative persuasiveness of narrative versus non-narrative health messages in public health emergency communication: Evidence from a field experiment. *Preventive Medicine*, *111*, 284–290. https://doi.org/10.1016/j.ypmed.2017.11.014

Benedek, M., & Kaernbach, C. (2010). A continuous measure of phasic electrodermal activity. *Journal of Neuroscience Methods*, *190*(1), 80–91. https://doi.org/10.1016/j.jneumeth.2010.04.028

Berman, R. A., & Katzenberger, I. (2004). Form and function in introducing narrative and expository texts: A developmental perspective. *Discourse Processes*, *38*(1), 57–94. https://doi.org/10.1207/s15326950dp3801_3

Bettinghaus, E. P. (1986). Health promotion and the knowledge-attitude-behavior continuum. *Preventive Medicine*, *15*(5), 475–491. https://doi.org/10.1016/0091-7435(86)90025-3

Bilandzic, H., Kinnebrock, S., & Klingler, M. (2020). The emotional effects of science narratives: A theoretical framework. *Media and Communication*, *8*(1), 151–163. https://doi.org/10.17645/mac.v8i1.2602

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry*, *25*(1), 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Bradley, M., & Lang, P. (2000). Affective reactions to acoustic stimuli. *Psychophysiology*, *37*(2), 204–215. https://doi.org/10.1111/1469-8986.3720204.

Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge: Harvard University Press. https://doi.org/10.4159/9780674029019

Chang, C. (2008). Increasing mental health literacy via narrative advertising. *Journal of Health Communication*, *13*(1), 37–55. https://doi.org/10.1080/10810730701807027

Christensen, R. H. B. (2022). Ordinal—Regression Models for Ordinal Data. https://CRAN.R-project.org/package=ordinal

Clinton, V., Taylor, T., Bajpayee, S., Davison, M. L., Carlson, S. E., & Seipel, B. (2020). Inferential comprehension differences between narrative and expository texts: A systematic review and meta-analysis. *Reading and Writing*, *33*(9), 2223–2248. https://doi.org/10.1007/s11145-020-10044-2

Critchley, H. D. (2002). Review: Electrodermal responses: What happens in the brain. *The Neuroscientist*, *8*(2), 132–142. https://doi.org/10.1177/107385840200800209

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, *111*, 13614–13620. https://doi.org/10.1073/pnas.1320645111

Dahlstrom, M. F., & Scheufele, D. A. (2018). (Escaping) the paradox of scientific storytelling. *PLoS Biology*, *16*(10), e2006720. https://doi.org/10.1371/journal.pbio.2006720

De Graaf, A., Sanders, J., & Hoeken, H. (2016). Characteristics of narrative interventions and health effects: A review of the content, form, and context of narratives in health-related narrative persuasion research. *Review of Communication Research*, *4*, 88–131. https://doi.org/10.12840/issn.2255-4165.2016.04.01.011

De Wit, J. B., Das, E., & Vet, R. (2008). What works best: Objective statistics or a personal testimonial? An assessment of the persuasive effects of different types of message evidence on risk perception. *Health Psychology*, *27*(1), 110. https://doi.org/10.1037/0278-6133.27.1.110

Dillard, A. J., Ferrer, R. A., & Welch, J. D. (2018). Associations between narrative transportation, risk perception and behaviour intentions following narrative messages about skin cancer. *Psychology & Health*, *33*(5), 573–593. https://doi.org/10.1080/08870446.2017.1380811

Furman, O., Dorfman, N., Hasson, U., Davachi, L., & Dudai, Y. (2007). They saw a movie: Long-term memory for an extended audiovisual narrative. *Learning & Memory*, *14*(6), 457–467. https://doi.org/10.1101/lm.550407

Graesser, A. C., McNamara, D. S., & Louwerse, M. M. (2003). What do readers need to learn in order to process coherence relations in narrative and expository text. *Rethinking Reading Comprehension*, *82*, 98.

Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review*, *101*(3), 371. https://doi.org/10.1037/0033-295X.101.3.371

Gray, J. B., & Harrington, N. G. (2011). Narrative and framing: A test of an integrated message strategy in the exercise context. *Journal of Health Communication*, *16*(3), 264–281. https://doi.org/10.1080/10810730.2010.529490

Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, *79*(5), 701. https://doi.org/10.1037/0022-3514.79.5.701

Green, M. C., Chatham, C., & Sestir, M. A. (2012). Emotion and transportation into fact and fiction. *Scientific Study of Literature*, *2*(1), 37–59. https://doi.org/10.1075/ssol.2.1.03gre

Greene, K., & Brinn, L. S. (2003). Messages influencing college women's tanning bed use: Statistical versus narrative evidence format and a self-assessment to increase perceived susceptibility. *Journal of Health Communication*, *8*(5), 443–461. https://doi.org/10.1080/713852118

Hall, S. (2015). *Parental Intentions to Immunize Children Against Influenza: A Randomized Trial of EPPM-based Immunization Messaging* Doctoral dissertation, Arizona State University.

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd edition). New York: The Guilford Press.

Hinyard, L. J., & Kreuter, M. W. (2007). Using narrative communication as a tool for health behavior change: A conceptual, theoretical, and empirical overview. *Health Education & Behavior*, *34*(5), 777–792. https://doi.org/10.1177/1090198106291963

Horvers, A., Tombeng, N., Bosse, T., Lazonder, A. W., & Molenaar, I. (2021). Detecting emotions through electrodermal activity in learning contexts: A systematic review. *Sensors*, *21*(23), 7869. https://doi.org/10.3390/s21237869

Hwang, J., Borah, P., Choi, J., & Ghosh, S. (2022). Understanding CDC's vaccine communication during the COVID-19 Pandemic and its effectiveness in promoting positive attitudes toward the COVID-19 vaccine. *Journal of Health Communication*, 1–10. https://doi.org/10.1080/10810730.2022.2149968 *27* 9

Knobloch, S., Patzig, G., Mende, A. M., & Hastall, M. (2004). Affective news: Effects of discourse structure in narratives on suspense, curiosity, and enjoyment while reading news and novels. *Communication Research*, *31*(3), 259–287. https://doi.org/10.1177/0093650203261517

Krakow, M. M., Yale, R. N., Jensen, J. D., Carcioppolo, N., & Ratcliff, C. L. (2018). Comparing mediational pathways for narrative-and argument-based messages: Believability, counterarguing, and emotional reaction. *Human Communication Research*, *44*(3), 299–321. https://doi.org/10.1093/hcr/hqy002

Kreuter, M. W., Green, M. C., Cappella, J. N., Slater, M. D., Wise, M. E., Storey, D., Clark, E. M., O'Keefe, D. J., Erwin, D. O., Holmes, K., Hinyard, L. J., Houston, T., & Woolley, S. (2007). Narrative communication in cancer prevention and control: A framework to guide research and application. *Annals of Behavioral Medicine*, *33*(3), 221–235. https://doi.org/10.1007/BF02879904

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 159–174. https://doi.org/10.2307/2529310.

Lenth, R. V. (2022). emmeans: Estimated Marginal Means, Aka Least-Squares Means. https://CRAN.R-project.org/package=emmeans

Liebfreund, M. D. (2021). Cognitive and motivational predictors of narrative and informational text comprehension. *Reading Psychology*, *42*(2), 177–196. https://doi.org/10.1080/02702711.2021.1888346

Limon, M. S., & Kazoleas, D. C. (2004). A comparison of exemplar and statistical evidence in reducing counter-arguments and responses to a message. *Communication Research Reports*, *21*(3), 291–298. https://doi.org/10.1080/08824090409359991

Liu, S., & Yang, J. Z. (2020). The role of temporal distance perception in narrative vs. non-narrative persuasion related to e-cigarettes. *Journal of Health Communication*, *25*(7), 543–553. https://doi.org/10.1080/10810730.2020.1788678

Mar, R. A., Li, J., Nguyen, A. T., & Ta, C. P. (2021). Memory and comprehension of narrative versus expository texts: A meta-analysis. *Psychonomic Bulletin & Review*, *28*(3), 732–749. https://doi.org/10.3758/s13423-020-01853-1

Mar, R. A., Oatley, K., Djikic, M., & Mullin, J. (2011). Emotion and narrative fiction: Interactive influences before, during, and after reading. *Cognition & Emotion*, *25*(5), 818–833. https://doi.org/10.1080/02699931.2010.515151

Mason, L., Zaccoletti, S., Scrimin, S., Tornatora, M. C., Florit, E., & Goetz, T. (2020). Reading with the eyes and under the skin: Comprehending conflicting digital texts. *Journal of Computer Assisted Learning*, *36*(1), 89–101. 10.1111/jcal.12399

Mazzocco, P. J., Green, M. C., Sasota, J. A., & Jones, N. W. (2010). This story is not for everyone: Transportability and narrative persuasion. *Social Psychological and Personality Science*, *1*(4), 361–368. https://doi.org/10.1177/1948550610376600

McKinley, C. J., Limbu, Y., & Jayachandran, C. N. (2017). The influence of statistical versus exemplar appeals on Indian adults' health intentions: An investigation of direct effects and intervening persuasion processes. *Health Communication*, *32*(4), 427–437. https://doi.org/10.1080/10410236.2016.1138811

McNamara, D. S., & Magliano, J. (2009). Toward a comprehensive model of comprehension. *Psychology of Learning and Motivation*, *51*, 297–384. https://doi.org/10.1016/S0079-7421(09)51009-2

Medina, A. L., & Pilonieta, P. (2006). Once upon a time: Comprehending narrative text. In J. S. Schumm (Ed.), *Reading assessment and instruction for all learners* (pp. 222–261). Guilford Press.

Meer, Y., Breznitz, Z., & Katzir, T. (2016). Calibration of self-reports of anxiety and physiological measures of anxiety while reading in adults with and without reading disability. *Dyslexia*, *22*(3), 267–284. 10.1002/dys.1532

Mensink, M. C., Kendeou, P., & Rapp, D. N. (2021). Do different kinds of introductions influence comprehension and memory for scientific explanations? *Discourse Processes*, *58*(5–6), 491–512. https://doi.org/10.1080/0163853X.2021.1904754

Murphy, S. T., Frank, L. B., Chatterjee, J. S., & Baezconde-Garbanati, L. (2013). Narrative versus nonnarrative: The role of identification, transportation, and emotion in reducing health disparities. *Journal of Communication*, *63*(1), 116–137. https://doi.org/10.1111/jcom.12007

Murphy, S. T., Frank, L. B., Moran, M. B., & Patnoe-Woodley, P. (2011). Involved, transported, or emotional? Exploring the determinants of change in knowledge, attitudes, and behavior in entertainment-education. *Journal of Communication*, *61*(3), 407–431. https://doi.org/10.1111/j.1460-2466.2011.01554.x

Nan, X., Dahlstrom, M. F., Richards, A., & Rangarajan, S. (2015). Influence of evidence type and narrative type on HPV risk perception and intention to obtain the HPV vaccine. *Health Communication*, *30*(3), 301–308. https://doi.org/10.1080/10410236.2014.888629

Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259–267. https://doi.org/10.1093/heapro/15.3.259

O'Keefe, D. J., & Nan, X. (2012). The relative persuasiveness of gain-and loss-framed messages for promoting vaccination: A meta-analytic review. *Health Communication*, *27*(8), 776–783. https://doi.org/10.1080/10410236.2011.640974

Okuhara, T., Ishikawa, H., Okada, M., Kato, M., & Kiuchi, T. (2018). Persuasiveness of statistics and patients' and mothers' narratives in human papillomavirus vaccine recommendation messages: A randomized controlled study in Japan. *Frontiers in Public Health*, *6*, 105. https://doi.org/10.3389/fpubh.2018.00105

Paek, H. J., & Hove, T. (2017). Risk perceptions and risk characteristics. In *Oxford Research Encyclopedia of Communication*. https://doi.org/10.1093/acrefore/9780190228613.013.283

Pappas, C. C. (2006). The information book genre: Its role in integrated science literacy research and practice. *Reading Research Quarterly*, *41* (2), 226–250. https://doi.org/10.1598/RRQ.41.2.4

Potter, R. F., & Bolls, P. (2012). *Psychophysiological measurement and meaning: Cognitive and emotional processing of media*. Routledge. https://doi.org/10.4324/9780203181027-11

Ramírez, A. S., Ramondt, S., Van Bogart, K., & Perez-Zuniga, R. (2019). Public awareness of air pollution and health threats: Challenges and opportunities for communication strategies to improve environmental health literacy. *Journal of Health Communication*, *24*(1), 75–83. https://doi.org/10.1080/10810730.2019.1574320

Ratcliff, C. L., & Sun, Y. (2020). Overcoming resistance through narratives: Findings from a meta-analytic review. *Human Communication Research*, *46*(4), 412–443. https://doi.org/10.1093/hcr/hqz017

R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-pro-ject.org/

Rickard, L. N., Yang, J. Z., Liu, S., & Boze, T. (2021). Fish tales: How narrative modality, emotion, and transportation influence support for sustainable aquaculture. *Science Communication*, *43*(2), 252–275. https://doi.org/10.1177/1075547020987555

Rimal, R. N., & Morrison, D. (2006). A uniqueness to personal threat (UPT) hypothesis: How similarity affects perceptions of susceptibility and severity in risk assessment. *Health Communication*, *20*(3), 209–219. https://doi.org/10.1207/s15327027hc2003_1

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178. https://doi.org/10.1037/h0077714

Sequeira, H., Hot, P., Silvert, L., & Delplanque, S. (2009). Electrical autonomic correlates of emotion. *International Journal of Psychophysiology*, *71*(1). https://doi.org/10.1016/j.ijpsycho.2008.07.009 50–56

Shelby, A., & Ernst, K. (2013). Story and science: How providers and parents can utilize storytelling to combat anti-vaccine misinformation. *Human Vaccines & Immunotherapeutics*, *9*(8), 1795–1801. https://doi.org/10.4161/hv.24828

Shen, F., Sheer, V. C., & Li, R. (2015). Impact of narratives on persuasion in health communication: A meta-analysis. *Journal of Advertising*, *44* (2), 105–113. https://doi.org/10.1080/00913367.2015.1018467

Stern, B. B. (1994). Classical and vignette television advertising dramas: Structural models, formal analysis, and consumer effects. *Journal of Consumer Research*, *20*(4), 601–615. https://doi.org/10.1086/209373

Thompson, D., Mackenzie, I. G., Leuthold, H., & Filik, R. (2016). Emotional responses to irony and emoticons in written language: Evidence from EDA and facial EMG. *Psychophysiology*, *53*(7), 1054–1062. https://doi.org/10.1111/psyp.12642

Trevors, G., & Kendeou, P. (2020). The effects of positive and negative emotional text content on knowledge revision. *Quarterly Journal of Experimental Psychology*, *73*(9), 1326–1339. https://doi.org/10.1177/1747021820913816

Venkatraman, V., Dimoka, A., Pavlou, P. A., Vo, K., Hampton, W., Bollinger, B., Hershfield, H. E., Ishihara, M., & Winer, R. S. (2015). Predicting advertising success beyond traditional measures: New insights from neurophysiological methods and market response modeling. *Journal of Marketing Research*, *52*(4), 436–452. https://doi.org/10.1509/jmr.13.0593

Walter, N., Murphy, S. T., Frank, L. B., & Baezconde-Garbanati, L. (2017). Each medium tells a different story: The effect of message channel on narrative persuasion. *Communication Research Reports*, *34*(2), 161–170. https://doi.org/10.1080/08824096.2017.1286471

Wannagat, W., Steinicke, V., Tibken, C., & Nieding, G. (2021). Same topic, different genre: Elementary school children's mental representations of information embedded in narrative and expository texts. *Learning and Instruction*, 101559. https://doi.org/10.1016/j.learninstruc.2021.101559 80

Wise, M., Han, J. Y., Shaw, B., McTavish, F., & Gustafson, D. H. (2008). Effects of using online narrative and didactic information on healthcare participation for breast cancer patients. *Patient Education and Counseling*, *70*(3), 348–356. https://doi.org/10.1016/j.pec.2007.11.009

Wolfe, M. B., & Mienko, J. A. (2007). Learning and memory of factual content from narrative and expository text. *British Journal of Educational Psychology*, *77*(3), 541–564. https://doi.org/10.1348/000709906X143902

Ye, W., Li, Q., & Yu, S. (2021). Persuasive effects of message framing and narrative format on promoting COVID-19 vaccination: A study on Chinese college students. *International Journal of Environmental Research and Public Health*, *18*(18), 9485. https://doi.org/10.3390/ijerph18189485

Yokoyama, O., Miura, N., Watanabe, J., Takemoto, A., Uchida, S., Sugiura, M., Horie, K., Sato, S., Kawashima, R., & Nakamura, K. (2010). Right frontopolar cortex activity correlates with reliability of retrospective rating of confidence in short-term recognition memory performance. *Neuroscience Research*, *68*(3), 199–206. https://doi.org/10.1016/j.neures.2010.07.2041

Zebregs, S., van den Putte, B., Neijens, P., & de Graaf, A. (2015). The differential impact of statistical and narrative evidence on beliefs, attitude, and intention: A meta-analysis. *Health Communication*, *30*(3), 282–289. https://doi.org/10.1080/10410236.2013.842528