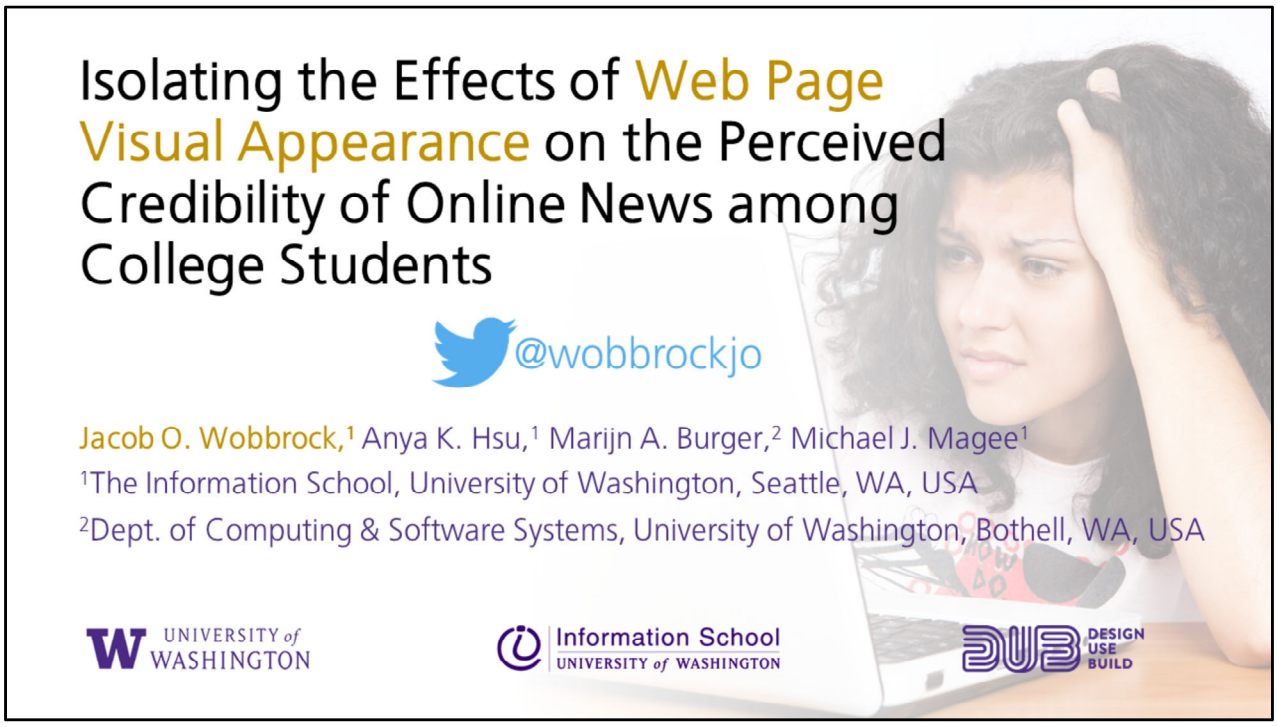
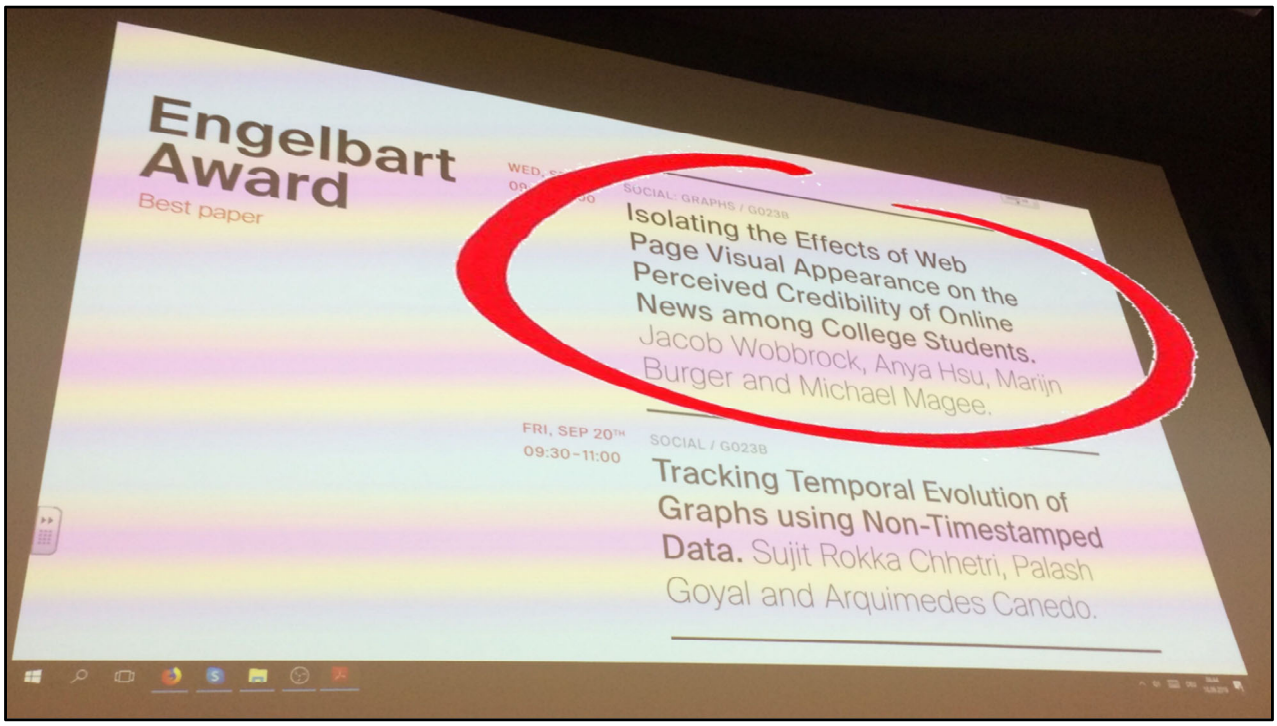
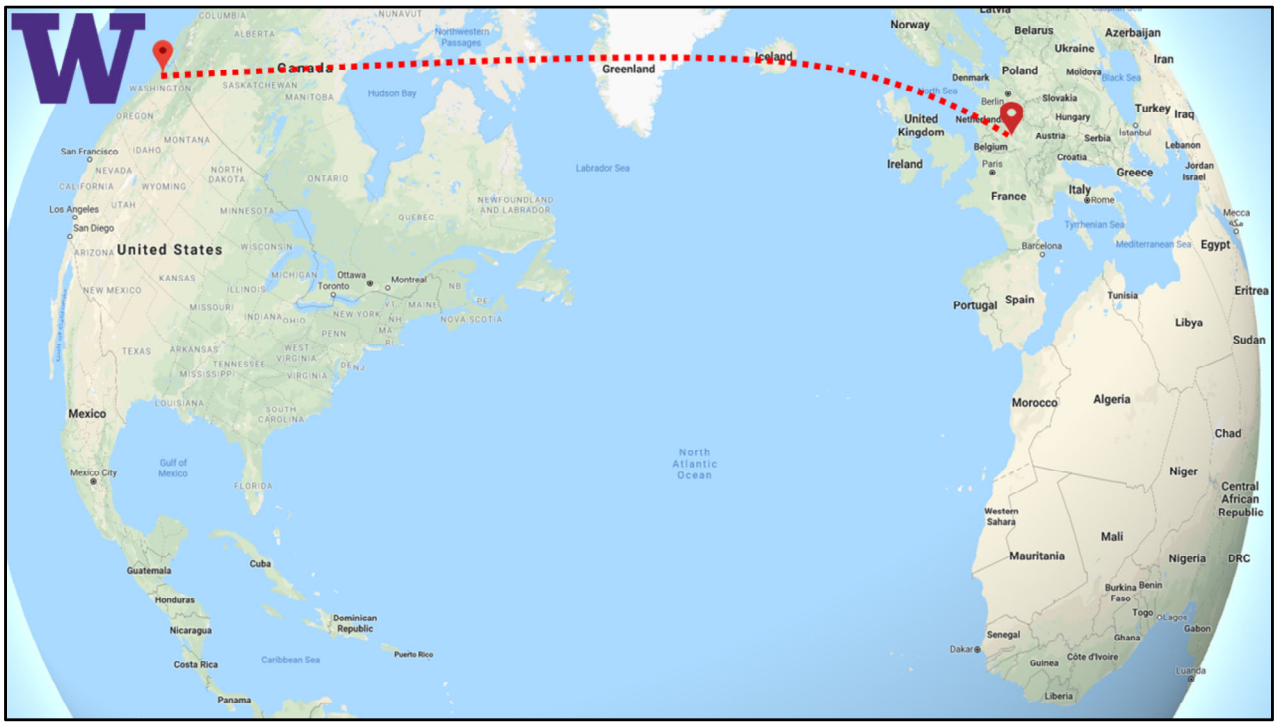


It's very nice to be here. This is my first Hypertext conference. I can tell you have a very strong community. My own community is SIGCHI, which I'm glad to see is a co-sponsor along with SIGWeb.

I know Hypertext wants us to tweet as often as possible so here is my Twitter handle if you wish to do so during my talk.



It was a very nice surprise this morning to be nominated for the Douglas Engelbart Award. That made my day!



I come from the University of Washington, which is a major research university in Seattle, Washington, in the Pacific Northwest corner of the United States.

I flew through Iceland to get here, which, as you can see, makes for a pretty straight route over Greenland.

Over the last few years, fake news has invaded our lives and our social media feeds.

https://www.snopes.com/news/2016/01/14/fake-news-sites/
https://en.wikipedia.org/wiki/List_of_fake_news_websites

FAKE NEWS
BREAKING
NEWS
https://www
43% of Americans report getting their news *primarily* online.
– Pew Research (Aug. 2017)
NEWS PUNCH
WHERE MAINSTREAM FEARS TO TREAD
NATIONAL REPORT
ACTION NEWS
Huzlers
WORLDNEWS
DAILYREPORT

2016 U.S. Presidential Election

The FAKE NEWS media (failing @nytimes, @NBCNews, @ABC, @CBS, @CNN) is not my enemy, it is the enemy of the American People!

— Donald J. Trump (@realDonaldTrump) February 17, 2017

Russia talk is FAKE NEWS put out by the Dems, and played up by the media, in order to mask the big election defeat and the illegal leaks!

— Donald J. Trump (@realDonaldTrump) February 26, 2017

Just watched the totally biased and fake news reports of the so-called Russia story on NBC and ABC. Such dishonesty!

— Donald J. Trump (@realDonaldTrump) March 23, 2017

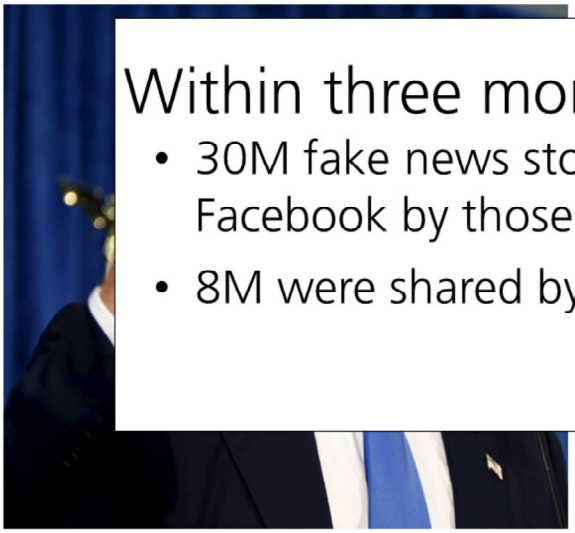
https://www.lawfareblog.com/donald-trumps-statements-putinrussiafake-news-media

6

We know that fake news played a big role in the 2016 American Presidential election, generally by promoting articles that favored Donald Trump over Hilary Clinton.

In an ironic twist, it has since been *Donald Trump* claiming that reports of the influence of fake news on his election are, *themselves*, the fake news.

2016 U.S. Presidential Election



Within three months of the election:

- 30M fake news stories were shared on Facebook by those favoring Trump.
- 8M were shared by those favoring Clinton.

– Allcott & Gentzkow (2017)

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eaks!

-called

Russia story on NBC and ABC. Such dishonesty!

— Donald J. Trump (@realDonaldTrump) March 23, 2017

https://www.lawfareblog.com/donald-trumps-statements-putinrussiafake-news-media

7

In the three months leading up to the 2016 U.S. Presidential election…

Typical credibility studies

Source credibility

- Expertise
- Reputation
- Trustworthiness
- Provenance

(Hass 1981, Ibelema & Powell 2001)

Message credibility

- Content
- Structure
- Language
- Intensity
- Clarity

(Rosenthal 1971, Slater & Rouner 1996, Metzger et al. 2003, Flanagin & Metzger 2000)

8

With the proliferation of fake news, and assertions about some news being fake, we are once again faced with the question of what online information people find credible, especially to the point of sharing it on social media.

Most credibility studies have looked at source credibility and message credibility.

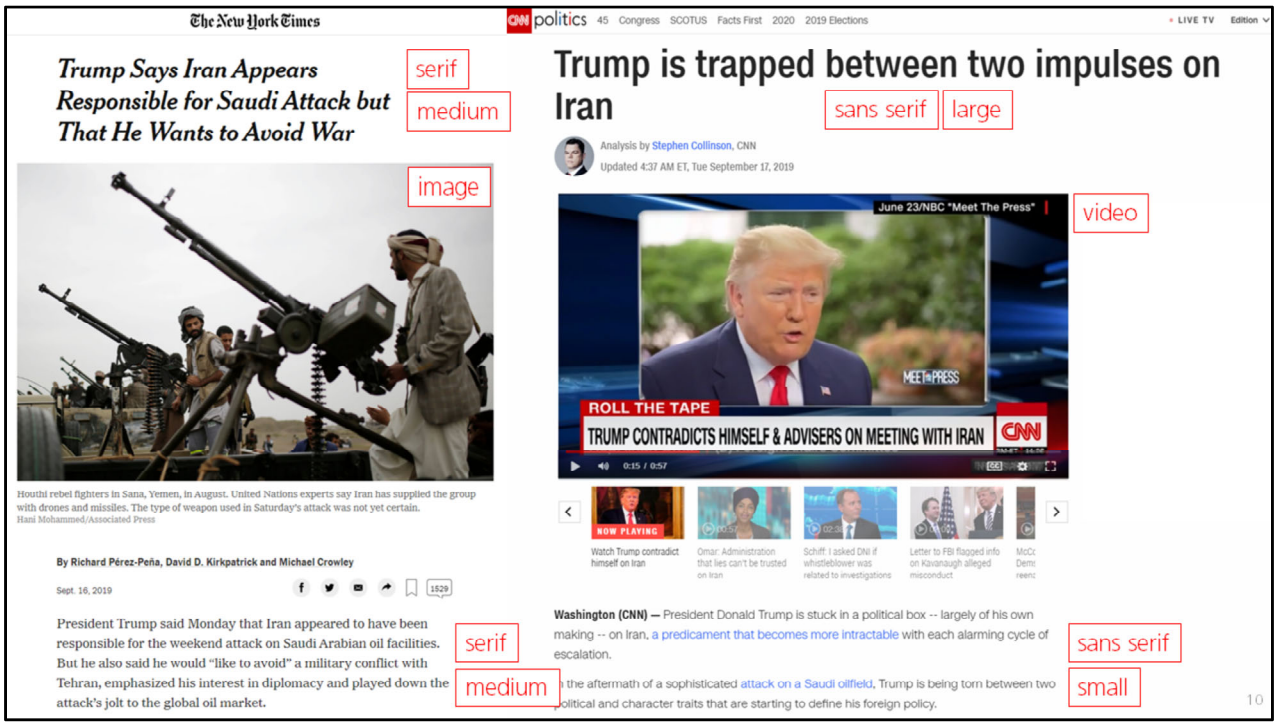
What about visual appearance?

- Word count
- Font serifs
- Font sizes
- Image count
- Video presence
- Video placement
- Hyperlink densities
- …

How does news page visual appearance, isolated from source or message factors, affect perceived credibility?

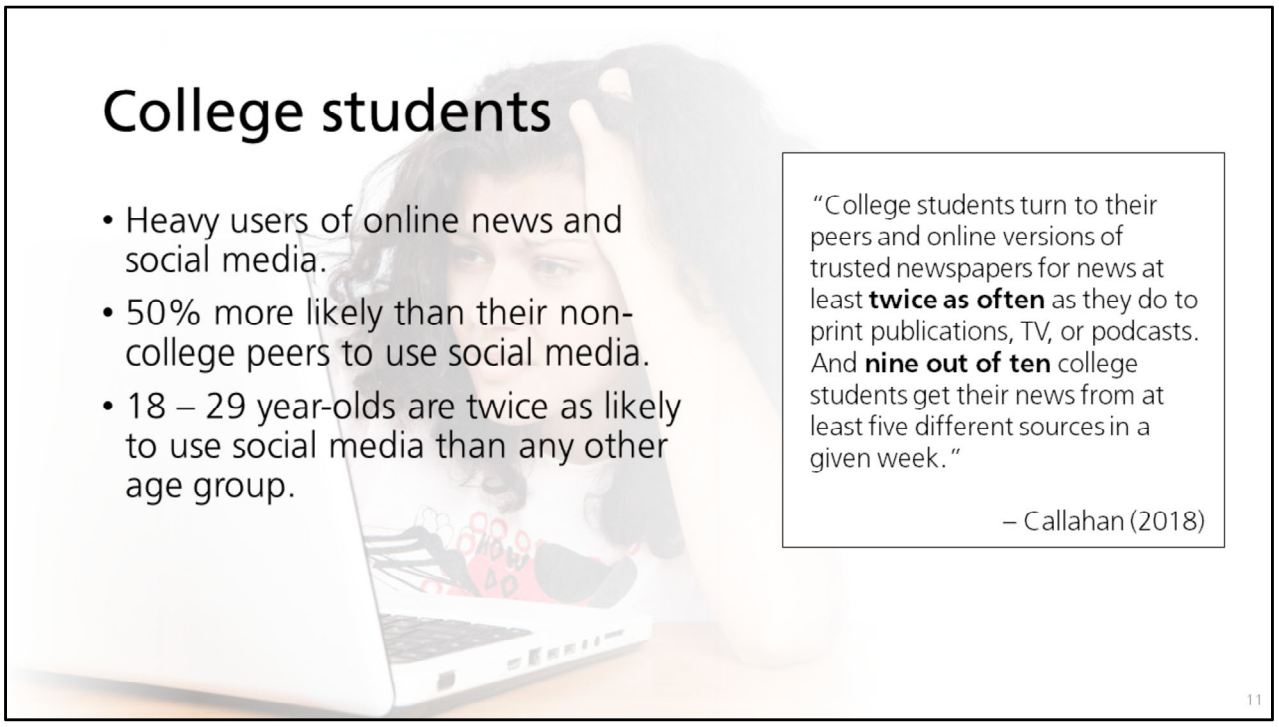
By visual appearance, we mean…

Our research question was…



Here are two related articles, one on the New York Times and one from CNN, both considered credible, legitimate news outlets.

We can see they differ visually in some interesting ways.



We were particularly interested in college students because of their heavy use of both online news and social media. And social media is a key channel by which online news spreads, especially via Facebook.

https://news.northeastern.edu/2018/10/16/faced-with-a-daily-barrage-of-news-college-students-find-it-hard-to-tell-whats-real-and-whats-fake-news/

Related work

Studies of web content credibility

- People lack motivation and/or skills to verify Web-based information
  - (Amsbary & Powell 2003, Meola 2004, Flanagin & Metzger 2000)
- Multiple dimensions considered simultaneously when people judge credibility of web pages
  - (Fogg & Tseng 1999, Freeman & Spyridakis 2004)
- Visual attributes play a significant role in forming credibility judgments
  - (Flanagin & Metzger 2007, Furman 2009, Tractinsky et al. 2006)

Studies of web page appearance *and* content credibility

- Visual elements can more strongly affect credibility than content
  - (Fogg et al. 2003, Robins & Holmes 2008)
- "Professionalism" is highly dependent upon page appearance
  - (Wathen & Burkell 2001, Stonewall & Dorneich 2016, Kim & Moon 1998)
- News page visual elements contribute differentially to perceptions of bias
  - (Spillane et al. 2017)

12

Of course, there has been related work on web page credibility for a long time.

But to our knowledge, none of it *isolated* purely presentational factors when studying credibility perceptions.

From this prior work, we know that…

Study goal

To isolate and examine the effects of presentational factors of news-like web pages on perceived credibility judgments among college students.

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Participants

- 31 participants
- Age: $M = 20.8$, $SD = 1.4$
- 13 women, 18 men
- Fields of study
  - 12 arts or sciences
  - 6 information science
  - 6 engineering
  - 3 business
  - 2 education
  - 1 pharmacy
  - 1 public health

14

31 participants were recruited via flyers, word of mouth, and snowball sampling.

Apparatus

- Google Chrome browser full screen
- 5 of 31 participants used 27" Mac desktops
- 26 of 31 participants used 13" Mac laptops
- Custom system generated synthetic news "articles"
  - Parameterized by 100 news articles from top 20 U.S. news websites[1]
- Text from Cicero's "lorem ipsum"
- CSS `blur` effect for images (20 px) and videos (40 px)

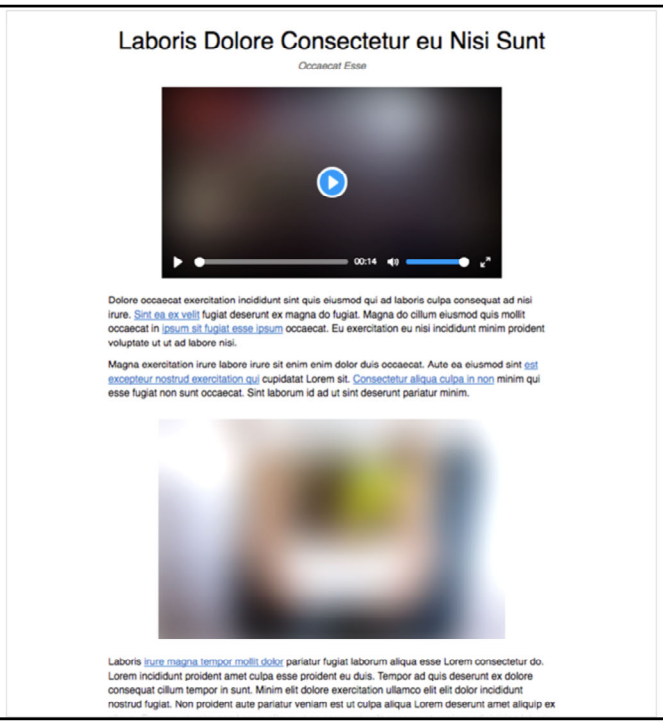
[1] https://www.alexa.com/topsites/category/Top/News

15

Parameters

- *Video*: absent, present
- *Video Placement*: top, middle
- *Images*: 0, 3, 6
- *Font Face*: serif, sans serif
- *Font Size*: 13 / 30, 16 / 38, 19 / 46 pt. body / title
- *Words*: 348, 644, 1070
- *Link Density*: 0.000, 0.002, 0.007, 0.017 links per word
  - One link about every 500, 145, and 60 words

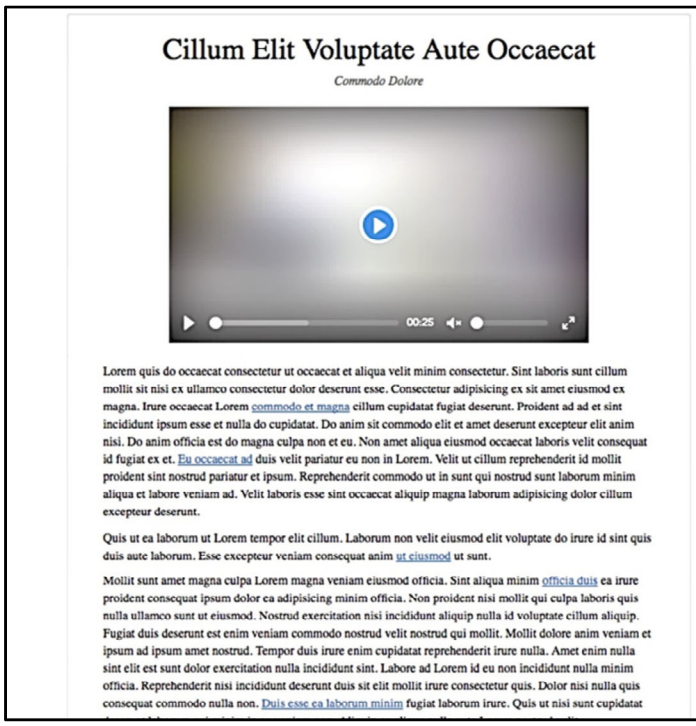
16



- Sans serif font
- Medium font (16 / 38 pt. body / title)
- Video present
- Video placed at top
- Medium image count (3 imgs.)
- Medium word count (644 words)
- High link density (0.017 per word)*

* One link every ~60 words

17



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00:25

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- Serif font
- Small font (13 / 30 pt. body / title)
- Video present
- Video placed at top
- No images
- High word count (1070 words)
- High link density (0.017 per word)*

* One link every ~60 words

18

Occaecat Lorem Aliqua Velit Lorem

Commodo Anim

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- Sans serif font
- Small font (13 / 30 pt. body / title)
- No video
- No images
- Low word count (348 words)
- High link density (0.017 per word)*

* One link every ~60 words

19

- Sans serif font
- Large font (19 / 46 pt. body / title)
- No video
- High image count (6 imgs.)
- Medium word count (644 words)
- No links

Procedure

- Initial practice and familiarization with the task
- Participants shown each of 24 synthetic "articles"
- Marked a 1-7 Likert scale at bottom of each article:

21

We chose the word "believe" in the prompt because it can serve as an active verb, where as "credible" has no such form.

Interviews

After rating all 24 articles, participants were interviewed:

1. What are your first impressions of the pages you saw after completing this study?
2. How did you evaluate each page for its believability?
3. What elements or characteristics of each page did you find yourself looking at?

Design summary

- Partial within-subjects design
- Fully counterbalanced factors
  - *Video*: present, absent
  - *Images*: 0, 3, 6
  - *Link Density*: 0.000, 0.002, 0.007, 0.017
  - *Trial*: 1 – 24
- Randomly chosen levels:
  - *Words*: 348, 644, 1070
  - *Font Size*: 13 / 30, 16 / 38, 19 / 46 pt. body / title
  - *Font Face*: serif, sans serif
  - *Video Placement*: top, middle
- Covariates
  - *Age*: 18 – 23
  - *Gender*: man, woman (self-reported)

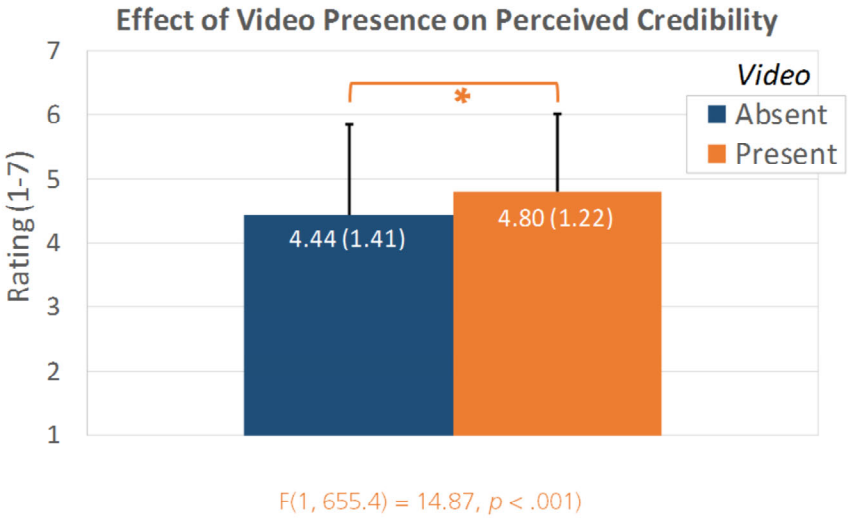
Factor screening (Morris 2006)

- With so many factors and levels, a full factorial model is undesirable and unjustified
- Factor screening uses EDA and statistical tests of main effects, 2- and 3-way interactions, keeping those that are $p < .10$
- Final statistical model for *Credibility* kept *Video*, *Images*, *Words*, *Font Size*
- Dropped *Link Density*, *Font Face*, and *Video Placement* as non-significant

Statistical analysis

- Ordinal *Credibility* ratings analyzed with nonparametric aligned rank transform (Higgins & Tashtoush 1994)
- Linear mixed model analysis of variance for log *Page Time* (Lawrence 1988)
- Main R packages used were `ARTool`, `lme4`, `car`, `phia`, `emmeans`

Video

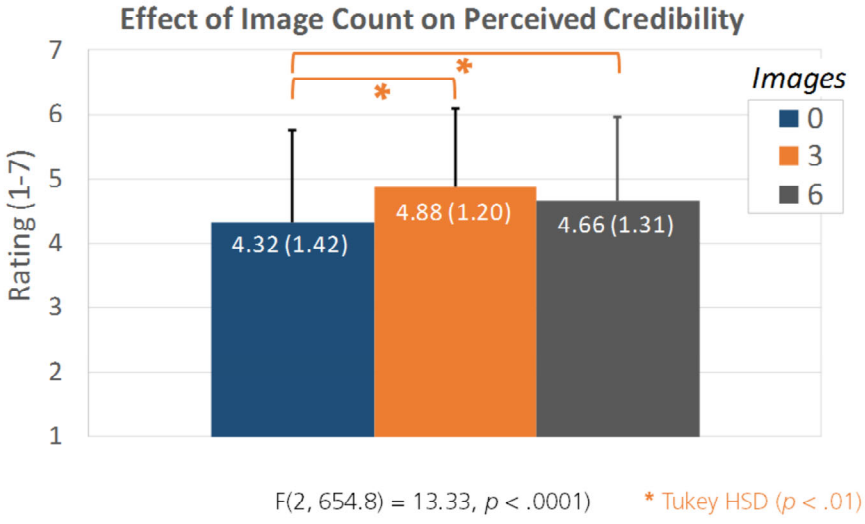


$F(1, 655.4) = 14.87, p < .001$

26

Video presence increased credibility by about 8.1%.

Images

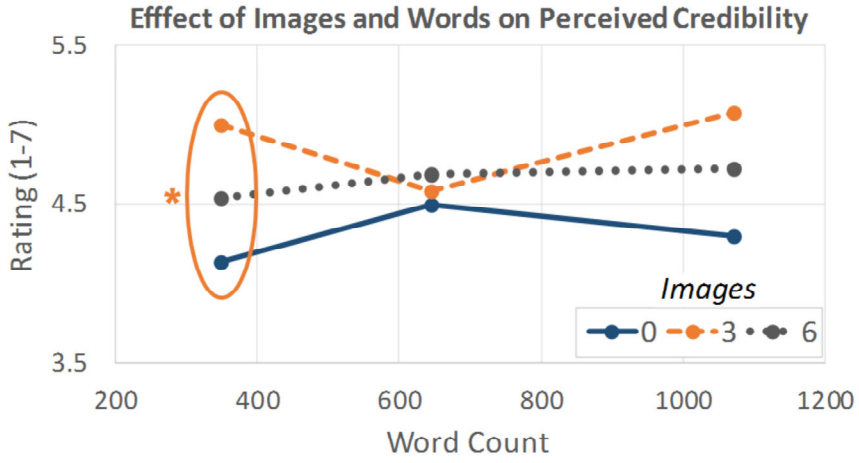


F(2, 654.8) = 13.33, $p < .0001$) * Tukey HSD ($p < .01$)

27

Image count affected credibility. Having no images was significantly less credible than having three or six images, but three and six images were not detectably different.

Images × Words

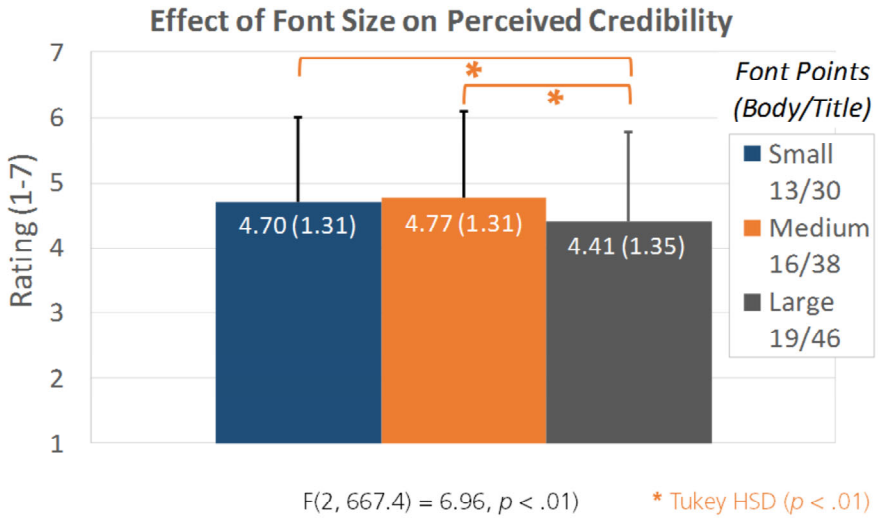


$F(4, 665.7) = 2.43$, $p < .05$) * Holm-Bonferroni ($p < .05$)

28

However, there is more to this story. Although there was no main effect of *Word* count alone on perceived credibility, there was an *Images × Words* interaction. This difference occurs mostly for articles with low word counts, where having a medium number of images is most credible.

Font Size

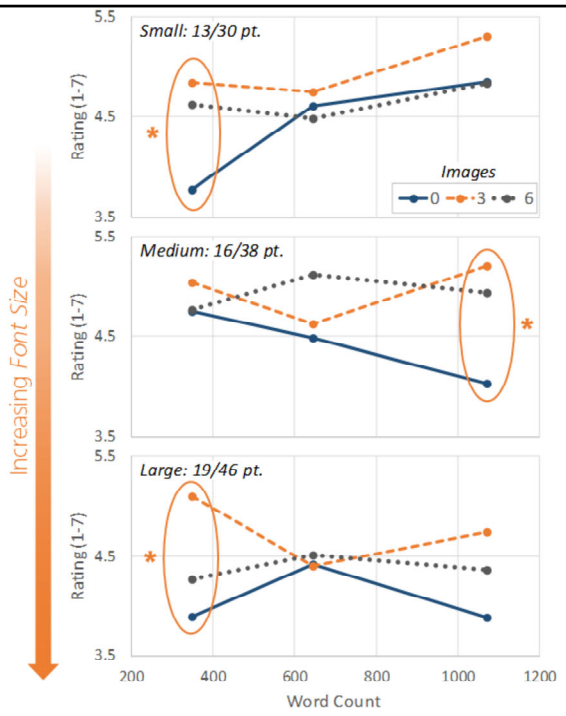


Font Size affected credibility. Large fonts were less credible than small or medium fonts, but small and medium fonts were not detectably different.

Images × Words × Font Size

F(8, 664.9) = 2.19, $p < .05$)
* Holm-Bonferroni ($p < .05$)

- 3-way interaction shows as *Font Size* increases, the *Images* × *Words* interaction changes.
- For small and large fonts, at low word counts, the number of images affects credibility.
- Not so for medium fonts, where credibility is affected by images for high word counts.



However, there is again more to this story. There was an *Images × Words × Font Size* 3-way interaction. As *Font Size* changes, the *Images × Words* interaction itself changes.

Page Time

- Pages with more content took a little longer for participants to make judgments on, which is expected and confirmatory.
- Each image added about 350 ms.
- Every 100 words added 310 ms.
- Therefore, "a nonsense picture is worth about 100 nonsense words."

31

A real picture might be worth a thousand words, but a nonsense picture is worth only about a hundred nonsense words.

Interview highlights

Of 31 participants…

- 12 said the *presence* of video or images most impacted their credibility ratings.
- 7 said the *placement* of video and images also mattered to them. Top placement was mentioned as more credible than middle.
- 10 said font size most impacted their credibility ratings, with larger fonts feeling less credible.
- Comments indicating statistical interactions were common. "If there was only a little text, and a lot of pictures, then I would find it less believable" (P6).

Summary

- Presence of video and images affects credibility ratings, even apart from content.
- Having three images, as opposed to zero or six images, was also viewed as more credible, especially when word counts were low and fonts were large.
- The small and medium font sizes were viewed as more credible than the large font.

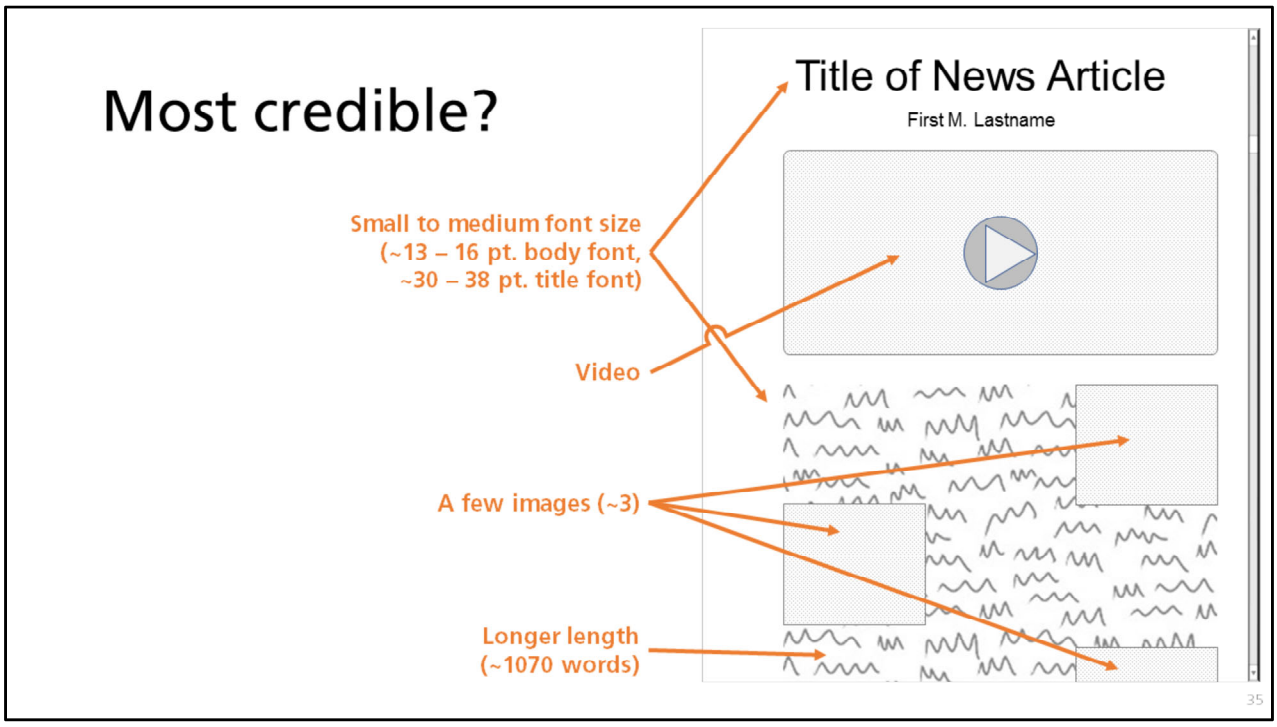
Goldilocks judgment about images

- Goldilocks was the girl who wanted her porridge not too hot, and not too cold, but "just right."
- At the lowest word count, having zero images was the least credible, six images was more credible, but three images was most credible. This pattern was exacerbated in the presence of large fonts.
- When articles were of a medium length, the number of images was less crucial, but for short or long articles, the number of images mattered more.

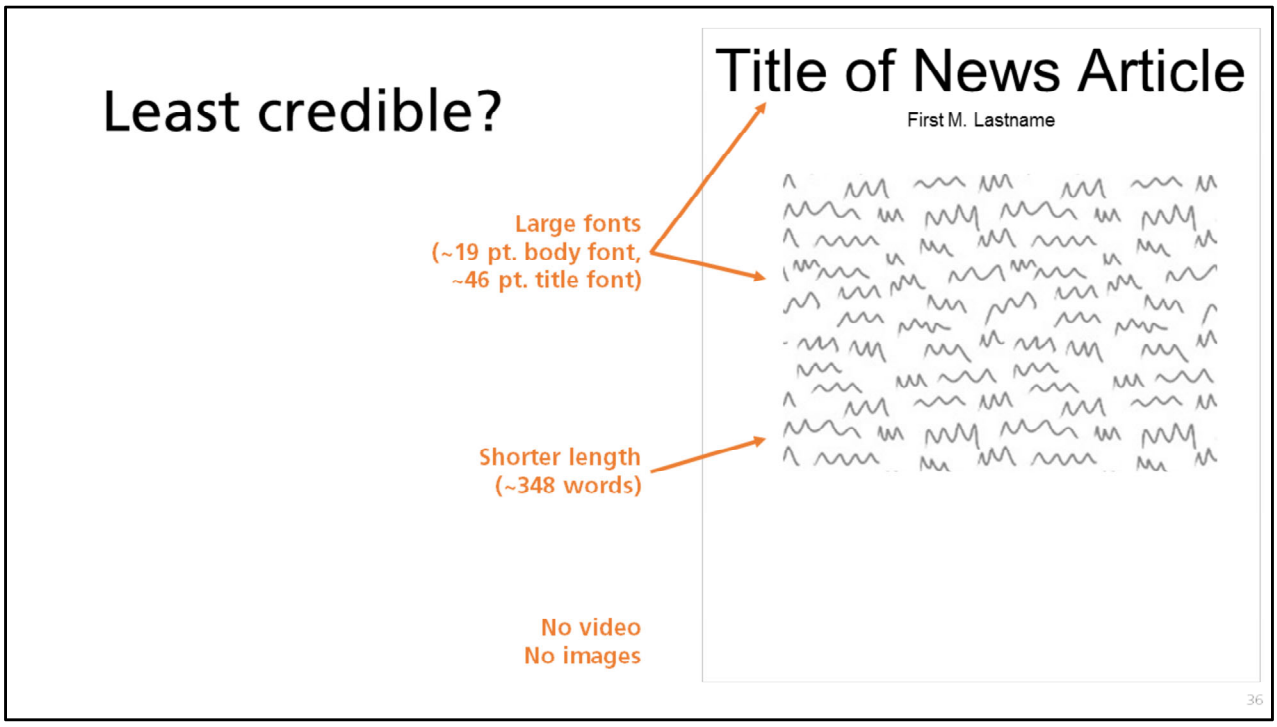
34

[After the last bullet…]

Why might this be so? Particularly short or long articles might be more "suspicious" to users than medium-length articles, which might be less susceptible to the effects of other elements like images when it comes to credibility perceptions.



So what would be a mockup of the most credible design, based on our findings?



And what would be a mockup of the least credible design, based on our findings?

Study limitations

- Many presentational factors were omitted
  - Whitespace amounts
  - Color schemes
  - Font families
  - Image or video sizes
  - Image placements
  - Additional elements (charts, buttons, other widgets, ads, etc.)
- Interaction of presentational factors with real content?
- Generalizability of findings to non-college students?

Future work

- Take credible articles and remove content, keeping only their presentation settings. Do our findings hold?
- Do ratings of real news articles *with content* also support our findings?
- Apply distortions systematically to real news articles and see if credibility ratings move according to our findings.
- Do our findings hold on smartphones? Tablets?
- Correlate interview results with eye-tracking data.

Conclusion

- Purely presentational factors do affect perceptions of "news article" credibility even when all meaningful content is removed.
- Video presence increased credibility, while large fonts and having no images reduced it. Having a few, but not too many, images increased credibility for short articles, especially in the presence of large fonts.
- Participants self-reported judgment criteria largely corroborated their actual ratings, i.e., they seemed rather self-aware.
- A start, but much more to understand!

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Acknowledgements

MANI CHARITABLE FOUNDATION

Thank you!

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@wobbrockjo