

A Gramulator Analysis of Gendered Language in Cable News Reportage

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Abstract

News reportage is intended to serve the public in terms of nurturing a better understanding of political and societal concerns. But such a goal may be stymied if reporters lack a sufficient understanding of the effect gendered language may have on the conveyance and interpretation of news. To address this issue, we use the Gramulator to conduct an applied natural language processing study of the linguistic and topical features of gendered language in news reportage. Our goal is to offer some insights as to how the choice of language and topics might affect the efficacy of news reportage. Results suggest that current news reportage largely conforms to an established gender divide: Specifically, we find evidence that male reportage is more *quantitative* and likely to focus on topics such as politics, crime, and the military. By contrast, female reportage is more *qualitative*, and likely to focus on issues such as home and education. The study is of interest to all current affairs writers (e.g., journalists) because it offers a systematic approach to identifying and assessing the linguistic and topical differences that contribute to gendered language in news reportage.

Introduction

In recent decades, women have gradually become more visible in America's sphere of journalism. The growth in female contribution to the news space has seen many researchers argue an increase in the influence of women on news reportage (Cann 2001; Desmond & Danilewicz 2009; Mack, 2003). However, a systematic approach to identifying and quantifying this contribution has yet to be proposed. The primary purpose of this study is to address this issue. Specifically, we aim to identify and quantify differences in lexical choice and topic selection in news articles that are attributable to the writer's gender. Through our findings, we hope to offer some insights as to how the choice of these language features might affect the efficacy

of news reportage. Ultimately, the goal of news reportage is to convey information and ideas and to help the audience better understand political and societal issues. In order to more successfully achieve that goal, it seems necessary that news writers and reporters understand the effect that gender may have on the way that news is both conveyed and interpreted.

Gender Differences in Language Use

Seminal work such as Lakoff (1975) has led researchers to broadly agree that male and female language is different, with male language (perceived as) the *default* type (e.g., Kroklokke & Sorensen 2005). Of course, gender differences in language are often the subject of intense debate (see Bradley 1981; Weatherall 2002), with many researchers dedicated to dispelling well-entrenched beliefs such as the perception that women are more likely to be qualitative whereas men are more likely to be quantitative (see Campbell & Storo 1996; cf Haas 1979). Intense debate notwithstanding, insights from the domains of social and cognitive psychology have managed to broadly establish predictions as to the different ways in which males and females use language. For example, much empirical work suggests that males use language as a tool for conveying information, while women tend to use language as a means of social interaction (for a recent review, see Mulac, Bradac, & Gibbons, 2001). Research also suggests that women tend to ask more questions, use more hedges, and call upon more perceptual and cognitive verbs (Mulac et al. 1988; Mulac & Lundell, 1994). Additionally, there is evidence that women tend to use extra-polite forms of language (e.g., "*Would you mind getting...X?*"), while men might be more direct "*Let's go get ... X*" (Holmes, 1995). Some researchers also theorize that features of women's language highlight a reluctance on the part of females to force opinions on others, choosing instead to offer opinions as open questions or ideas (Mehl & Pennebaker, 2003;

Mulac, Bradac, & Gibbons, 2001; cf. Thomson & Murachver, 2001).

There is some evidence that women are more likely than men to use emotion terminology in their language (Mulac et al., 1990). However, more recent research suggests that men and women are somewhat equivalent in their use of emotion words, but differ in the *types* of emotion words they use. In general, there is evidence that women tend to talk more about positive emotions like happiness or joy, while men are more likely to talk about negative emotions like anger (Mehl & Pennebaker, 2003).

In sum, from the time of Haas (1979), research into gendered language provides evidence that male language is more direct, more likely to have physical topics, more likely to include quantifiable elements (e.g., sports, money, business, time) and more likely to feature destructive aspects (e.g., military matters). By contrast, female language is more likely to be supportive and polite, more likely to include elements of home and family, and more likely to be evaluative. Given this breadth of findings, it is reasonable to assume that gendered language extends into news reportage.

Gendered Differences in News Reportage

Considerable research in gendered language has been conducted in news reportage (e.g., Desmond & Danilewicz, 2009; 2009; Grabe & Kamhawi, 2006). One of the earliest examples is Soderlund et al. (1989) who conducted a content analysis of television news in Canada. Soderlund and colleagues revealed that female reportage appeared to be “softer” and more general than that of their male counterparts. More recently, Desmond and Danilewicz (2009) examined local news and found that female reporters were more likely to present human interest and health related stories, whereas male reporters tended to present political stories.

Although the concept of gender in news reporting has been explored for more than three decades, the majority of studies have focused on reportage at the *topic level*, rather than the *lexical level*. This is not to say that analysis of news reporting at the lexical level is rare. For example, O’Donnell and Todd (1980) compared prominent linguistic features of major British newspapers; and Ljung (1997) also used newspapers to assess the use of modals, relative pronouns, and sentence complexity. More recently, Haertl and McCarthy (2012) made a considerable development in lexical analysis of news reportage with their introduction of systematic computational corpus analysis. Specifically, the authors assessed news websites and demonstrated quantifiable differences in the lexical features between northern US border and southern US border local news reportage. Although clearly there is a history of lexical analysis of news reportage, to our knowledge there are no contemporary studies that explore the lexical underpinnings of gender in the news.

Taken as a whole, this study builds on a tradition of assessing gender differences of news topics but fills a gap in the literature by focusing on the linguistic features that may be indicative of gender. Specifically, we investigate news reportage so as to address the following primary research question: *Does a computational analysis at the linguistic level reveal topic differences between male and female news reportage? We further ask, What specific topics are revealed by this analysis?* To address our research questions, we formed the hypothesis that the language of male and female news reporters will have lexical differences which reflect established topic difference within news media (see Cann, 2001; Desmond & Danilewicz, 2009; Soderlund et al, 1989). For instance, we predicted that males would be more likely to feature “harder” topics (e.g. politics and crime) and females would be more likely to feature “softer topics (e.g., human interest, health and home (see also Armstrong, Boyle and McLeod, 2012).

Corpora

Our corpus comprises 142 online news texts taken from FOX News and MSNBC. The corpus was divided into Male ($n = 82$) and Female ($n = 60$) categories based on the reporter’s name and author-identified websites. Fox and MSNBC were selected for text collection because they are two of the major leading news cable networks. The two channels are also appropriate as they represent, respectively, what is widely perceived as the right and left wing manifestation of American cable news (Groeling 2008). The texts were all extracted over a two-week period from September 20, 2012 to October 4, 2012. Although larger and well-establish databases are available, current news stories were selected so that contemporary issues would be the focus. All texts were selected from the “U.S. news section” of the respective websites. To better establish confidence in the primary variables (i.e. Male and Female), the editors of the news websites were consulted for information concerning the writers’ contribution to the final text. In terms of age, all reporters were described as ranging from 30-40 years old. In terms of editing practices, the editors for both networks reported that they were in charge of such issues as correcting errors in spelling, grammar, and punctuation as well as errors in facts and in formatting. The editors reported that if the writers’ name appears in the by-line, it means that the news article was overwhelmingly written by that person. Given the exploratory nature of this initial investigation, the corpus of texts would appear to be a reasonable point of departure for a representation of gendered language features of news articles.

The Gramulator

In this study, we use the textual analysis system, the Gramulator (McCarthy, Watanabe, & Lamkin, 2012). The

Gramulator identifies key linguistic features within a contrastive corpus design. Specifically, in this study, the contrastive design is the identification of relative indicative lexical and topical features of Male reportage and Female reportage.

The Gramulator uses n-gram analysis to identify strings of indicative lexical features of one corpus relative to another. The major unit of Gramulator analysis is the differential bi-gram (or D-bigram). This unit is the most commonly employed across Gramulator studies (Min & McCarthy 2010; Stanchevici, in press; and for an extensive review, see Booker 2012).

Indices are created based on a procedure of machine differential diagnostics (MDD; McCarthy, Watanabe, & Lamkin, 2012). MDD allows for meaningful lexical features of a representative corpus to be identified through a process of relativity. The principle is that any discourse unit (e.g. a corpus of Male reportage) is best understood in the context of its contrastive corpus (i.e., Female reportage). The Gramulator's MDD process is established through the following major steps: 1) Calculate the weighted frequency of the designated lexical unit; and 2) Eliminate from consideration any lexical units that are characteristics of *both* corpora. In Step 1, designated lexical units (here, bigrams) are weighted according to their gross frequency across the corpus relative to their binary occurrence in documents. The final evaluation also considers the length of the document in which the lexical unit occurs (see McCarthy, Watanabe, & Lamkin 2012 for full details). In Step 2, designated lexical units (e.g., bigrams) that pass a threshold weigh of "high frequency" in *both* corpora are removed. The principle here is that *what is characteristic of both corpora is indicative of neither*. The bigrams that remain are therefore high frequency characteristics of only one of the contrastive corpora. These bigrams are deemed indicative and, collectively, they form the index designated for each category. Thus, in Gramulator nomenclature, *D-bigrams: Male (Female)* means an index of bigrams that are high frequency in the Male corpus but not high frequency (although may be present) in the Female corpus.

In recent years, the Gramulator has featured in many studies of contrastive corpora across a variety of contexts (Min & McCarthy 2010; Stanchevici, in press; see Booker, 2012 for an extensive review). This widespread and successful application of the Gramulator suggests it is a suitable tool for the current analysis.

Results

The corpora of Male and Female reportage were processed following standard Gramulator procedures (see Booker, 2012; McCarthy, Watanabe, & Lamkin, 2012). Thus, the corpus was first validated to establish confidence in its representation of the designated categories. Having

established corpus validity, the main Gramulator module processed the two corpora (Male and Female) to identify D-bigrams for Male (Female) and Female (Male). The analysis of the validation and the D-bigram assessment is detailed over the following sections.

Corpus Validation

Corpus validation is a critical element for demonstrating confidence in the distribution of collected data when conducting computational textual analysis approaches (McCarthy, Duran, & Booker, 2011). To establish this confidence, we used the *internal validation process* (IVP; Booker, 2012). The IVP is an assessment procedure devised for analyses that involve *evaluated* data and *evaluating* indices. For the Gramulator, the IVP is conducted as follows: 1) Randomly divide the data into training and test sets; 2) Use the training set data to form indices following the MDD procedure explained earlier; 3) Assess the test set data using the differentials that form the indices; 4) The derived indices (from the training data) together with the test set data make possible a series of six *means tests* (see below). If all six means are in the predicted direction then binomial probability suggests significance at the level of $p < .05$. Note that it is the accumulated effect of six means tests that is critical here rather than a t-test on any one (or more) comparisons.

The predicted directions, associated hypothesis, and results of the IVP are given below. Note that in Gramulator nomenclature, an analysis such as $Md \# Mi > Md \# Fi$ can be read as follows: the *Male data* set (Md), which is the test set data, as measured by (#) the *Male index* (Mi), which comprises the differentials derived from the male training set data, will produce a descriptive value greater than (>) the same *Male data* set (Md) as measured by (#) the *Female index*, which comprises the differentials derived from the corresponding female training set data.

1. **Md # Mi > Md # Fi.** Male data will provide higher values when using the Male index than when using the Female index. The Male index will produce higher values for the Male data if the differentials of the index that were produced from the Male training set are more consistent with the Male data than the corresponding differentials of the Female training set. The result supported the prediction (Male by Male: $M = 25.21$, $SD = 16.23$; Male by Female: $M = 21.02$; $SD = 12.20$).

2. **Fd # Fi > Fd # Mi.** Female data will provide higher values when using the Female index than when using the Male index. The Female index will produce higher values for the Male data if the differentials of the index that were produced from the female training set are more consistent with the Male data than the corresponding differentials of the male training set. The result supported the prediction (Female by Female: $M = 25.01$, $SD = 20.79$; Female by Male: $M = 24.27$; $SD = 12.20$).

3. **Fd # Fi > Md # Fi.** Female data will provide higher values when using the Female index than Male data when using the same index. The Female data will produce higher values from the Female index if the differentials from the Female index are more consistent with the Female data than they are with the Male data. The result supported the prediction (Female by Female: $M = 25.01$, $SD = 20.79$; Male by Female: $M = 21.02$; $SD = 25.42$).

4. **Md # Mi > Fd # Mi.** Male data will provide higher values when using the Male index than Female data when using the same index. The Male data will produce higher values from the Male index if the differentials from the Male index are more consistent with the Male data than they are with the Female data. The result supported the prediction (Male by Male: $M = 25.21$, $SD = 16.23$; Female by Male: $M = 24.27$; $SD = 12.20$).

5. **Md # Mi > Fd # Fi.** Male data will provide higher values when using the corresponding Male index than Female data when using the corresponding female index. The Male # Male assessment will produce higher values than the Female # Female assessment if the Male data and index are more consistent than the Female index and data. Here, greater consistency implies the default whereas the alternative form would likely be more diverse and correspondingly lead to lower consistency between evaluating index and evaluated test data. The result supported the prediction (Male by Male: $M = 25.21$, $SD = 16.23$; Female by Female: $M = 25.01$; $SD = 20.79$).

6. **Fd # Mi > Md # Fi.** Female data will provide higher values when using the Male index than Male data when using the Female index. The Female data will produce higher values from the Male index than the Male data from the Female index if the Male index is the more consistent. Here, greater consistency implies the default whereas the alternative form would likely be more diverse and correspondingly lead to lower consistency between trained index and test data. The index, being more concentrated than the data, would favor the default Male over the alternative Female. The result supported the prediction (Female by Male: $M = 24.27$, $SD = 12.20$; Male by Female: $M = 21.02$; $SD = 25.42$).

D-bigram Analysis of Topics

The Gramulator's Viewer module displays the derived D-bigrams relevant to the study: Male (Female) and Female (Male). These D-bigrams are manually sorted into themes in a manner not unlike naming factors in a principle components analysis. To establish initial confidence in the manual sorting process, three criteria need to be satisfied: (1) Themes need adhere to the theoretical gender construct described earlier; (2) Themes must form a *dyad*, such that both the Male and Female theorized element is present; and (3) there must be a significant difference in the D-bigram

deployment between the two genders. Our analysis revealed three dyads: (1) Male-investigators vs. Female-prosecutors, (2) Male-State vs. Female-Home/Education, and (3) Male-quantitative vs. Female-qualitative. The results of these dyads are given below. Note that in Gramulator nomenclature, a result such as (Male: 96, 30/82; Female: 20, 12/60; $p = .041$) can be read as *Males produced 96 total instances of the construct (i.e., the collected examples of D-bigrams that matched the theme), occurring in 30 of the 82 total files; whereas Females produced 20 total instances, occurring in 12 of their 60 total files; a Fisher's Exact Test suggests this difference to be significant ($p = .041$).*

Male-Investigators vs. Female-Prosecutors

A distinction between the theme of Male-investigators and Female-prosecutors supports research such as Armstrong, Boyle and McLeod (2012) and Desmond and Danilewicz (2009). That research suggests that men are more likely to report on intense, dynamic, active stories, whereas women are more likely to report on safer aspects in a more controlled environment. The result features 6 D-bigrams for *investigators* and 8 D-bigrams for *prosecutors*. Males appear to be significantly more likely to use *investigator* features than females (Male: 96, 30/82; Female: 20, 12/60; $p = .041$). Conversely, females appear to be significantly more likely to use *prosecutor* features than males (Female: 84, 19/60; Male: 36, 14/82; $p = .047$). The Male-investigators element included D-bigrams such as *police said, law enforcement, charged with, homeland security, the bill, the investigation*. By contrast, the Female-prosecutors element included D-bigrams such as *supreme court, same sex marriage, the court, convicted of, a judge, gay marriage, in court, sexual assault* (see Table 1 for concordance examples).

Male-State vs. Female-Home/Education

A distinction between the theme of Male-State and Female-Home/Education supports research such as Cann (2001), Desmond and Danilewicz (2009), and Soderlund et al. (1989). The research suggests that men are more likely to report on "harder" topics (e.g., politics, world affairs, and conflict), and women on "softer" topics (e.g., health and human interest). The result features 20 D-bigrams for *state* and 5 D-bigrams for *home/education*. Males appear to be significantly more likely to use *state* features than females (Male: 129, 26/82; Female: 20, 9/60; $p = .030$). Conversely, females appear to be more likely to use *home/education* features than males (Female: 52, 21/60; Male: 9, 8/82; $p < .001$). The Male-state element included D-bigrams such as *the election, barack obama, the federal, the senate, white house, the military, and the president*. By contrast, the Females-home/education element included D-bigrams such as *the family, the woman, a child, the couple, public school, and the students* (see Table 1 for concordance examples).

Table 1: Concordance examples of Male/Female categories for the three identified dyads

Dyad	Gender	Corpus Examples
Investigators/ Prosecutors	Male	jumped approximately 20 feet into the den, <i>police said</i> before rescuers could reach the man terrorist experts like sam kharoba to help <i>law enforcement</i> agencies to route [sic] out radical
	Female	same-sex couples wait for the <i>supreme court</i> to decide if it will hear one of five challenges the <i>supreme court</i> decide the question of <i>same-sex marriage</i>
State/ Home & Education	Male	<i>white house</i> risks complaints that president <i>barack obama</i> is anti-business from republicans <i>the military and veterans</i> vote could tip <i>the election</i> , iava is armed with the sorts of stats that
	Female	a state of anguish. <i>the family</i> has been broken in half by this tragedy debate nationwide over how to improve <i>public schools</i> . democrats and republicans have blasted
Quantitative/ Qualitative	Male	toyota priuses has travelled <i>hundreds of thousands of</i> miles in northern california where passwords were leaked online. soon after, <i>millions of</i> passwords from eHarmony and yahoo
	Female	the country looking for who was doing <i>the best</i> work and we found the ounce of prevention encouraged by polls showing they have <i>a good</i> chance of finally logging their first victory

Male-Quantitative vs. Female-Qualitative

A distinction between the theme of Male-quantitative and Female-qualitative supports Mulac, Bradac, and Gibbons (2001) and Hass (1979). That research suggests that men are more likely to favor quantitative language elements (e.g., sports, money, business, and time) whereas women are more likely to favor qualitative elements (e.g., politeness, expressive language, issues of home, family, feeling, and interpretation). The result features 10 D-Bigrams for *quantitative* and 3 D-bigrams for *qualitative*. Males appear to be significantly more likely to use *quantitative* features than females (Male: 100, 39/82; Female: 28, 17/60; $p = .024$). Conversely, females appear to be significantly more likely to use *qualitative* features than males (Female: 22, 16/60; Male: 7, 7/82; $p = .005$). The Male-Quantitative element included D-bigrams such as *hundreds of, thousands of, millions of, dozens of, lot of, most of, a few*. By contrast, the Females-Qualitative element included D-bigrams such as *the best* and *a good*. (see Table 1 for concordance examples).

Conclusions and Discussion

This study used the Gramulator to investigate the linguistic and topical features of male and female news reportage. Our analysis revealed evidence of gendered differences that broadly conform to an established gender divide. We found evidence that male reportage is more likely to focus on topics such as politics, crime, and the military; whereas, female reportage focused on issues such as home and education. We also reported evidence for a Male *quantitative* linguistic element and a Female *qualitative* element.

Although we provide compelling and extensive evidence for the validity of the corpus, we acknowledge that the

current study has limitations: Future research needs to increase corpus size, include international news, and examine gender across a wide variety of news domains. Additionally, we need to examine linguistic features across gender when the same topics occur. It is also possible that topics could differ depending on the source (e.g., Fox News only). Future research also needs to consider other approaches to topic extraction such as Latent Dirichlet Allocation Blei, Ng, & Jordan 2003) approach).

Despite these limitations, our study is of interest to anyone (especially writers) whose task is to effectively communicate information. Our study is of particular interest to journalist, editors, and current affairs communicators (e.g., bloggers) because it highlights how gendered linguistic and topical differences (unconsciously) permeate reportage. The study is also of importance to linguists and cognitive psychologist because it stands to better identify textual features of gendered language. Such insights may facilitate predictions regarding male and female communication, understanding, and perception.

Even with broad agreement that differences exists, the study of gendered language remains fraught with intense debate. The systematic identifying and assessment of these differences through computational, textual analysis is unlikely to end the debate but it may, at least, provide enough useful information for new and productive discussions to develop.

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