

The Impact of Increasing and Decreasing the Professionalism of News Webpage Aesthetics on the Perception of Bias in News Articles

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This paper is dedicated to the memory of Professor Séamus “Shay” Lawless who died after fulfilling his dream of summiting Mount Everest on May 16th 2019.

Abstract This paper reports further results from a large study examining the impact of the visual aesthetics of news websites on the perception of bias in news articles. It focuses on the characteristic of professionalism, which is of particular importance to mainstream news websites. Nine news articles were amended to create a range of biased content. They were then paired with webpages from nine popular news websites which underwent common cumulative distortions to degrade the professionalism of their aesthetics. Pre-tests confirmed the effectiveness of these processes. A crowdsourced experiment and ANOVA analysis (N=405, $\alpha=0.05$, ES=0.24) demonstrated a negative correlation between the professionalism of the aesthetics and perceptions of bias. These effects were common across all nine news websites and news articles with different levels of bias.

Keywords: Bias · News Webpage Aesthetics · News Website Design

1 Introduction

Bias has been a factor in news since time immemorial. The production, dissemination, and consumption stages of the news cycle are rife with opportunities for its introduction and influence [85]. Bias in the dissemination of news on the Internet, is an increasingly important issue [74]. Despite this, there is a lack of research investigating its manifestation or effect. With the current focus on the veracity and quality of news, especially online, research is required to understand if the medium and method of its presentation may be exerting undue influence. One factor which has received little attention is the impact of the professionalism of the aesthetics of news webpages on the perception of bias in news articles. Professionalism is an important characteristic of successful mainstream news websites [54].

Understanding whether the visual presentation of news online impacts consumers perception of bias is important because of the unknown influence it may have on consumers and the long-term consequences for news agencies. Bias is

considered a core dimension and measure of credibility. Credibility has been defined as a multi-dimensional construct [35], and/or as a perceptual variable [27]. Dimensions such as trustworthiness, expertise, bias, believability, accuracy, fairness, and depth of coverage have all regularly been used in studies to measure credibility. Which dimensions and their number depends on multiple factors including what is being assessed (source, message or medium), and the domain it is being measured in. Thus, dimensions such as *qualified* and *safe* are often used when measuring the credibility of healthcare websites, while *bias* and *accuracy* are more often relied on when measuring the credibility of news websites.

Fogg et al. have shown that the importance of bias as a dimension increases when users are judging news online [29]. Fico et al. have shown that an increase in perceived bias in a news article has a corresponding decrease in credibility of the news organization behind it [26]. Chiagouris et al. have also shown that credibility factors have a significant relationship to positive attitudes towards a news website [13]. Thus, an increase in perceived bias, reduces perceived credibility, which can negatively impact a user's attitude towards a news website and the news organization behind it, resulting in them turning to other sources of news.

2 Motivation

Historically, research into bias in the news can be visualized as a grid. On the x-axis are the various mediums of dissemination; Print, Radio, Television, and the Internet. On the y-axis are the three main stages of the news cycle; Production, Dissemination, and Consumption. While there is large overlap, most studies on bias in the news, whether on selection, partisan, agenda setting, coverage, or framing bias etc., fit within this grid. The few examples of research into bias in the dissemination of news online [103,104] are outweighed by the preponderance of studies investigating bias in the dissemination of news in print, radio, and television shown below.

Production: Studies include research proving news agencies purposely bias their news to match the opinions of their target audiences [36,79], the impact of advertisers on news agencies [2,20,45,91,93], the influence of editors, editorials, and policy [21,31,52,57,70,115], and individual journalistic biases [23,25,44,87,89,97].

Dissemination: There is an extensive compendium of research on bias in the dissemination of news in print, radio, and television. A small sample of the research includes studies on bias in photographs in newspapers and news magazines [5,42,55,76,77], research into the overarching area of visual biases [38,43,56,96], bias in news anchors' facial expressions [32,73,80,117], news anchor intonation and tone [41,78], presenters' non-verbal communication [3,69,114], television soundbites and image-bites [24,40], newspaper layout [8,99], newspaper coverage [9,10,17,58,59,64,84,92], newspaper headlines and lead stories [105,52,58,60,63,70,98,106,108,110], and description or labelling bias [22,66,67,68].

Consumption: The impact of bias in the consumption stage of the news cycle has tended to focus on the impact on voting in elections [18,21,37,80], with several attempts proposed to mitigate its effects [81,85,86].

3 Related Work

This paper reports results from an experiment that investigates the impact of aesthetic *professionalism* on the perception of bias in news articles on mainstream news websites. It is the second experiment reported from a large multifaceted study which investigated how design and visual aesthetics influence the perception of news. A previously reported experiment demonstrated a negative correlation between *visual quality* and perceived bias in news articles [104]. The distortions in that emulated lower quality news outlets such as tabloids, entertainment news websites, and content farms. The experiment reported in this paper is distinct from that work. It has a different research question, objectives, and separate hypotheses. For the most part, it uses different data to answer the hypotheses, though there are some crossover observations used in both experiments, e.g. the D0 controls are the same. The news articles that were inserted into the webpages and the procedure they underwent to add bias are also the same. As a result of the aligned though separate nature of these experiments, much of the experiment setup is the same. To avoid replication, brief synopses of certain experiment setup procedures are provided, with further detail available in [104].

3.1 Professionalism Versus Visual Quality

The results reported in [104] show that increasing and decreasing the *visual quality* of news webpages impacts the perception of bias in news articles is of limited relevance to mainstream news websites. The elements which impact *visual quality* such as loud, prominent, gaudy and cheap advertising and excessive calls to action, are typically only found on low quality, tabloid, entertainment news, or content farm news websites. The majority of mainstream news websites such as those used in this study do not include such elements. Thus, this study instead focuses on the characteristic of *professionalism* as it is more important to mainstream news agencies than *visual quality* [6,112,100,101]. In her work on the visual identity of mainstream and alternative news websites, Kenix argues that “*When something embodies professional characteristics, the audience assumes that there is a higher level of competence and specialized knowledge present*” [54].

3.2 The Impact of Visual Design and Aesthetics on Credibility

In their review of empirical literature investigating the impact of website design on initial impressions of trust, Karimov, Brengman and Van Hove present a conceptual framework based on the literature defining the three main dimensions of website design (visual design, social cue design, and content design) and several sub dimensions [53]. They define visual design, which we call aesthetics, as “*graphical and structural factors that give consumers a first impression*”. Lavie and Tractinsky identified ‘*classical*’ and ‘*expressive*’ as the main dimensions of website aesthetics [61]. Several studies have also shown that website aesthetics impact perceptions of credibility [95,51,102,15,27].

3.3 Bias - A Core Dimension and Measure of Credibility

The closest related work on the impact of aesthetics on bias is in the overarching domain of credibility, of which bias is a core dimension and measure. Credibility may be defined in terms of believability [30], its dimensions [48,35], or as a perceptual variable [50,83]. Being perceived as credible is of paramount importance to news organizations. Cassidy maintains that *“journalism is built on credibility”* [11]. Fogg et al. have also shown that bias is especially relied upon in judgements of credibility of online news [29]. Abdulla et al. also found that *“online news credibility... ...was built upon trustworthiness, timeliness, and bias factors”* [1].

3.4 Professionalism and Mainstream News Websites

Professionalism is one of the most important characteristics of mainstream news media. Vuontela roots her definitions of mainstream news in its professionalism with *“print, broadcast (television and radio), or online news items that are meant for mass communication and are published by professional media companies and/or journalists.”* [111]. Leccese defines mainstream news websites as *“Web sites operated by mass media outlets that employ salaried staff and whose Web site is a supplement to its print editions, broadcasts, or syndicated news service”* [62]. As many news websites now exist without such traditional mediums of dissemination, this study adopts the definition of Deuze who maintains that mainstream news websites have two common characteristics, editorial content, and a minimal often moderated form of participatory communication. He further maintains: *“This type of news site cannot be said to differ - in its approach to journalistic storytelling, news values, relationships with audiences - fundamentally from journalism as it is practised in print or broadcasting media”* [19].

3.5 MTFS of Credibility Judgement and Underlying Theory

Unlike economics [109], or political communication [116], there are currently no general models or theories to explain how users form judgements of bias when consuming news on the Internet. Yet numerous texts exist demonstrating that the news we consume has an innate bias favouring the privileged while ignoring the needs of minorities [7,14,46]. News agencies have also been shown to bias their news in favour of the views of the segment of the market they are trying to attract [36,79]. Consequently, the overarching domain of credibility was explored. Ten cognitive Models, Theories, Frameworks, and Schematics (MTFS) which explain how users form judgements of credibility online were identified [28,30,33,47,65,71,72,94,107,113]. Each of these provide a different arc of perspective on the same problem. Many highlight the iterative nature of the process, where users continuously notice different elements and make or refine their credibility judgements. Most of the MTFS do not solely focus on the content or message, but also highlight the importance of its presentation. Many, such as Sundar’s MAIN model, maintain that visual cues in a webpage enable the user to make judgements heuristically [107]. Metzger and Flanagin go further and

categorize three types of cues (site, message, and author), by which judgements of credibility are formed. Combined with characteristics of the receiver, they influence credibility evaluations online [72]. Hilligoss and Rieh also highlight the importance of three types of cues; content, peripheral source, and peripheral information objects [47].

Almost all of the MTFS rely in part on underlying theory provided by the Elaboration Likelihood Model (ELM) or the Heuristic Systematic Model (HSM) [12,88], two of the Dual-Process Models of Persuasion [34]. They generally contend that if the user is unmotivated, uninspired, or uncommitted, or if the task is unimportant, mundane or repetitive, the user will adopt the less cognitively demanding peripheral route or heuristic strategy from the ELM or HSM when judging information. This research was undertaken under the supposition that like credibility, judgements of perceived bias in online news, are at least partially judged heuristically and there would be a negative correlation between professionalism and bias.

4 Hypotheses

H1: H_0 Perceived bias will not be decreased due to an increase in the professionalism of the news webpage’s aesthetics. This focuses on the impact of increasing the professionalism of news webpage’s aesthetics on perceived bias.

H2: H_0 Perceived bias will not be increased due to a decrease in the professionalism of news webpage’s aesthetics. This focuses on the impact of decreasing the professionalism of the webpage’s aesthetics on perceived bias. It should be noted that this is not simply the opposite of H1.

H3: H_0 The impact of the professionalism of the aesthetics will be inconsistent, regardless of the level of bias in the article. This focuses on whether any potential impact of the primary hypotheses is dependent on the level of bias in a news article itself, rather than the webpage.

5 Experiment Design

A single webpage was selected from nine news websites and paired with one of nine news articles for the duration of the experiment. The text of each news article was modified before the experiment began and then remained unchanged. Each news article was inserted into the webpage’s HTML replacing the existing article so that the website’s CSS rendered it like an original. Each webpage/article combination was then subject to a series of common, cumulative distortions. After each distortion was applied (D6-D0), a static image was captured for use in the experiment. Four levels of degrading distortion (D4 to D1 below) were chosen as a balance between enough granularity and the natural break points provided by the underlying technologies which could be removed in stages.

- **D6:** An undistorted version of each webpage/article combination with their original name, branding, and logo.

- **D5:** Name, branding and logos replaced with the generic moniker NewsCom matching the original colour palette.
- **D4 - D1:** Incrementally less aesthetically professional versions of D5.
- **D0:** The controls, plain text versions of each article to establish ground truth bias ratings.

6 Methodology

The experiment was set up as a 9x7 within subjects incomplete counterbalanced measures design. Incomplete counterbalancing was achieved by arranging the webpage/article combinations and distortions (D0-D6) in a reduced form Latin square. Participants were randomly assigned to one of 9 diagonal paths through the Latin square that intersected with the 9x7 distorted webpage/article combinations, thus ensuring that each participant experienced each news webpage/article and each distortion once. To reduce carryover effects and task fatigue, once assigned to a path, the distorted webpage/article combinations the participant would encounter were displayed in random order. Two attention questions, to determine continued diligence to the task were also added to each path.

6.1 Creating a Range of Biased News Articles

Existing news articles on un-emotive topics were modified to create a range of biased content to test H3. This is described in detail in [104]. A pre-test bias rating task which showed that a range of biased content was successfully created.

6.2 Selection of Websites and Webpages and their Pairing

The selection process for the websites¹ and individual webpages is described in detail in [104]. In summary, they were all English language news websites which fit Kenix’s description of mainstream [54]. The individual webpages were the most recent from each website related to the article that would be inserted. It should be noted, that as explained in [104], it is incidental that e.g. the Guardian was considered highly biased or that the New Statesman was considered mostly unbiased. The bias ratings are due to the articles that were inserted into the webpages. It should also be noted that only the D6 distortions had branding applied. We simply use the website names for simplicity and descriptive purposes to describe the webpage/article combination rather than e.g. W1, W2 etc.

6.3 Distorting the Professionalism of the Aesthetics

The aim of the distortion process was to progressively and commonly degrade the professionalism of the aesthetics of each webpage in stages to ascertain if

¹ theguardian.com, telegraph.co.uk, independent.co.uk, economist.com, spectator.co.uk, newstatesman.com, aljazeera.com, bbc.com, and reuters.com

Table 1. The main factors of professional design, the main underlying design or technical means of conveying it, and the action required to degrade it.

Aspect of (Un)Professionalism Conveyed to the User	Means of Affordance	Degrading Action
Overall design / colour scheme	Design, layout, images, colour schemes	Add issues with alignment and layout. Reduce the quality of the colour scheme
Technical quality of the website	HTML / CSS / JavaScript	Reduce or remove elements that convey technical ability
Design appropriateness, reserved, custom, unique or non-standard features or elements	Image quality, fonts, interactive features and widgets	Degrade quality of images, introduce basic or standard elements e.g. fonts or third party services
Money and/or technical ability in the organization behind the website	Technical ability	Introduce obvious technical issues
Credibility, focus on the news article	Size, prominence, quality of advertising	Increase amount and prominence of advertising
Excessive calls to action on the user	Sharing, signup, user interaction or other methods of connecting	Increase the amount or size of calls to action
Expertise's on the topic, history dealing with the subject	Information scent via links to supporting content	Remove or reduce supporting links

there was a corresponding increase in the perception of bias in the news articles they contain. An image of each distorted webpage/article combination was used in the experiment to negate browser support issues resulting from the distorted code and to prevent participants navigating away from the webpages.

In Kenix's work on the visual identity of news websites, she explores design principles and professionalism in detail [54]. She maintains that *"the overall design of a Web page itself can suggest an identity of sophistication, seriousness, and professionalism if it follows a structured, aligned construction."* [54]. This is conveyed through alignment, unity, balance, rhythm, and contrast among other factors. She argues that these elements can also be manipulated to convey a sense of *"unprofessionalism characterized by disorder, tension, a sense of chaos, and division"* [54]. With this knowledge, a review of the news websites used in this experiment and others was conducted by five experienced website designers, see Table 1. This focused on identifying the means by which professionalism is conveyed and the degrading action necessary to negatively impact it.

6.4 Creating and Applying the Distortions

Based on Kenix's work and the design review, a two-pronged approach was used to distort the webpage/article combinations. First, technical support for underlying technologies, which Sundar claims are the means of providing such affordances

[107], was removed by deleting the underlying code. This contributed to a reduced visual aesthetic. Second, every image used in each webpage was degraded by reducing file size, bit rate, and DPI. The screenshot of each webpage/article combination taken after each stage of the distortion process was also similarly degraded. The distortion process is detailed in Table 2 and an example of the D5-D2 distortions for Al Jazeera are shown in Figure 1. The decision to include seven levels of distortion was based on the following.

- **D6:** These were included to see if branding made a significant difference to participant bias ratings.
- **D5:** These formed the basis from which the cumulative process to reduce the professionalism of each webpage/article’s aesthetic begun.
- **D4-D1:** The decision to incrementally reduce the level of professionalism over four levels was primarily based on the underlying support provided by W3C standards. During research into content preparation it was found that removing the underlying technological support for the W3C standards shown in Table 2 across all nine websites produced roughly equal incremental reductions in professional appearance.
- **D0:** These were included to establish a ground truth bias rating.

Table 2. Distortion stages and descriptions.

Distortion	Distortion Descriptions
D6 Branded	Visible comments in comment facilities removed so that the opinions expressed in such would not impact the experiment
D5 Unbranded	Remove Logo, Name, and Branding
D4	Remove CSS 3 and CSS 4, Reduce the quality (DPI) of each image used in the website
D3	Remove all elements introduced in HTML 5.1 Further reduce the DPI of each image used in the website. Resize images to show stretching Remove all custom fonts Remove all JavaScript functionality
D2	Remove CSS 2 / 2.1 support Further reduce DPI of images and skew size
D1	Unlink all CSS files but keep HTML elements Further reduce DPI of images and skew size
D0 Control	Remove all CSS / HTML except for the plain text, <p> and <h1> tags in the article

The distortion process was designed to be replicable and focus on removing and/or slowly breaking underlying technologies and reducing the quality of images and graphics. This would replicate the sense of disorder, tensions, chaos and division described by Kenix which contribute to an unprofessional appearance [54]. While colour schemes were raised several times during the review, no distortion was applied to this aspect due to reductions in quality being subjective and difficult to replicate. Depending on their construction and underlying technologies, there was some variation in the commonality of the degrading effect of each level of distortion. However, this could not be helped and the overall trend of increasingly unprofessional aesthetics from D4 to D1 was common overall.

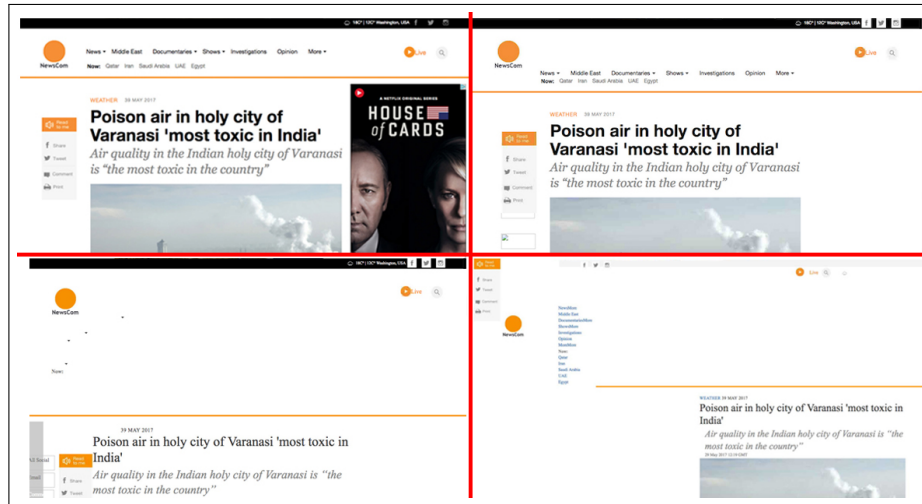


Figure 1. (Top row) D5, D4, (bottom row) D3, and D2 distorted webpage/article combinations for the Al Jazeera webpage and its paired article.

6.5 Measuring the Success of the Distortion Process

To ensure that the distorted webpage/article combinations for each website reflected a range from professional to unprofessional, a pre-test evaluation was undertaken. Twelve participants were presented with the D5–D1 distorted webpage/article combinations from each website in random order, and were tasked with ranking them from most to least professional. D0 was not included as it is a plain text version of the news article, while the D6s were not included as they are just branded versions of the D5s. Cronbach’s Alpha [16], showed a high level of consistency in the participants’ ordering, see Table 3. Gower’s Similarity Coefficient (GSC) [39], was used to calculate the similarity of the participants ordering of the five webpage/article combinations to the ‘correct’ or intended order. GSC is usually used for calculating distance for data with mixed variables. However, it has been shown to work for ordinal type data [4,49], and has even been extended for such [90]. GSC analysis showed a high level of similarity when then the Dissimilarity Threshold (DT) was set to 0.50, which allows for one or two differences in order and position. The GSC results show that overall, most pre-test participants arranged the five distorted webpage/article combinations for each website in roughly the correct order (D5 to D1).

6.6 Crowdsourcing, Statistical Power Analysis, and Validity

Participants were recruited through the Prolific Academic² marketplace and paid £1.25. Participants were over 18 with English as their first language. Participation was limited to the US to increase the homogeneity of the data and

² www.prolific.co

Table 3. Cronbach’s Alpha and Gower’s Similarity Coefficient scores.

Website Assigned	Cronbach’s Alpha	GSC DT: 0.95	GSC DT: 0.75	GSC DT: 0.50
Guardian	.948	3	5	12
Economist	.891	1	5	11
Al Jazeera	.961	4	8	12
Telegraph	.969	2	5	11
Spectator	.950	4	4	11
BBC	.893	1	3	12
Independent	.897	3	5	12
New Statesman	.848	2	9	12
Reuters	.979	4	4	9

because the experiment assumptions were based on a US population. To ensure balance in age, the experiment was run in three iterations to collect data from different age groups, over four days in late August 2017. In total, 508 participants completed the experiment. 47 submissions were rejected for failing one or both attention questions. 32 were rejected for having missing or erroneous completion codes and/or for completing the experiment within 1-2 minutes, indicating automated bots at work. 10 were rejected due to the participants rating >4 webpage/distortion combinations as having 0 bias. 10 were rejected due to having missing data. The last 4 submissions were rejected to balance the dataset. Therefore, the final dataset consisted of 405 submissions, yielding 45 participant bias ratings for each distorted webpage/article combination. A post hoc statistical power analysis for ANOVA: fixed effects, special, main effects and interactions using G*Power revealed a $>.95$ Actual Power to detect a strong effect size of 0.24 with the 405 submissions. Four actions were taken to increase validity. These included instruction tasks, attention questions, comparative re-evaluation, and the selection of un-emotive content. These are described in more detail in [104].

6.7 Instructions, Definition of Bias, and VAS Rating Scale

During recruitment participants were informed that *“In this study, you will be asked to rate, from 0 to 100, how biased different online news articles are. 0 being unbiased and 100 being extremely biased.”*. Bias was defined as *“Deliberate or accidental slant by the journalist, editor or publication to distort reality”*. These were reiterated during the instruction tasks. A Visual Analogue Scale (VAS) from 0 - 100 was used to measure bias. This was placed below each distorted webpage/article combination. Above each VAS was the instruction *“Please rate how Biased this News Article is. 0 being unbiased and 100 being extremely Biased”*. The left and right of the VAS was anchored with 0 and 100 with the headings *“Unbiased”* and *“Biased”* respectively. Further detail on this is provided in [104].

7 Participant Profile

$N = 405$: Male 51.4%, Female 47.2%, Other 1.4%. Mean age 36.48. Participants were spread across 44 US states and Washington D.C. Education and Occupation

revealed a highly educated, mostly professional sample with 57% having completed a four-year degree or higher. Internet usage was extremely high with the largest group, 31.11%, using the Internet for >8 hours per day. Participants regularly accessed news via. Radio: 25.43%, Television: 51.11%, Print: 25.68%, Internet: 95.56%, Social Media: 61.73%, Other: 0.74, and None: 0.74%.

8 Statistical Analysis

A 9x7, two-way repeated measures ANOVA was undertaken using the Bonferroni correction for multiple comparisons. An analysis of the studentized residuals for data points \pm SD revealed no outliers. A Shapiro-Wilk test ($p > .05$) for normality on the studentized residuals revealed 40% was not normally distributed. However, the Shapiro-Wilk test is considered especially sensitive to deviations from normality on data sets >50 . As this dataset has 405, a visual inspection of QQ plots was undertaken which showed that, of the 40%, half was not normally distributed. Due to the central limit theorem, when $N \geq 30$, one-way ANOVAs can still provide valid results even when the distribution of the data is very non-normal. ANOVA are also considered fairly robust to deviations from normality. Mauchly's Test of Sphericity (MTS) ($p > .05$) indicated that the assumption of sphericity had been violated for the two-way interaction. Consequently, the Greenhouse-Geisser correction is reported rather than the Huynh-Feldt as epsilon (ϵ) was <0.75 . The two-way ANOVA revealed no statistically significant two-way interaction between webpage/article combinations and distortions, $F(23.22, 1021.79) = .861, p = .655$. This was expected as the experiment was designed to measure the impact of distortions on each webpage/article combination.

8.1 Main Effects

The **main effects of webpage/article combinations** test showed a statistically significant difference $F(6.60, 290.28) = 80.38, p < .0005$. This was a likely due to slight variances in the level of effect of each distortion at each stage on each website. As the focus was on investigating the impact of distortions, further exploration via **simple main effects of webpage/article combinations** were not undertaken. The **main effects of distortions** test showed that there was a statistically significant difference $F(5.46, 240.42) = 12.24, p < .0005$. Thus, **simple main effects of distortions** are further explored in the next section.

8.2 Simple Main Effects of Distortions

While simple main effects of distortions would not usually be explored without a significant two-way ANOVA, the focus is comparing the distorted webpage/article combinations and the D0 controls to each other. In SPSS, simple main effects are undertaken by performing multiple one-way repeated measures ANOVAs. Alternatively, one could perform multiple paired samples t-tests, however the increased validity of the one-way ANOVA due to the option of the Bonferroni

correction is preferred. The data assumptions required for two-way ANOVAs are also valid for one-way ANOVAs.

The **simple main effects of distortions** test revealed four significant results. Telegraph (D1 - D6), Independent (D1 - D6 and D0 - D1), and the Spectator (D0 - D1). Detailed results for these are presented below. As there were no significant results for the Guardian, Economist, New Statesman, Al Jazeera, BBC, or Reuters, their simple main effects of distortions are not shown below in detail. However, the Mean bias rating, Standard Deviation and Standard Error for each are shown in Table 4. The Means are also graphed in Figure 2.

Telegraph: MTS ($p > .05$) was met for the one-way interaction, $X^2(2) = 9.632$, $p = .974$. Mean bias rating for distortions was significantly different for the Telegraph, $F(6, 264) = 4.294$, $p < .0005$, partial $\eta^2 = .089$. An analysis of the pairwise comparisons showed a decrease in perceived bias from D1, 59.44 ± 25.07 to D6, 41.00 ± 26.70 (95% CI 1.71 to 35.17), $p = .019$.

Independent: MTS ($p > .05$) was met for the one-way interaction, $X^2(2) = 26.595$, $p = .148$. Mean bias rating for distortions was significantly different for the Independent, $F(6, 264) = 3.328$, $p = .004$, partial $\eta^2 = .070$. An analysis of the pairwise comparisons showed a decrease in perceived bias from D1 44.62 ± 24.96 to D0 26.98 ± 24.16 (95% CI 2.66 to 32.62), $p = .009$. Pairwise analysis showed a second significant reduction in bias from D1 44.62 ± 24.96 to D6 27.84 ± 25.28 (95% CI 0.85 to 32.70), $p = .031$.

Spectator: MTS ($p > .05$) was met for the one-way interaction, $X^2(2) = 13.221$, $p = .868$. Mean bias rating for distortions was not significantly different for the Spectator, $F(6, 264) = 1.725$, $p = .115$, partial $\eta^2 = .038$. While no significant difference was revealed in the simple main effects, an analysis of the pairwise comparisons showed a significant decrease in perceived bias from D1 53.04 ± 28.88 to D0 36.02 ± 26.99 (95% CI 0.054 to 33.991), $p = .049$. This is likely due to the different sensitivities of the two tests.

9 Results

H1: H_0 Perceived bias will not be decreased due to an increase in the professionalism of the news webpage's aesthetics.

H1: H_A Perceived bias will be decreased due to an increase in the professionalism of the news webpage's aesthetics.

The impact of increasingly professional aesthetics to reduce the perception of bias in news articles is evident in Table 4 and Figure 2. While there were some slight individual inconsistencies, overall the perception of bias decreased in each webpage/article combination by an average of: D1 to D2 (3.61%); D2 to D3 (0.73%); D3 to D4 (4.01%), and D4 to D5 (3.02%). Combined, this 11.37% decrease in perceived bias was virtually identical to the average 11.75% increase from D0 to D1. This effect is common across all nine webpage/article combinations and across articles with different levels of bias. This demonstrates that as the professionalism of the aesthetics of a news webpage increases, the perception of bias in the news article it contains decreases.

Table 4. Results of one-way repeated measures ANOVAs - simple main effects for distortions with the Bonferroni correction for multiple comparisons.

	H2 Comparison		H1 Comparison				
	D0 Control	D1	D2	D3	D4	D5 Original Unbranded	D6 Original Branded
Guardian	M 70.51 SD 29.07 SE 4.33	M 76.91 SD 19.22 SE 2.87	M 74.04 SD 21.45 SE 3.20	M 74.47 SD 21.34 SE 3.18	M 63.13 SD 31.64 SE 4.72	M 63.29 SD 27.75 SE 4.14	M 64.96 SD 27.37 SE 4.08
Telegraph	M 54.27 SD 27.91 SE 4.16	M 59.44 SD 25.07 SE 3.74	M 59.53 SD 24.10 SE 3.59	M 58.98 SD 27.83 SE 4.15	M 43.18 SD 28.28 SE 4.22	M 44.60 SD 30.07 SE 4.48	M 41.00 SD 26.70 SE 3.98
		F 4.294 p .019					F 4.294 p .019
Independent	M 26.98 SD 24.16 SE 3.60	M 44.62 SD 24.96 SE 3.72	M 35.33 SD 24.11 SE 3.59	M 38.84 SD 25.96 SE 3.87	M 30.04 SD 23.38 SE 3.49	M 30.40 SD 27.54 SE 4.11	M 27.84 SD 25.28 SE 3.77
	F 3.328 p .009	F 3.328 p .009					
		F 3.328 p .031					F 3.328 p .031
Economist	M 30.27 SD 27.53 SE 4.10	M 46.04 SD 29.72 SE 4.43	M 43.09 SD 30.47 SE 4.54	M 41.84 SD 28.14 SE 4.20	M 42.27 SD 32.74 SE 4.88	M 41.00 SD 26.96 SE 4.02	M 36.18 SD 28.10 SE 4.19
Spectator	M 36.02 SD 27.00 SE 4.02	M 53.04 SD 28.89 SE 4.31	M 50.33 SD 26.75 SE 3.99	M 46.36 SD 30.03 SE 4.48	M 48.22 SD 28.71 SE 4.28	M 41.80 SD 31.12 SE 4.64	M 45.73 SD 29.02 SE 4.33
	F 1.725 p .049	F 1.725 p .049					
New Statesman	M 20.02 SD 25.49 SE 3.80	M 31.73 SD 29.03 SE 4.33	M 31.11 SD 29.07 SE 4.33	M 28.00 SD 29.59 SE 4.41	M 32.36 SD 25.38 SE 3.78	M 19.47 SD 17.92 SE 2.67	M 23.56 SD 24.71 SE 3.68
Al Jazeera	M 42.78 SD 30.59 SE 4.56	M 54.20 SD 29.99 SE 4.47	M 52.09 SD 24.59 SE 3.67	M 50.58 SD 31.01 SE 4.62	M 40.51 SD 29.64 SE 4.42	M 47.87 SD 28.57 SE 4.26	M 45.29 SD 27.65 SE 4.12
BBC	M 31.87 SD 28.67 SE 4.27	M 41.51 SD 27.61 SE 4.12	M 37.09 SD 27.58 SE 4.11	M 37.13 SD 27.77 SE 3.39	M 41.87 SD 24.67 SE 3.68	M 26.53 SD 26.31 SE 3.92	M 32.78 SD 30.76 SE 4.59
Reuters	M 22.36 SD 25.02 SE 3.73	M 33.33 SD 27.71 SE 4.13	M 25.69 SD 25.86 SE 3.86	M 25.58 SD 28.18 SE 4.20	M 24.07 SD 22.56 SE 3.36	M 23.49 SD 25.27 SE 3.77	M 22.53 SD 26.60 SE 3.97

While there were no significant results between the D1 and D5, there is between the D1 and D6 distortions. D6 is simply a branded version of D5 with similar mean bias scores. It is also worth noting that if the D1 distortions were made more unprofessional, there would likely have been several significant results further proving the impact of professional aesthetics on decreasing the perception of bias. Therefore, based on these results we can reject H_0 and accept H_A .

H2: H_0 Perceived bias will not be increased due to a decrease in the professionalism of news webpage’s aesthetics.

H2: H_A Perceived bias will be increased due to a decrease in the professionalism of news webpage’s aesthetics.

As can be seen in Table 4 and Figure 2, there is a marked difference in perceived bias ratings between the D0 ground truth controls and their respective least professional D1 versions. The average increase in perceived bias was 11.75%. This

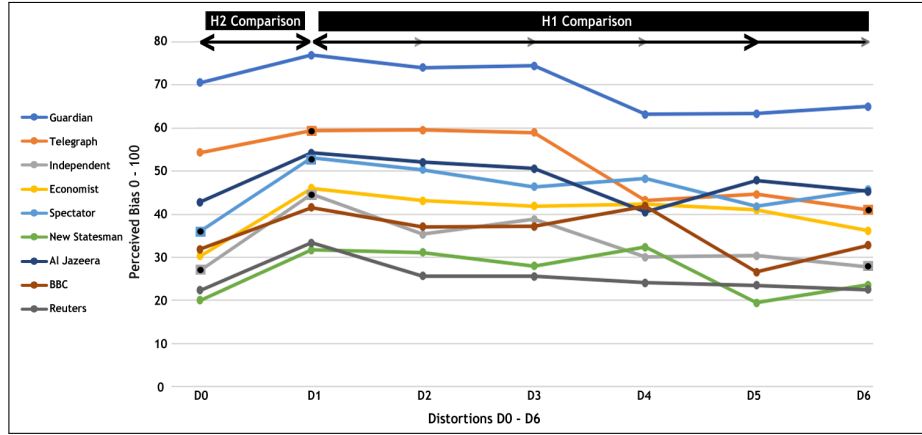


Figure 2. Graph of the mean bias scores from Table 4 for the nine webpage/article combinations.

increase is both large and common. It was also significant in the Independent and the Spectator, see Table 4. This demonstrates that unprofessional webpage aesthetics surrounding a news article increases perceived bias when compared to ground truth versions of the same article. This effect is common across all nine news websites and news articles with different levels of bias. This is despite the participants being directed multiple times, including via two Instruction Tasks, to rate perceived bias in the news article only. Consequently, we can reject H_0 and accept H_A .

H3: H_0 The impact of the professionalism of the aesthetics will be inconsistent, regardless of the level of bias in the article.

H3: H_A The impact of the professionalism of the aesthetics will be consistent, regardless of the level of bias in the article.

The impact of increasing and decreasing the professionalism of the webpage aesthetics surrounding the news articles with different amounts of bias can be broken down in four ways. 1) In the most biased articles, the impact of the least professional D1 distortion is muted compared to articles with lower levels of perceived bias, see Table 4 and Figure 2. This is visible when comparing the smaller increase from the D0 to the D1 distorted webpage/article combinations for the Guardian and the Telegraph, to the larger increases from the D0 to D1 for the other seven webpage/article combinations. This would suggest that it is harder to make an already highly biased article appear more biased by its aesthetics. 2) Conversely, it also appears that it is easier to make news articles with lower levels of bias appear more biased due to unprofessional aesthetics. This is evident in Figure 2 where the webpage/article combinations with the least amount of bias registered the greatest increase from D0 to D1. This means that high-quality news organizations who try to disseminate unbiased news have the most to lose from the unprofessional presentation of news articles. 3) Worryingly for consumers, the

results of the experiment demonstrate that aesthetically professional webpages have the greatest impact on reducing the perception of bias in the most biased news articles. This is visible in the large reduction in perceived bias for the Guardian and the Telegraph, and to a lesser extent Al Jazeera, from their D1s to their respective D5/D6s in comparison to the smaller reduction the other six webpage/article combinations received. 4) Notwithstanding the above, overall, the impact of increasing and decreasing the professionalism of the aesthetic of each webpage/article combination on the perception of bias in the news articles they contain, was largely consistent.

Based the results in Table 4 and Figure 2, the overall impact of the level of professionalism of the aesthetics of a news webpage is largely consistent across news articles with different levels of bias. Although the impact of unprofessional aesthetics is muted and the impact of professional aesthetics is exaggerated on the most biased webpage/article combinations, overall the effect of each level of distortion was fairly consistent. This is most evident in the graph presented in Figure 2. Consequently, it is possible to reject H_0 and accept H_A .

9.1 Implications for News Website Designers, Online Editors, and Journalists

With the current focus on the quality and veracity of news, especially online, news website designers, online editors, and journalists, need to be fully aware that any reduction in the professionalism of the aesthetics of news webpages, can increase the perception of bias in the news articles they contain. Although uncommon, some of the issues introduced in this experiment to reduce the professionalism of a news webpage's aesthetic can occasionally be seen in the webpages of high-quality news agencies. These issues can be introduced in six ways. 1) Poor design. 2) Sub-standard coding. This often manifests itself through lack of robustness to different types of content or screen widths. 3) Not checking newly posted content to confirm it does not break standard templates and conforms to style guidelines. 4) Poorly integrated third-party content or services. 5) Using miss sized or stretched images with low DPI. 6) Lack of maintenance.

Decreasing the professionalism of a webpage's visual aesthetic, and thus increasing the perception of bias in the news articles they contain, can have long term consequences. As Fico has previously demonstrated, as the perception of bias in a news article increases, the perception of the credibility of the news agency behind it decreases [26]. They are therefore likely to turn to one of the many alternative sources of news online.

9.2 Implications for Consumers

The core concern for news consumers is that biased news could be perceived as being less biased by presenting it in an aesthetically professional manner. Conversely, unbiased news articles could be considered more biased due to unprofessional aesthetics. News consumers need to be aware that the visual characteristics of a news website's design or webpage's aesthetic such as professionalism may

influence their perception of the news they consume. While this study demonstrated the impact of professional aesthetics on the perception of bias, other visual characteristics of a news website’s design or a webpage’s aesthetic such as seriousness, trustworthiness, boldness, gaudiness, traditional, conservative etc., could be similarly affecting their perception of news articles.

10 Discussion

This research was undertaken under the supposition that news webpage’s aesthetics impact the perception of bias within a news article. This was based on the knowledge that a website’s design and individual structural features have previously been shown to impact perceived credibility. Bias is a core dimension and measure of credibility, especially when judging news online [29].

The credibility of a news website or news article is judged by a host of features, including message features such as judgements of information quality and argument quality which in turn are judged on balance, objectivity etc. Yet, a large proportion of empirical studies have focused on the means of presentation of information on judgements of credibility, especially online. Most of the ten MTFS explaining judgements of credibility online also highlight the importance of the visual presentation and heuristic evaluation of such. Eight out of the ten MTFS rely on the underlying theory provided by the ELM or HSM [12,88]. They maintain that users can form judgements of credibility by the peripheral route or heuristic strategy, which rely on visual cues.

This study has demonstrated that like credibility, perceived bias in news articles on the Internet is partially judged heuristically. This finding has long term ramifications for the domain. Historically, many studies into bias in the news have not focused on the content of the message, but on its means of dissemination. This includes visual analysis of political imagery, area or duration of coverage, or the influence of news anchors. However, despite this very little work has been done on the dissemination of news online. This research addresses this imbalance.

Another critical contribution absent from the body of knowledge is the lack of cognitive models explaining how judgements of bias are formed when consuming news online, similar to the ten MTFS of credibility judgement highlighted earlier. Such contributions are important as they form the theoretical underpinnings which subsequent empirical works can be based on. This is a definite lacuna in the literature. A future aim is to present such a model. A second aim is to understand the process leading to judgments of bias in news articles.

Traditionally the consumption of news was a definitive act. Watching the 6 o’clock or reading the morning paper. Consumers were limited in the news they were exposed to. Whether it was by the papers their local shop stocked and they selected each day or each week, or by the news which the editors and journalists covered [115], or their access to radio or television stations. News consumption was limited to local events or national events of importance which trickled down to available mediums and formats. In comparison, today’s consumers are exposed to an almost unlimited range of local, national, and international news. While many

local newspapers failed, they have been replaced by additional radio stations and television channels, many of which now offer always on, 24-hour news, with headlines at 15-minute intervals. Smartphones have also enabled access to an almost unlimited range of news from around the world, and because of push notifications, the user is alerted within minutes of an important event or a news story, often relating to a topic which they have expressed interest in previously. Consequently, many news consumers do not have the time to properly read and digest this constant stream of information. News is scanned, or headlines and notifications are perused and dismissed with impunity. Many news consumers visit news websites for minutes or less multiple times throughout the day to "*snack*' or *'graze*' on the news" [75,82]. This rapid consumption provides the consumer with a visual snapshot of what is important and how much it is being discussed. Due to time constraints and the ease of rapidly traversing through multiple articles quickly online, news consumers now regularly scan the news and individual articles to get a sense of how a subject is being treated. Thus, they heavily rely on rapid heuristic evaluation and are more reliant on the visual presentation. Consequently, further investigation is required to ascertain whether other news website design or aesthetics characteristics may be influencing the perception of the message within the news article.

11 Conclusion

Bias is one of the most destructive forces on the credibility of successful mainstream news websites. Increased perception of bias in a news article decreases the credibility of the news organisation behind it, resulting in consumers turning to alternative sources. News agencies and news website designers strive to convey a sense of professionalism in the design and aesthetic of their websites. Historically judgements of professionalism of a news organization were entwined with their reputation and the quality of the news output. However, with changing news consumption practices, news website design and aesthetics have become increasingly important. This study has demonstrated a negative correlation between the professionalism of the aesthetics of news webpages and the perception of bias in news articles. This effect was common across nine news websites and across news articles with different levels of bias. This study provides further evidence that like credibility, perceived bias in a news article online is at least partially judged visually or heuristically.

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References

1. Abdulla, R.A., Garrison, B., Salwen, M., Driscoll, P., Casey, D.: The credibility of newspapers, television news, and online news. Artículo presentado en la Association for Education in Journalism and Mass Communication (2002), <http://www.com.miami.edu/car/miamibeach1.pdf>
2. An, S., Bergen, L.: Advertiser pressure on daily newspapers: A survey of advertising sales executives. *Journal of Advertising* **36**(2), 111–121 (6 2007). <https://doi.org/10.2753/JOA0091-3367360208>, <https://doi.org/10.2753/JOA0091-3367360208>, [Online; accessed 2018-03-17]
3. Babad, E.: Preferential treatment in television interviewing: Evidence from nonverbal behavior. *Political Communication* **16**(3), 337–358 (7 1999). <https://doi.org/10.1080/105846099198668>, <https://doi.org/10.1080/105846099198668>, [Online; accessed 2018-05-22]
4. Bacher, J., Wenzig, K., Vogler, M.: Spss twostep cluster - a first evaluation **2004-2** (2004)
5. Barrett, A.W., Barrington, L.W.: Bias in newspaper photograph selection. *Political Research Quarterly* **58**(4), 609–618 (2005), <http://prq.sagepub.com/content/58/4/609.short>, 00038
6. Beam, R.A.: Journalism professionalism as an organizational-level concept. *Association for Education in Journalism and Mass Communication* **121**, 43 (1990)
7. Bernays, E.L.: *Propaganda*. Ig Publishing (1928)
8. Bernstein, D.: Israel in the Media: A Guide to Producing Effective Media Critiques. *The American Jewish Committee* (6 2004), <http://www.kintera.org/atf/cf/%7B42D75369-D582-4380-8395-D25925B85EAF%7D/Israel%20in%20the%20Media.pdf>, [Online; accessed 2018-03-17]
9. Brandenburg, H.: Political bias in the Irish media: A quantitative study of campaign coverage during the 2002 general election. *Irish Political Studies* **20**(3), 297–322 (9 2005). <https://doi.org/10.1080/07907180500359350>, <https://doi.org/10.1080/07907180500359350>, [Online; accessed 2018-02-16]
10. Brandenburg, H.: Party strategy and media bias: A quantitative analysis of the 2005 UK election campaign. *Journal of Elections, Public Opinion and Parties* **16**(2), 157–178 (7 2006). <https://doi.org/10.1080/13689880600716027>, <https://doi.org/10.1080/13689880600716027>, [Online; accessed 2018-02-15]
11. Cassidy, W.P.: Online news credibility: An examination of the perceptions of newspaper journalists. *Journal of Computer-Mediated Communication* **12**(2), 478–498 (Jan 2007). <https://doi.org/10.1111/j.1083-6101.2007.00334.x>, <https://academic.oup.com/jcmc/article/12/2/478/4583013>
12. Chaiken, S.: Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology* **39**(5), 752–766 (1980), <https://www.unc.edu/~fbaum/teaching/articles/jpsp-1980-Chaiken.pdf>, 03839
13. Chiagouris, L., Long, M.M., Plank, R.E.: The consumption of online news: The relationship of attitudes toward the site and credibility. *Journal of Internet Commerce* **7**(4), 528–549 (2008)
14. Chomsky, N.: *Media Control: The Spectacular Achievements of Propaganda*. Open Media Series, Seven Stories Press (2002)
15. Chung, C.J., Nam, Y., Stefanone, M.A.: Exploring online news credibility: The relative influence of traditional and technological factors. *Journal of Computer-Mediated Communication* **17**(2), 171–186 (2012).

- <https://doi.org/10.1111/j.1083-6101.2011.01565.x>, <http://onlinelibrary.wiley.com/doi/10.1111/j.1083-6101.2011.01565.x/abstract>, [Online; accessed 2012-08-18]
16. Cronbach, L.J.: Coefficient alpha and the internal structure of tests. *Psychometrika* **16**(3), 297–334 (Sep 1951). <https://doi.org/10.1007/BF02310555>, <https://doi.org/10.1007/BF02310555>
 17. D’Alessio, D., Allen, M.: Media bias in presidential elections: a meta-analysis. *Journal of Communication* **50**(4), 133–156 (12 2000). <https://doi.org/10.1111/j.1460-2466.2000.tb02866.x>, <http://onlinelibrary.wiley.com/doi/10.1111/j.1460-2466.2000.tb02866.x/abstract>, [Online; accessed 2018-02-10]
 18. DellaVigna, S., Kaplan, E.: The fox news effect: Media bias and voting. *The Quarterly Journal of Economics* **122**(3), 1187–1234 (2007)
 19. Deuze, M.: Online journalism: Modelling the first generation of news media on the world wide web. *First Monday* **6**(10) (2001)
 20. Di Tella, R., Franceschelli, I.: Government advertising and media coverage of corruption scandals. *American Economic Journal: Applied Economics* **3**(4), 119–151 (2011), <http://www.jstor.org/stable/41288653>, [Online; accessed 2018-02-16]
 21. Druckman, J.N., Parkin, M.: The impact of media bias: How editorial slant affects voters. *The Journal of Politics* **67**(4), 1030–1049 (2005)
 22. Earl, J., Martin, A., McCarthy, J.D., Soule, S.A.: The use of newspaper data in the study of collective action. *Annual Review of Sociology* **30**, 65–80 (1 2004), <http://www.jstor.org/stable/29737685>, 00546
 23. Ekström, M., Eriksson, G., Johansson, B., Wikström, P.: Biased interrogations? *Journalism Studies* **14**(3), 423–439 (6 2013). <https://doi.org/10.1080/1461670X.2012.689488>, <https://doi.org/10.1080/1461670X.2012.689488>, [Online; accessed 2018-03-18]
 24. Esser, F.: Dimensions of political news cultures: Sound bite and image bite news in france, germany, great britain, and the united states. *The International Journal of Press/Politics* **13**(4), 401–428 (10 2008). <https://doi.org/10.1177/1940161208323691>, <https://doi.org/10.1177/1940161208323691>, [Online; accessed 2018-03-17]
 25. Fahmy, S., Johnson, T.J.: “how we performe”: Embedded journalists’ attitudes and perceptions towards covering the iraq war. *Journalism & Mass Communication Quarterly* **82**(2), 301–317 (6 2005). <https://doi.org/10.1177/107769900508200205>, <https://doi.org/10.1177/107769900508200205>, [Online; accessed 2018-12-17]
 26. Fico, F., Richardson, J.D., Edwards, S.M.: Influence of story structure on perceived story bias and news organization credibility. *Mass Communication and Society* **7**(3), 301–318 (7 2004). https://doi.org/10.1207/s15327825mcs0703_3, https://doi.org/10.1207/s15327825mcs0703_3
 27. Flanagin, A.J., Metzger, M.J.: The role of site features, user attributes, and information verification behaviors on the perceived credibility of web-based information. *New Media & Society* **9**(2), 319–342 (4 2007). <https://doi.org/10.1177/1461444807075015>, <http://nms.sagepub.com/content/9/2/319>, 00355
 28. Fogg, B.J.: Prominence-interpretation theory: Explaining how people assess credibility online. pp. 722–723. CHI EA ’03, ACM, New York, NY, USA (2003). <https://doi.org/10.1145/765891.765951>, <http://doi.acm.org/10.1145/765891.765951>, 00233
 29. Fogg, B.J., Soohoo, C., Danielson, D.R., Marable, L., Stanford, J., Tauber, E.R.: How do users evaluate the credibility of web sites?: A study with over 2,500 participants. pp. 1–15 (2003), <http://dl.acm.org/citation.cfm?id=997097>, 00420

30. Fogg, B.J., Tseng, H.: The elements of computer credibility. pp. 80–87. CHI '99, ACM, New York, NY, USA (1999). <https://doi.org/10.1145/302979.303001>, <http://doi.acm.org/10.1145/302979.303001>, 00613
31. Forward, R.: Editorial opinion and the whitlam government. *Politics* **12**(1), 136–141 (5 1977). <https://doi.org/10.1080/00323267708401596>, <https://doi.org/10.1080/00323267708401596>, [Online; accessed 2018-02-16]
32. Friedman, H.S., Mertz, T.I., DiMatteo, M.R.: Perceived bias in the facial expressions of television news broadcasters. *Journal of Communication* **30**(4), 103–111 (12 1980). <https://doi.org/10.1111/j.1460-2466.1980.tb02022.x>, <http://onlinelibrary.wiley.com/doi/10.1111/j.1460-2466.1980.tb02022.x/abstract>, 00033
33. Fritch, J.W., Cromwell, R.L.: Evaluating internet resources: Identity, affiliation, and cognitive authority in a networked world. *Journal of the American Society for Information Science and Technology* **52**(6), 499–507 (2001). <https://doi.org/10.1002/asi.1081>, <http://onlinelibrary.wiley.com/doi/10.1002/asi.1081/abstract>, 00158
34. Gawronski, B., Creighton, L.A.: Dual-process theories, pp. 282–312 (2013)
35. Gaziano, C., McGrath, K.: Measuring the concept of credibility. *Journalism Quarterly* **63**(3), 451–462 (1986)
36. Gentzkow, M., Shapiro, J.M.: What drives media slant? evidence from u.s. daily newspapers. *Econometrica* **78**(1), 35–71 (1 2010). <https://doi.org/10.3982/ECTA7195>, <http://onlinelibrary.wiley.com/doi/10.3982/ECTA7195/abstract>, 00707
37. Gerber, A.S., Karlan, D., Bergan, D.: Does the media matter? a field experiment measuring the effect of newspapers on voting behavior and political opinions. *American Economic Journal: Applied Economics* **1**(2), 35–52 (2009)
38. Goodnow, T.: Visual bias in time’s “the great divid”: A semiotic analysis of clinton and obama photographs. *American Behavioral Scientist* **54**(4), 406–416 (12 2010). <https://doi.org/10.1177/0002764210381865>, <https://doi.org/10.1177/0002764210381865>, [Online; accessed 2018-03-21]
39. Gower, J.C.: A general coefficient of similarity and some of its properties. *Biometrics* **27**(4), 857–871 (1971). <https://doi.org/10.2307/2528823>, <https://www.jstor.org/stable/2528823>
40. Grabe, M.E., Bucy, E.P.: *Image Bite Politics: News and the Visual Framing of Elections*. Oxford University Press, USA (3 2009), google-Books-ID: ahISDAAAQBAJ
41. Green-Pedersen, C., Mortensen, P.B., Thesen, G.: The incumbency bonus revisited: Causes and consequences of media dominance. *British Journal of Political Science* **47**(1), 131–148 (2017)
42. Greenwood, K.: Picturing presidents: A content analysis of photographs of presidents from the pictures of the year. *International Communication Association* pp. 1–34 (2005)
43. Groeling, T.: Media bias by the numbers: Challenges and opportunities in the empirical study of partisan news. *Annual Review of Political Science* **16**(1), 129–151 (5 2013). <https://doi.org/10.1146/annurev-polisci-040811-115123>, <http://www.annualreviews.org/doi/abs/10.1146/annurev-polisci-040811-115123>, 00017
44. Hackett, R.A.: A hierarchy of access: Aspects of source bias in canadian tv news. *Journalism Quarterly* **62**(2), 256–277 (6 1985). <https://doi.org/10.1177/107769908506200205>, <https://doi.org/10.1177/107769908506200205>, [Online; accessed 2018-03-12]

45. Hays, R.G., Reisner, A.E.: Farm journalists and advertiser influence: Pressures on ethical standards. *Journalism Quarterly* **68**(1-2), 172–178 (3 1991). <https://doi.org/10.1177/107769909106800118>, <https://doi.org/10.1177/107769909106800118>, [Online; accessed 2018-03-18]
46. Herman, E.S., Chomsky, N.: *Manufacturing Consent: The Political Economy of the Mass Media*. Pantheon, New York, reprint edition edn. (1 2002)
47. Hilligoss, B., Rieh, S.Y.: Developing a unifying framework of credibility assessment: Construct, heuristics, and interaction in context. *Information Processing and Management* **44**, 1467–1484 (2008), http://rieh.people.si.umich.edu/papers/hilligoss_ipm.pdf, 00258
48. Hovland, C.I., Janis, I.L., Kelley, H.H.: *Communication and persuasion: Psychological studies of opinion change*. Yale University Press (1953)
49. Hummel, M., Edelman, D., Kopp-Schneider, A.: Clustering of samples and variables with mixed-type data. *PLoS ONE* **12**(11) (Nov 2017). <https://doi.org/10.1371/journal.pone.0188274>, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5705083/>
50. Johnson, T.J., Kaye, B.K.: Cruising is believing?: comparing internet and traditional sources on media credibility measures. *Journalism & Mass Communication Quarterly* **75**(2), 325–340 (1998), 00552
51. Jung, W.S., Chung, M.Y., Rhee, E.S.: The effects of attractiveness and source expertise on online health sites. *Health Communication* **0**(0), 1–10 (6 2017). <https://doi.org/10.1080/10410236.2017.1323364>, <https://doi.org/10.1080/10410236.2017.1323364>, pMID: 28569543
52. Kahn, K.F., Kenney, P.J.: The slant of the news: How editorial endorsements influence campaign coverage and citizens' views of candidates. *American Political Science Review* **96**(2), 381–394 (6 2002). <https://doi.org/10.1017/S0003055402000230>, <https://www.cambridge.org/core/journals/american-political-science-review/article/slant-of-the-news-how-editorial-endorsements-influence-campaign-coverage-and-citizens-views-of-candidates/71FB7C8336B7B12EB239802C09A37F4D0>Online; accessed 2018-03-18
53. Karimov, F.P., Brengman, M., Van Hove, L.: The effect of website design dimensions on initial trust: A synthesis of the empirical literature. *Journal of Electronic Commerce Research* **12**(4) (2011)
54. Kenix, L.J.: A converging image? commercialism and the visual identity of alternative and mainstream news websites. *Journalism Studies* **14**(6), 835–856 (2013)
55. Kenney, K., Simpson, C.: Was coverage of the 1988 presidential race by Washington's two major dailies biased? *Journalism Quarterly* **70**(2), 345–355 (6 1993). <https://doi.org/10.1177/107769909307000210>, <https://doi.org/10.1177/107769909307000210>, [Online; accessed 2018-02-14]
56. Kepplinger, H.M.: Visual biases in television campaign coverage. *Communication Research* **9**(3), 432–446 (7 1982). <https://doi.org/10.1177/009365082009003005>, <https://doi.org/10.1177/009365082009003005>, [Online; accessed 2018-03-17]
57. Kerrick, J.S., Anderson, T.E., Swales, L.B.: Balance and the writer's attitude in news stories and editorials. *Journalism Quarterly* **41**(2), 207–215 (6 1964). <https://doi.org/10.1177/107769906404100207>, <http://journals.sagepub.com/doi/10.1177/107769906404100207>, [Online; accessed 2018-03-12]
58. Kingsbury, S., Hart, H.: Measuring the ethics of American newspapers iii. newspaper bias on congressional controversies. *Journalism Bulletin* **10**(4), 323–342 (12 1933). <https://doi.org/10.1177/107769903301000411>, <https://doi.org/10.1177/107769903301000411>, [Online; accessed 2018-03-12]

59. Klein, M.W., Maccoby, N.: Newspaper objectivity in the 1952 campaign. *Journalism Bulletin* **31**(3), 285–296 (6 1954). <https://doi.org/10.1177/107769905403100301>, <https://doi.org/10.1177/107769905403100301>, [Online; accessed 2018-02-14]
60. Kriesberg, M.: Soviet news in the “new york times”. *Public Opinion Quarterly* **10**(4), 540–564 (1 1946). <https://doi.org/10.1093/poq/10.4.540>, <https://academic.oup.com/poq/article/10/4/540/1861359>, [Online; accessed 2018-03-12]
61. Lavie, T., Tractinsky, N.: Assessing dimensions of perceived visual aesthetics of web sites. *International journal of human-computer studies* **60**(3), 269–298 (2004)
62. Leccese, M.: Online information sources of political blogs. *Journalism and Mass Communication Quarterly*; Thousand Oaks **86**(3), 578–593 (2009), <https://search.proquest.com/docview/216940194/abstract/7ECF2800BBE4A4APQ/1>
63. Lott, J.R., Hassett, K.A.: Is newspaper coverage of economic events politically biased? *Public Choice* **160**(1-2), 65–108 (7 2014). <https://doi.org/10.1007/s11127-014-0171-5>, <https://link.springer.com/article/10.1007/s11127-014-0171-5>, [Online; accessed 2018-04-24]
64. Lowry, D.T.: Measures of network news bias in the 1972 presidential campaign. *Journal of Broadcasting* **18**, 387 (1973), <http://heinonline.org/HOL/Page?handle=hein.journals/jbem18&id=389&div=&collection=journals,00012>
65. Lucassen, T., Muilwijk, R., Noordzij, M.L., Schraagen, J.M.: Topic familiarity and information skills in online credibility evaluation. *Journal of the American Society for Information Science and Technology* **64**(2), 254–264 (2 2013). <https://doi.org/10.1002/asi.22743>, <http://onlinelibrary.wiley.com/doi/10.1002/asi.22743/abstract,00025>
66. McCarthy, J.D., McPhail, C.: The institutionalization of protest in the united states. In: Meyer, D.S., Tarrow, S. (eds.) *The Social Movement Society: Contentious Politics for a New Century*, pp. 83–110. Rowman and Littlefield Publishers (12 1997), google-Books-ID: g0M3AgAAQBAJ
67. McCarthy, J.D., McPhail, C., Smith, J.: Images of protest: Dimensions of selection bias in media coverage of washington demonstrations, 1982 and 1991. *American Sociological Review* **61**(3), 478–499 (6 1996). <https://doi.org/10.2307/2096360>, <http://www.jstor.org/stable/2096360?origin=crossref>, [Online; accessed 2018-04-10]
68. McCarthy, J.D., McPhail, C., Smith, J., Crishock, L.: Electronic and print media representations of washington d.c. demonstrations, 1982 and 1991. In: Rucht, D., Koopmans, R., Neidhardt, F. (eds.) *Acts of Dissent: New Developments in the Study of Protest*, pp. 113–130. Rowman and Littlefield, Lanham, MD (1999), <http://d-scholarship.pitt.edu/20703/>, [Online; accessed 2018-04-22]
69. Meadors, J.D., Murray, C.B.: Measuring nonverbal bias through body language responses to stereotypes. *Journal of Nonverbal Behavior* **38**(2), 209–229 (6 2014). <https://doi.org/10.1007/s10919-013-0172-y>, <https://link.springer.com/article/10.1007/s10919-013-0172-y>, [Online; accessed 2018-05-22]
70. Merron, J., Gaddy, G.D.: Editorial endorsements and news play: Bias in coverage of ferraro’s finances. *Journalism Quarterly* **63**(1), 127–137 (3 1986). <https://doi.org/10.1177/107769908606300119>, <https://doi.org/10.1177/107769908606300119>, [Online; accessed 2018-02-15]
71. Metzger, M.J.: Making sense of credibility on the web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology* **58**(13), 2078–2091 (11 2007). <https://doi.org/10.1002/asi.20672>, <http://onlinelibrary.wiley.com/doi/10.1002/asi.20672/abstract,00506>

72. Metzger, M.J., Flanagin, A.J.: Psychological approaches to credibility assessment online (2015), [http://www.comm.ucsb.edu/faculty/flanagin/CV/MetzgerandFlanagin2015\(HPCT\).pdf](http://www.comm.ucsb.edu/faculty/flanagin/CV/MetzgerandFlanagin2015(HPCT).pdf), 00002
73. Miller, A., Coleman, R., Granberg, D.: Tv anchors, elections & bias: A longitudinal study of the facial expressions of brokaw rather jennings. *Visual Communication Quarterly* **14**(4), 244–257 (12 2007). <https://doi.org/10.1080/15551390701730232>, <https://doi.org/10.1080/15551390701730232>, [Online; accessed 2018-01-20]
74. Mitchell, A., Simmons, K., Matsa, K.E., Silver, L.: People around world want unbiased news. Tech. rep., 1615 L St. NW, Suite 800 Washington, DC 20036 USA (1 2018), <http://www.pewglobal.org/2018/01/11/>, [Online; accessed 2019-01-08]
75. Molyneux, L.: Mobile news consumption: A habit of snacking. *Digital Journalism* **6**(5), 634–650 (May 2018). <https://doi.org/10.1080/21670811.2017.1334567>
76. Moriarty, S.E., Garramone, G.M.: A study of newsmagazine photographs of the 1984 presidential campaign. *Journalism Quarterly* **63**(4), 728–734 (12 1986). <https://doi.org/10.1177/107769908606300408>, <https://doi.org/10.1177/107769908606300408>, [Online; accessed 2018-02-13]
77. Moriarty, S.E., Popovich, M.N.: Newsmagazine visuals and the 1988 presidential election. *Journalism Quarterly* **68**(3), 371–380 (9 1991). <https://doi.org/10.1177/107769909106800307>, <https://doi.org/10.1177/107769909106800307>, [Online; accessed 2018-01-21]
78. Moss, P.: Words, words, words: Radio news discourses and how they work. *European Journal of Communication* **3**(2), 207–230 (6 1988). <https://doi.org/10.1177/0267323188003002006>, <https://doi.org/10.1177/0267323188003002006>, [Online; accessed 2018-03-24]
79. Mullainathan, S., Shleifer, A.: The market for news. *The American Economic Review* **95**(4), 1031–1053 (2005), <http://www.jstor.org/stable/4132704>, [Online; accessed 2018-02-13]
80. Mullen, B., Futrell, D., Stairs, D., Tice, D.M., Baumeister, R.F., Dawson, K.E., Riordan, C.A., Radloff, C.E., Goethals, G.R., Kennedy, J.G.: Newcasters' facial expressions and voting behavior of viewers: Can a smile elect a president? *Journal of Personality and Social Psychology* **51**(2), 291 (1986)
81. Narwal, V., Salih, M.H., Lopez, J.A., Ortega, A., O'Donovan, J., Höllerer, T., Savage, S.: Automated assistants to identify and prompt action on visual news bias. arXiv:1702.06492 [cs] pp. 2796–2801 (2017). <https://doi.org/10.1145/3027063.3053227>, <http://arxiv.org/abs/1702.06492>, arXiv: 1702.06492
82. Nelson, J.L., Lei, R.F.: The effect of digital platforms on news audience behavior. *Digital Journalism* **6**(5), 619–633 (May 2018). <https://doi.org/10.1080/21670811.2017.1394202>
83. Newhagen, J., Nass, C.: Differential criteria for evaluating credibility of newspapers and tv news. *Journalism Quarterly* **66**(2), 277–284 (1989)
84. Nokelainen, T., Kanninen, J.: Coverage bias in business news: evidence and methodological implications. *Management Research Review* **41**(4), 487–503 (3 2018). <https://doi.org/10.1108/MRR-02-2017-0048>, <https://www.emeraldinsight.com/doi/full/10.1108/MRR-02-2017-0048>, [Online; accessed 2018-04-27]
85. Park, S., Kang, S., Chung, S., Song, J.: Newscube: delivering multiple aspects of news to mitigate media bias. pp. 443–452. CHI '09, ACM, New York, NY, USA (2009). <https://doi.org/10.1145/1518701.1518772>, <http://doi.acm.org/10.1145/1518701.1518772>, 00036

86. Park, S., Ko, M., Kim, J., Choi, H., Song, J.: Newscube2. 0: An exploratory design of a social news website for media bias mitigation (2011), <http://nclab.kaist.ac.kr/papers/Conference/NC2.pdf>, 00003
87. Patterson, T.E., Donsbagh, W.: News decisions: Journalists as partisan actors. *Political Communication* **13**(4), 455–468 (10 1996). <https://doi.org/10.1080/10584609.1996.9963131>, <http://dx.doi.org/10.1080/10584609.1996.9963131>, 00306
88. Petty, R.E., Cacioppo, J.T.: The elaboration likelihood model of persuasion. In: *Communication and Persuasion*, pp. 1–24. Springer Series in Social Psychology, Springer New York (1986), http://link.springer.com/chapter/10.1007/978-1-4612-4964-1_1, 06318
89. Pfau, M., Haigh, M., Gettle, M., Donnelly, M., Scott, G., Warr, D., Wittenberg, E.: Embedding journalists in military combat units: Impact on newspaper story frames and tone. *Journalism & Mass Communication Quarterly* **81**(1), 74–88 (3 2004). <https://doi.org/10.1177/107769900408100106>, <https://doi.org/10.1177/107769900408100106>, [Online; accessed 2018-03-18]
90. Podani, J.: Extending gower’s general coefficient of similarity to ordinal characters. *TAXON* **48**(2), 331–340 (1999). <https://doi.org/10.2307/1224438>, <https://onlinelibrary.wiley.com/doi/abs/10.2307/1224438>
91. Price, C.J.: Interfering owners or meddling advertisers: How network television news correspondents feel about ownership and advertiser influence on news stories. *Journal of Media Economics* **16**(3), 175–188 (7 2003). <https://doi.org/10.1207/S15327736ME16033>, https://doi.org/10.1207/S15327736ME1603_3, [Online; accessed 2018-03-17]
92. Puglisi, R., Snyder, J.M.: Newspaper coverage of political scandals. *The Journal of Politics* **73**(3), 931–950 (7 2011). <https://doi.org/10.1017/S0022381611000569>, <https://www.journals.uchicago.edu/doi/abs/10.1017/S0022381611000569>, [Online; accessed 2018-05-18]
93. Reuter, J., Zitzewitz, E.: Do ads influence editors? advertising and bias in the financial media. *The Quarterly Journal of Economics* **121**(1), 197–227 (2 2006). <https://doi.org/10.1093/qje/121.1.197>, <https://academic.oup.com/qje/article/121/1/197/1849013>, [Online; accessed 2018-01-21]
94. Rieh, S.Y.: Judgment of information quality and cognitive authority in the web. *Journal of The American Society for Information Science and Technology* **53**(2), 145–161 (2002), <https://onlinelibrary.wiley.com/doi/full/10.1002/asi.10017>, 00637
95. Robins, D., Holmes, J.: Aesthetics and credibility in web site design. *Information Processing & Management* **44**(1), 386–399 (2008). <https://doi.org/10.1016/j.ipm.2007.02.003>, <http://www.sciencedirect.com/science/article/pii/S0306457307000568>, 00218
96. Robinson, C.: Visual press bias in a multi-party electoral context. *Design & Democracy* p. 37 (2 2016), <https://static1.squarespace.com/static/578aa0eac534a56f885f3d9b/t/579db422b8a79bb7da57671c/1469953062061/Visualforpublishing.pdf>
97. Rucinski, D.: Personalized bias in news: The potency of the particular? *Communication Research* **19**(1), 91–108 (2 1992). <https://doi.org/10.1177/009365092019001004>, <https://doi.org/10.1177/009365092019001004>, [Online; accessed 2018-03-12]
98. Sachsman, D.B.: A test of ‘loading’: New measure of bias. *Journalism Quarterly* **47**(4), 759–762 (12 1970). <https://doi.org/10.1177/107769907004700415>, <http://>

- [//journals.sagepub.com/doi/10.1177/107769907004700415](http://journals.sagepub.com/doi/10.1177/107769907004700415), [Online; accessed 2018-03-12]
99. Schindler, J., Krämer, B., Müller, P.: Looking left or looking right? effects of newspaper layout style on the perception of political news. *European Journal of Communication* **32**(4), 348–366 (8 2017). <https://doi.org/10.1177/0267323117718463>, <https://doi.org/10.1177/0267323117718463>, [Online; accessed 2018-03-17]
 100. Schudson, M., Anderson, C.: *Objectivity, professionalism, and truth seeking in journalism*, pp. 108–121. Routledge (2009)
 101. Soloski, J.: News reporting and professionalism: Some constraints on the reporting of the news, vol. 11, p. 207–228 (1989)
 102. Spillane, B., Hoe, I., Brady, M., Wade, V., Lawless, S.: Tabloidization versus credibility: Short term gain for long term pain. In: CHI Conference on Human Factors in Computing Systems (CHI '20), April 25–30, 2020, Honolulu, HI, USA. ACM (Apr 2020). <https://doi.org/10.1145/3313831.3376388>
 103. Spillane, B., Lawless, S., Wade, V.: Perception of bias: The impact of user characteristics, website design and technical features. pp. 227–236. WI '17, ACM, New York, NY, USA (2017). <https://doi.org/10.1145/3106426.3106474>, <http://doi.acm.org/10.1145/3106426.3106474>, [Online; accessed 2017-09-18]
 104. Spillane, B., Lawless, S., Wade, V.: Increasing and decreasing perceived bias by distorting the quality of news website design. p. 13. British HCI 2018, Belfast, Northern Ireland (7 2018)
 105. Stempel-III, G.H.: The prestige press covers the 1960 presidential campaign. *Journalism Quarterly* **38**(2), 157–163 (6 1961). <https://doi.org/10.1177/107769906103800201>, <https://doi.org/10.1177/107769906103800201>, [Online; accessed 2018-03-09]
 106. Stoodley, B.H.: Bias in reporting the fcc investigation. *Public Opinion Quarterly* **24**(1), 92–98 (1 1960). <https://doi.org/10.1086/266933>, <https://academic.oup.com/poq/article/24/1/92/1824637>, [Online; accessed 2018-03-12]
 107. Sundar, S.S.: The main model: A heuristic approach to understanding technology effects on credibility. *Digital media, youth, and credibility* pp. 73–100 (2008), http://www.marketingsociale.net/download/modello_MAIN.pdf, 00327
 108. Tannenbaum, P.H.: The effect of headlines on the interpretation of news stories. *Journalism Bulletin* **30**(2), 189–197 (3 1953). <https://doi.org/10.1177/107769905303000206>, <http://journals.sagepub.com/doi/10.1177/107769905303000206>, [Online; accessed 2018-03-12]
 109. Tversky, A., Kahneman, D.: Judgment under uncertainty: Heuristics and biases. *Science* **185**(4157), 1124–1131 (9 1974). <https://doi.org/10.1126/science.185.4157.1124>, <http://science.sciencemag.org/content/185/4157/1124>, PMID: 17835457
 110. Van Dijk, T.A.: New(s) racism: A discourse analytical approach. *Ethnic Minorities and the Media* **37**, 33–49 (2000), <http://dare.uva.nl/search?metis.record.id=203737>, [Online; accessed 2018-04-20]
 111. Vuontela, S.: Women’s hidden agency in the news coverage of the tibetian riots. *Nordlit* pp. 129–142 (Oct 2012). <https://doi.org/10.7557/13.2376>, <https://septentrio.uit.no/index.php/nordlit/article/view/2376>
 112. Waisbord, S.: *Reinventing Professionalism: Journalism and News in Global Perspective*. John Wiley & Sons (Aug 2013)
 113. Wathen, C.N., Burkell, J.: Believe it or not: Factors influencing credibility on the web. *Journal of the American society for information science and technology* **53**(2), 134–144 (2002), <http://onlinelibrary.wiley.com/doi/10.1002/asi.10016/full>, [Online; accessed 2013-01-17]

114. Weisbuch, M., Pauker, K., Ambady, N.: The subtle transmission of race bias via televised nonverbal behavior. *Science* **326**(5960), 1711–1714 (12 2009). <https://doi.org/10.1126/science.1178358>, <http://science.sciencemag.org/content/326/5960/1711>, PMID: 20019288
115. White, D.M.: The “Gate Keeper”: A case study in the selection of news. *Journalism Bulletin* **27**(4), 383–390 (9 1950). <https://doi.org/10.1177/107769905002700403>, <http://journals.sagepub.com/doi/10.1177/107769905002700403>, [Online; accessed 2018-03-18]
116. Zaller, J.: *A Theory of Media Politics: How the Interests of Politicians, Journalists, and Citizens Shape the News*. University of Chicago Press (1999), google-Books-ID: 9KmwXwAACA AJ
117. Zimmerman, J.: *Media bias through facial expressions on local las vegas television news* (2013)