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Hanna Louise Landgrebe

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**INVESTIGATING THE RELATIONSHIP BETWEEN DATA DISPLAYS,
RHETORIC, AND READER RESPONSE IN TECHNICAL WRITING**

A Masters Thesis

Presented to

The Graduate College of
Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts, Writing

By

Hanna Landgrebe

July 2016

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**INVESTIGATING THE RELATIONSHIP BETWEEN DATA DISPLAYS,
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English

Missouri State University, July 2016

Master of Arts

Hanna Landgrebe

ABSTRACT

This study is meant to deepen the discussion Dragga and Voss began in “Cruel Pies” by exploring the connection between data displays and their ability to evoke or suppress emotional reactions in readers. It begins with a literature review of relevant discussions in ethics and technical writing, and then describes how readers responded to a series of news excerpts—some of which were paired with data displays or photographs—both by answering Likert scale questions and by thinking aloud and responding to written, open-ended questions. Though the quantitative data collected from the Likert scales is not robust enough to make any generalizations, the verbal responses indicated that readers’ emotional reactions were typically caused by specific interpretive lenses through which they viewed the excerpts. Data were not related to interpretative lenses that typically seemed to cause stronger emotional responses, but sometimes affected emotional intensity by helping or hindering readers’ understanding.

KEYWORDS: technical writing, ethics, intuition, rhetoric, visual rhetoric, data displays, information design, logos, ethos, pathos, emotion

This abstract is approved as to form and content

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TABLE OF CONTENTS

Introduction.....	1
Literature Review	9
Defining “Data Display”	10
The Rhetorical Power of Data Displays	10
The Debate on Ethics and Pathos in Data Displays.....	14
The Need for Empirical Inquiry in Ethical Decision Making	17
Methods	20
Participants.....	20
Materials	21
Procedure	25
Results and discussion	27
Quantitative Analysis.....	27
Qualitative Analysis.....	30
Conclusion	52
Data Displays	54
Photographs	55
Consequences for a Hypothetical Document.....	55
Future Studies	56
References.....	58
Appendices.....	62
Appendix A: Questionnaire Materials	62
Appendix B: ANOVA for Emotional Response.....	66

LIST OF TABLES

Table 1. Group Statistics.....	28
Table 2. Independent Samples Tests.....	29
Table 3. Responses Relating Excerpts to Politics.....	32
Table 4. Responses Relating Excerpts to Personal Experience	35
Table 5. Responses Indicate Sensitivity to Human Suffering.....	38
Table 6. Responses Indicate Previous Exposure Dulls Emotion	40
Table 7. Responses Assess Claims	43
Table 8. Responses Assess Presentation of Information	47

LIST OF FIGURES

Figure 1. Florence Nightingale's Rose Diagrams (1858).....	12
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INTRODUCTION

This paper was prompted by a debate between Sam Dragga and Dan Voss (2001) and Jean-luc Doumont (2002), who disagree on whether it is ethical, or even necessary, for data displays concerning human suffering to be accompanied by other visual and verbal details so that they might affect readers on a deeper emotional level. The debate can be broken into two arguments: a rhetorical argument over whether data displays intensify or dull reader emotions, and an ethical argument over whether or not technical writers should try to induce readers' emotions in certain rhetorical situations. Regardless of a writer's stance on the second argument, he or she must have some idea of how visual devices such as data displays actually affect readers before setting out to make an ethical document. After all, whether one wants to make readers feel or not, one must know which kinds of visual and verbal rhetoric to use and which to avoid. Rhetorical theories abound about how data displays affect readers, but research is rather limited on how these displays actually affect readers on emotional and rhetorical levels. While user testing can measure the emotional reactions of readers to specific documents, it does not provide a holistic picture for technical writers to use when formulating their ethical beliefs or standard practices. The purpose of this study is to gather new information on how data displays affect reader emotions in order to begin the process of creating a general understanding of how users react to different visuals that is based in empirical evidence as well as rhetorical theory. This information will be able to inform technical writers as they formulate basic ideas about the best ethical practices for using data displays and other visuals.

As an illustration of the need for empirical evidence on the rhetorical power of visuals, consider this hypothetical case study: Olivia is writing a technical report on domestic violence. Her purpose is to educate, to raise awareness, and, through increased awareness, to encourage widespread social change. She is debating the most effective way to present her findings, including what kinds of rhetorical devices to use. The most obvious choices are Aristotle's concepts of logos, ethos, and pathos, and Olivia could use any one of these or some combination thereof. She will almost certainly want to use logos and ethos, typically by filling the report with well-documented statistics and data displays, as it is widely accepted that the use of data displays in technical writing is rhetorical (Allen, 1996; Kostelnick, 1996; Richards, 2003; Brasseur, 2005; Kimball, 2006; Amare & Manning, 2007; Birdsell & Groarke, 2007; Gross, 2007; Hutto, 2008; Agostinelli et al., 2013). For example, Olivia might use a bar graph comparing the percentages of domestic violence victims in different age groups, or a choropleth map indicating high-density areas of domestic violence across the country. Including these data displays would help her audience understand which demographics in which communities are in the most need of assistance (logos); it would also show that she has done a significant amount of research and, therefore, establish her role as an authority on domestic violence (ethos).

If Olivia wants to employ pathos, however, she has some more thinking to do, as the role of emotional argument in technical documents is part of an ethical debate that has never been fully resolved. How she uses pathos, and whether she uses it at all, will depend largely on her personal beliefs: first, whether pathos is appropriate in a technical report, and second, what the most appropriate form of pathos might be. In this case,

Olivia decides that a report meant to enact change on behalf of those in need will be more effective if it elicits sympathy or horror from the audience, and that, as an advocate for victims of domestic violence, it is her responsibility to make the report as effective as possible. Her first instinct is to add pathos on a visual level by including black-and-white photographs of sad-looking people, possibly with visible injuries, because she has been taught that such illustrations are a quick and accessible way to convey feelings without imbuing the text with non-technical elements, which may detract from its perceived legitimacy. Or, depending on her target audience and the context of the report, Olivia could use carefully chosen but emotionally charged words, include details that her audience may identify with, add excerpts of dialogue, or manipulate the color scheme of the document to reflect the feelings she wants to elicit.

Let us examine Olivia's thought process so far: She knows from experience that two rhetorical strategies, logos and ethos, are standard in technical writing. Education, experience, and research have taught her that she can use data displays to enhance these strategies. Olivia's education and experience have also taught her that using photographs and a certain kind of language are effective ways to engage her readers' emotions, so she does not consider how she may already be unconsciously engaging their emotions with other elements of the document. Like other technical writers before her, Olivia has assumed that her conscious inclusion or exclusion of particular visual elements will influence her readers to react to the document in particular ways. Olivia has little evidence, however, to prove that the report will make people feel more strongly about domestic violence if she includes images in it. Likewise, she cannot know for certain that the data displays in the report will impact the audience only on a logical level and not an

emotional one. This is important to Olivia's initial ethical dilemma: her idea of what is right or wrong and her idea of what is appropriate or inappropriate in a technical document is based largely on how she thinks her readers will react to it. They may be moved to tears by photographs of beaten children, or they may be moved by the raw data indicating how many children are beaten daily in the U.S. and insulted that Olivia thought she needed a photograph to move them. Olivia cannot be sure of what the audience—or the majority of her audience—will react to because she does not have the data, but she thinks that she knows regardless. Her thoughts on ethics and appropriate content are guesses in the guise of common sense and common knowledge.

This issue is part of a bigger picture. Technical writers often take this common-sense approach to both rhetoric and ethics: they base ethical stances in their understanding of language and rhetorical theory, both of which are drawn from cultural norms rather than empirical data. Some prime examples include Katz's (1992) famous discussion of a Nazi memo and Dombrowski's 2009 discussion of several Nazi documents, including a chart explaining Nuremburg race laws and a photograph illustrating the proper way to measure facial features for a racial examination. Both Katz and Dombrowski explain exactly how the verbal and visual rhetoric of these documents work to distance both reader and writer from the subjects at hand (the institutionalization of mass murder and racism). Katz and Dombrowski agree that this use of rhetoric was both a product and a perpetuation of what Katz calls an "ethic of expediency," (p. 275). Dombrowski (2009) explains this concept with particular clarity: "The technical values of excellence, effectiveness, efficiency, and expediency came to replace many of the traditional social values of Germany.... What was technically possible came to be sought

almost for its own sake. The result is a circular sort of self-justification: What we can do, we should do, largely because we can do it” (p. 103).

Katz considers this ethic of expediency a central cause—if not *the* central cause—of the Holocaust, making the rhetoric that perpetuated it a grievous ethical failure on the part of memo-writers and information designers alike. (Dombrowski seems to accept Katz’s argument as truth and applies it in his own analysis of Nazi documents.) However, Katz and Dombrowski’s conclusions are drawn primarily from rhetorical analysis and classic rhetorical theory rather than contemporary research on the Holocaust, and this leaves their arguments weaker than they would be with more concrete evidence.

Ward (2009b, 2010) takes issue with Katz’s theory, and reevaluates the memo—and many other Nazi documents—in a different rhetorical situation, one where enactors of the Holocaust were moral agents trying to bring about a romantic, populist vision of Germany’s future promised by the Nazi regime. Ward further places the memo in the context of a political power-struggle: if the gassing vans were not more efficient, they could be discontinued, and control of Jewish policy (and Hitler’s favor) could be passed onto another organization. In this analysis, the rhetoric behind the memo was driven by a combination of self-interest and nationalism rather than a belief in expediency.

Ward (2009a) also analyzes a chart illustrating racial categories defined by the Nuremberg laws. Though he does not counter Dombrowski directly, Ward comes up with an alternate and, arguably, better-supported conclusion for a very similar instance of information design: rather than an ethic of expediency, the designer was motivated by an ethic of exigence—an intuitive co-construction of meaning between the designer and user to ensure the continuation of shared beliefs when confronted with exceptions to their

understanding of the world. In this case, both designer and user wanted to maintain the inferior status of Jews but also find an alternative to the lawless, anti-Semitic street violence that had taken place up to that point. The Nuremburg laws provided a more lawful way to perpetuate racial inequality, but were somewhat difficult to understand. The poster, in making the laws accessible to the public, built on the foundations of anti-Semitism and helped people continue practicing this racially-exclusive worldview in a way more acceptable to the public.

While Katz, Dombrowski, and Ward all have valid arguments, Katz and Dombrowski's arguments are based more in rhetorical theory than history. Ward bases his arguments on recent and relevant historical analyses of the Holocaust as well as rhetorical and ethical arguments. Because he can draw so heavily from cultural context, and because he points out that Katz's sources are considered out-of-date by Holocaust scholars, Ward is able to cast significant doubt on Katz's argument and, by extension, Dombrowski's. Though Katz and Dombrowski are far from unreasonable, their arguments are based on incomplete evidence, and their analyses of ethics are therefore flawed.

In another recent example of an argument based on much theory and little evidence, Dragga and Voss (2001) claim data displays in technical writing distance both writers and their audiences from human suffering. Again, their analysis (which is discussed in greater depth in the literature review) is based entirely on rhetorical theory and can easily be countered by arguing that data displays, by increasing understanding, should intensify reader responses rather than limit them. Alternately, one might argue that unadorned information is powerful enough that audiences will connect with it

automatically. This is not to say that rhetorical theory is useless or that technical writers' personal judgments are irrelevant—indeed, a technical writer who cannot gauge reader reactions with at least some accuracy can hardly be effective at his or her job. However, as illustrated by the discussion among Katz, Dombrowski, and Ward, rhetorical theory alone is not enough to make an argument for what *is*; it can make arguments only for what *should be*, at least as far as reader reactions are concerned.

To summarize, rhetorical theory is too limited a tool to make generalizations about reader reactions on which ethical stances can be taken. This is especially true because we are, to a certain extent, preconditioned by our culture to respond to writing in different ways, and that cultural conditioning is not consistent across time and place. Asimov did not write like Darwin, but they were both undoubtedly successful technical writers. The memo Katz examines serves as another relevant example; because the Holocaust is so embedded in our knowledge of history and our discussions of ethics, students today react to the memo with horror and disgust despite its carefully constructed rhetoric. As culture and public consciousness continue to change, the ways our readers react to upsetting technical content in various formats may also change. The way we present this information may need to change as well, and we will not always be able to rely solely on our own judgment, or on theories of persuasion developed thousands of years ago. In this case, the best way to understand reader reactions is to ask our readers, not Aristotle.

The purpose of this paper is to deepen the discussion Dragga and Voss began by reviewing relevant discussions in technical writing and ethics, and then exploring what connections data displays may have to the pathos aspect of rhetoric—their ability to

evoked or suppressed emotional reactions in readers. By providing readers with excerpts of informational writing, which are occasionally accompanied by visuals, and then collecting quantitative and qualitative feedback on their reactions to the excerpts, we can begin to assess existing ideas of how rhetoric works in data displays, and whether or not they really do have the power to distance readers and writers from human subjects. Admittedly, usability studies may be able to determine this for individual documents. However, a series of focused academic studies could help technical writers obtain a broad understanding of how visual rhetoric functions—one that is based in empirical evidence as well as rhetorical theory. This understanding would provide writers with a more informed foundation for their ethical codes and help them to make successful rhetorical decisions even when usability studies are impractical.

LITERATURE REVIEW

Up to this point, data displays have been attributed two kinds of rhetorical power: logos and ethos, the kinds of rhetoric most used in most technical writing. However, much of this attribution is based on logical thought and interpretations of rhetorical theory rather than actual user feedback. This lack of feedback is a problem for Dragga and Voss (2001), who assert that data displays distance readers from upsetting content, and that pathos should be employed as a countermeasure to this distance. There are no studies on this subject to reference, and Dragga and Voss support their argument with rhetorical analysis rather than by collecting user feedback. As a result, they do not have evidence to show that their conclusion is correct or widely applicable. Likewise, Jean-luc Doumont (2002), who would argue against Dragga and Voss's demand for more emotional data displays, argues only with theory and personal belief. This lack of empirical research becomes a problem for writers who do not actively take part in the discussion as well—they also need to use data displays, and one would hope that these writers also attempt to write ethically. However, because the effect of data displays on readers' emotions has been the subject of so little empirical study, most ideas about the ethical and appropriate use of data displays can easily become muddled by differing perceptions of the world. Writers make ethical decisions based on their worldviews, which are often incomplete, so they use intuition to navigate their senses of right and wrong. Experts agree that intuition can serve as a starting point for ethical exploration; for technical writers, the next step is to begin gathering evidence from readers to deepen our understanding of how rhetoric really affects readers and users (Steinberg, 2011; Szigetzi, 2013; Sunderland, 2014).

Defining “Data Display”

“Data display” belongs to a continuum of terminology that is regularly altered and re-defined to fit very specific individual ideas. Before truly beginning this discussion, then, the term “data display” must be defined as it will be used in this paper. In a study of scientific visuals, Richards (2003) uses three categories to describe informational visuals: “raw data, or data that (has) been interpreted loosely for the viewer; summarizing data, or raw data that (has) been simplified further; and tendential data, or data that present(s) a clear trend” (p. 190). For example, *raw data* might refer a set of survey responses detailing instances of domestic abuse for every country in Europe over the past year. This data could be *summarized* in tables that organize survey responses by month and by category. The data might then be organized into a *tendential* graph that shows certain kinds of domestic violence peak around high-stress holidays. In this paper, “data displays” refers largely to tendential data and, to a lesser extent, summarizing data. Data displays organize points of data so that readers can draw conclusions for themselves or, as is more often the case, so that readers can clearly see why writers draw certain conclusions, and to prove that these conclusions are not baseless.

The Rhetorical Power of Data Displays

Part of what makes data displays so rhetorically powerful is that they apply to multiple rhetorical strategies in multiple ways. Their application to the Aristotelian concepts of logos and ethos has been especially well established in the field of technical writing.

Logos. An argument that does not make sense does not work, so we naturally distrust arguments we do not understand. Conversely, when we do understand an

argument, we are more inclined to agree with it. Successful data displays help our audiences understand our arguments in a variety of ways. In *The Visual Display of Quantitative Information*, Edward Tufte explains that, to be effective, data displays must accomplish the following:

- Make large data sets coherent
- Encourage the eye to compare different pieces of data
- Reveal the data at several levels of detail, from a broad overview to the fine structure (1983, p. 13)

In short, good data displays help readers understand large data sets in multiple ways. Stephen Few (2012) emphasizes a similar point: successful data displays highlight important information and organize it for the audience to access easily. Professor Lee Brasseur (2005) provides a practical example of how these goals are achieved in Florence Nightingale's second rose diagram (Figure 1), which compared the number of deaths by disease in the Crimean War to the comparatively small numbers of deaths by wounds and other causes. Nightingale used color and placement in the rose diagrams to *organize* her data into clear categories; she *highlighted* the large number of deaths by disease by placing that category on the outside of each wedge where it would be the most visible (Brasseur, 2005).

Nightingale's diagrams also support the logic of her argument by acting as a representation of her evidence, or what Alan Gross (2007) calls a "statement," which is almost valued as evidence itself (p. 421). Of course, providing the individual death

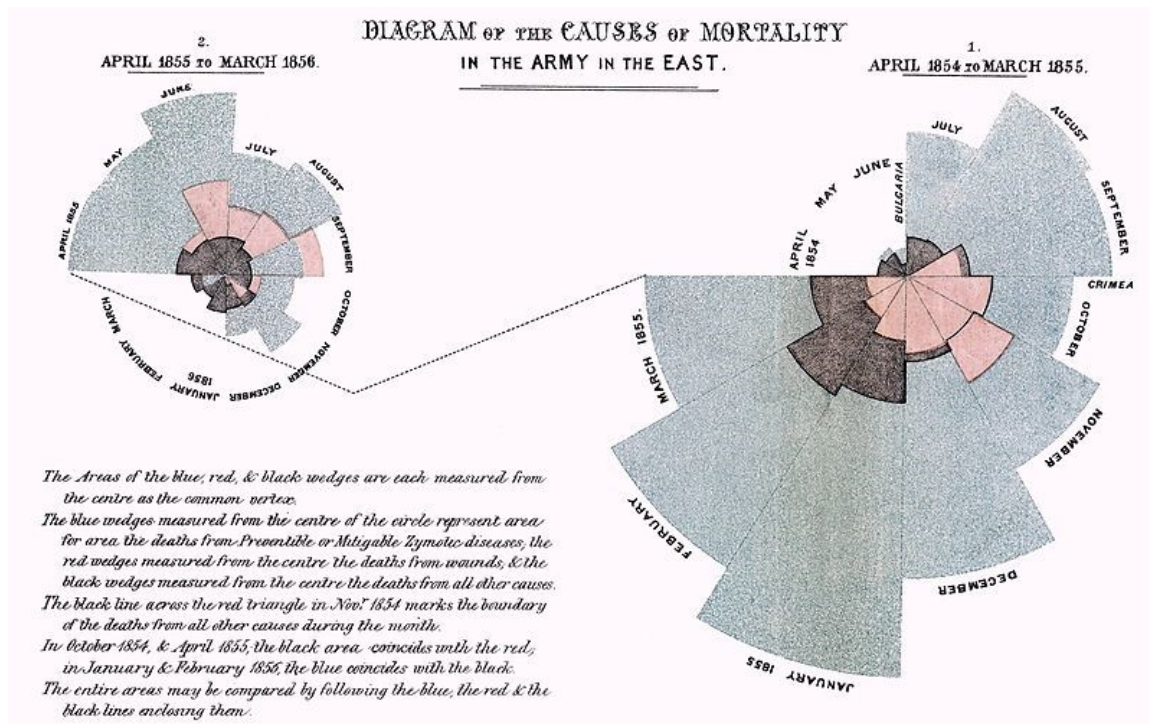


Figure 1: Florence Nightingale's Rose Diagrams (1858)

reports (raw data) to her readers would have been inefficient. Instead, Nightingale created her tables and rose diagrams as more comprehensible stand-ins that hold as much logical weight as the raw data; words shape her arguments, but the diagrams are her *proof*. Without the diagrams, then, her argument loses much of its logical effectiveness.

Ethos. Perhaps because of the status of data displays as representative evidence, Richards (2003) suggests that their mere presence may enhance the perceived legitimacy of an author or his or her work. However, data displays affect the view of the document and the author beyond their ability to establish legitimacy. Experts agree that data displays are an important part of global document design, which is inherently rhetorical; the combination of headings, body text, graphic elements, and decorative elements throughout an entire document work together to appear content-heavy or light, inviting or authoritative, organized or confusing (Kostlenick, 1996; Amare & Manning, 2007; Hutto,

2008). Amare and Manning (2007) demonstrate the impact of design by comparing the difference between a dense paragraph and text divided by headings and bulleted lists to the difference between a satellite image and a map. Like the single paragraph, the satellite image is intimidating and unstructured: there is too much information in one space and it is difficult to process. The more structured text, like the map, is inviting; the information has been filtered for relevance and sorted to aid the reader's understanding. For much the same reason, a dense document may appear more readable with the addition of a well-chosen data display, which can replace clumsy sentences with more easily processed visual representations of trends and data points. David Hutto (2008) also shows that data displays can enhance ethos by resonating with audience values. He gives the example of two journals: *The Journal of Cell Biology* and *The New England Journal of Medicine*. *The Journal of Cell Biology* focuses on research in a developing field where "credibility is partially dependent on showing familiarity with current technology and trends" (Hutto, 2008, p. 116). To show this visually, the journal uses a large variety of creative and often colorful data displays. In contrast, *The New England Journal of Medicine* focuses on applied medicine and does its best to portray a gravitas worthy of the responsibility practicing doctors have toward their patients. To achieve this gravitas, *The New England Journal of Medicine* uses a more limited color palette and less variety in data displays.¹

Establishing Rhetorical Theories. Much of this research, though well established, is interpretive. Kostelnick (1996), Hutto (2008), Richards (2003), and Amare and Manning (2007) all use their own sense of aesthetics and understanding of visual and

¹ The term Hutto used was "graphics," which could refer to visualizations other than data displays. I visited the websites of these two journals to verify that his statement also applies to data displays before using the more specific term.

rhetorical theories to explain the design decisions technical writers make—usually informed by a combination of intuition and training—and how they expect people to perceive the visual effects these decisions produce. Similarly, Alan Gross (2007) uses gestalt theory to explain his system of understanding the things we already see. For example, Gross describes what he calls a “superstructure”—the background grid in most tables and graphs—in terms of the figure-ground principle: the superstructure is the ground against which the reader perceives various figures—the bars, lines, or data points in any table or graph (p. 191). The creation of this system, however, is based on his own experience and thought process rather than empirical data. And this makes sense. Logical aspects of logical arguments are deductible by nature. Though these discussions of logos and ethos differ, they do not conflict. Most of these authors, when creating and using data displays, would likely make similar decisions for similar reasons. Pathos, however, is neither well established as a rhetorical strategy for technical documents nor deeply analyzed in connection with data displays, and there is a distinct lack of consensus on how it can and should be applied. When technical writers begin to examine the role of pathos in these contexts, the need for empirical research becomes clearer.

The Debate on Ethics and Pathos in Data Displays

In 2001, Dragga and Voss argued that charts and graphs, standard fare for technical communicators, are not appropriate for portraying human fatalities—at least, not by themselves. Data displays such as these distance the reader from the suffering of the victims and, in doing so, deny the victims and the reader a portion of their humanity. Dragga and Voss (2003) clarified this point of view in a later article by directly linking the missing “human element” in accident reports to the feelings of those who read

accident reports. In short, being human, we should have an emotional reaction when reading about human suffering. It is *right* for readers to have this reaction and *wrong* for technical communicators to deprive them of it through the use of language and visuals that, much like the Nazi memo studied by Katz, deny victims of tragedy an acknowledgment of their humanity. According to Dragga and Voss, the necessary data displays in Olivia's report should be augmented with details that cause her readers to empathize with people who are victims of domestic abuse. Such empathy-inspiring details may include photographs or illustrations, or she could even draw from Dragga and Voss's 2003 example and categorize abuse victims by their familial relationships: mothers, fathers, daughters, and sons.

Of course, this idea has not been universally accepted among technical communicators. Dragga and Voss published their 2001 article in volume 48 of *Technical Communication*. The next volume included a section where five of seven technical communicators commented on the article and took issue with its premise (Hayhoe, 2002, pp. 9-15). In addition, Jean-luc Doumont (2002) responded to Dragga and Voss's article with one of his own. Much like the commentators, Doumont (2002) holds that adding humanizing details, which might cause the readers distress, is both unnecessary and cruel; he is particularly against the use of illustrations and photographs, which he says contain extraneous details that distract from whatever point the data displays are supposed convey. For instance, if Olivia pairs a graph about the prevalence of domestic abuse with a photograph of a ragged little girl who is, supposedly, an abuse victim, her readers may be distracted by wondering specifically where in the world the little girl is or what kind of abuse she is enduring. They may think that her features appear Chinese and, despite

Olivia's equal focus on other areas of the world, begin to subconsciously associate child abuse with China, or wonder why Olivia would choose an image of someone of this particular ethnicity. The readers may even think that Olivia is exploiting the child for the sole purpose of manipulating their emotions. These thoughts would, supposedly, distract Olivia's readers from actually processing and comprehending the graph and any accompanying text. The strength of data displays, Doumont says, is in the stripping away of contextual details to reveal an abstract concept; adding those details back in with a picture or a few choice words is as counterproductive as it is cruel. The implied message here, and among the commenters in volume 49, is that data involving human suffering and death is already upsetting; no one needs a technical writer to make it worse.

Both sides of the argument on pathos and data displays are based firmly on what the authors believe is right and what they believe a data display is capable of doing (though Doumont also uses well-established theories to justify his case). Consequentially, both arguments have the same weak point: the arguers fail to critically analyze the worldviews their ethical arguments are based on—or, rather, a specific part of their worldviews. Both ethical arguments are driven by arguers' ideas of how readers will feel when confronted with content that concerns human suffering and is framed by a specific set of visual rhetorical devices. These ideas, however, seem to come from Dragga, Voss, and Doumont's intuition and experience alone, as they make their arguments with rhetorical analysis rather than empirical evidence. Intuition is undoubtedly an important part of writing; we often use it to determine appropriate content, tone, and stylistic decisions, but it should be used as an aid in formulating our ethical beliefs, not as our primary means of determining right and wrong.

The Need for Empirical Inquiry in Ethical Decision Making

Ethics are often, if not always, based in beliefs about the world. Utilitarianism, for example, is based in the pursuit of the greatest good for the greatest number of people; this idea presupposes that the value of one person's welfare can and should be measured against the value of other people's welfare. However, this ethic would hold little value to one who denies the measurability of individual worth and wellbeing or one who believes personal loyalties are more important than loyalties to society. Likewise, proponents of the Golden Rule must believe that all people deserve equal treatment, but this concept would not matter to those who believe that people of certain classes genuinely deserve better privileges than people of lower classes.

These assumptions are made not only for philosophical stances, but also for specific ethical arguments. For example, Markel (2009) claims that loyalty cannot be considered a duty in the workplace for two reasons:

1. A duty is an obligation, and you cannot require someone to have certain thoughts or feelings.
2. Loyalty, by definition, calls for acts beyond workplace requirements, and "it is illogical to say that loyalty is a duty above and beyond the call of duty" (p. 135).

Both of these arguments are based on explicit assumptions that, if proven false or inconsistent, would render each argument irrelevant. If one believes that employers have every right to demand feelings such as gratitude from employees, then loyalty, which is partially defined by such feelings, may be considered a duty. Likewise, if one's definition of loyalty does not include actions beyond what the workplace requires, Markel's second argument is rendered irrelevant. This connection between what is believed to be true and what is believed to be right also holds for Dragga and Voss. Their belief that technical writers should be ethically moved to include elements of pathos with data displays stems

from the belief that the implicit rhetoric of data displays distances readers from their own human feelings. If someone could prove beyond a doubt that data displays create no such distance, or that data displays sometimes intensify readers' emotions, this argument would not hold.

Ideally, then, technical writers who wish to make informed ethical decisions should remain conscious of the connections between what they believe to be true and what they believe to be ethical. Unfortunately, multiple studies have proven that this has not been the case so far. In 1997, Sam Dragga interviewed 48 technical writers on how they dealt with ethical dilemmas: most of these writers learned from personal experiences and used intuitive processes; none of them used an analytical heuristic. In 2009, Amare and Manning conducted interviews with three journal editors and discovered much the same thing: "The editors...typically followed their own sense of what was ethical and consulted formal policy statements only rarely" (p. 299). In 1999, Faber added to this conversation by proving an excellent critique of how two prominent discussions of ethics take intuition for granted by assuming both that everyone's intuition leads them to the same conclusions and that intuition is an inherent understanding of right and wrong rather than learned behavior. Faber takes issue with the second assumption especially, claiming that intuition is actually the "naturalization of dominant values and beliefs," and that relying on intuition inhibits moral development by preventing people from examining the cultural ideas that their values are based in (p. 190). Faber is neither the only one to hold this critique, nor the most recent. Shari Steinberg (2011), Andras Szigeti (2013), and Mary Sunderland (2014) all advocate for the critical evaluation of intuitive ethics in and out of the classroom; rather than telling students what is right and wrong, they want

students to analyze their own feelings and determine *why* something is right or wrong. Technical writers need to do the same.

For technical writers, a good place to begin evaluating our ethical use of craft is by examining the things we think we know about how rhetoric interacts with reader emotion. Data displays in particular would benefit from such an examination because so much of what we think we know about the effect of data displays on our emotions is assumed. Studies involving real user feedback have largely focused on what makes various displays efficient (Siegel & Fischl, 1971; Yamani & McCarley, 2010; Duesbery, Werblow, & Yovanoff, 2011; Agostinelli et al., 2013). What we do not have is significant data about the emotional impact of data displays. Is the information enough to make us feel something, or does it have to be presented in a certain way? One might presume that data we trust is more likely to make us feel something than data we are skeptical of; does the legitimizing factor of data displays therefore make them an emotional trigger? Or do they, as Dragga and Voss argue, allow us to distance ourselves from the humanity behind so many statistics? Unless we have user-centered studies to draw from, our ethical decisions will, at best, be ethical guesses. This study is meant to begin the process of discovering how much technical documents that include data displays affect emotions, and how data displays affect reader perceptions of the text.

METHODS

In this study, participants gathered from Missouri State University provided a combination of written and oral feedback on a variety of excerpts from real technical documents. This study was approved by the Missouri State University Institutional Review Board (February 9, 2016; approval# 16-0274).

Participants

Participants were recruited from Missouri State University because it was a convenient and accessible source of volunteers. Four faculty members were recruited through personal emails, and thirteen students were recruited through word of mouth and postings on their class websites. Students were not filtered by major, class standing, gender, ethnicity, or age; anyone who volunteered could participate. Undergraduates were specifically requested because they were likely to have less experience reading technical content and data displays. Faculty members were selected for the opposite reason: they were more likely to have experience reading technical content and data displays, and more practice at analyzing them. Experience has been proven to have an impact on people's ability to read different kinds of data displays effectively (Duesbery, Werblow, and Yovanoff, 2011); it is likely that experience also affects readers' emotional reactions to data displays. Ensuring a mixed level of experience in the participant sample was meant to provide more balanced feedback rather than feedback from a single demographic.

While the limited number of participants prevented generalizable conclusions from being drawn from the study, it also meant the limited time available could be used

to gain more insightful feedback. Having fewer participants left time to collect and analyze oral feedback and written responses to open-ended questions (a much slower task than tallying a mass of electronic survey results). This study was meant to examine not only how much data displays impact the participants emotionally, but also how and why they might impact the participants, to what extent the participants are aware of this impact, and what role Aristotle's pillars of rhetoric play in this process. Qualitative feedback is necessary for such an examination.

All participation was voluntary. Emails and class postings on Blackboard, which were used for recruitment, indicated only that the study was concerned with technical writing and emotion; at no point were the participants made aware that the purpose of the study was to gauge the impact of data displays. This was meant to prevent participants from giving feedback on how impactful they *thought* the data displays should be, as people's self-perceptions are not always parallel to their actual attitudes.

Materials

Data were collected from the participants with a questionnaire consisting of seven excerpts from four news articles and one technical report (see Appendix A). Though journalism and technical writing are widely considered to be separate fields, they share several core qualities. Good journalism is factual and honest; it helps readers understand new information. Good technical writing should do the same, and these similarities seemed sufficient for this study to draw information that might be useful to both fields from reactions to news articles. In fact, journalistic writing samples are especially appropriate for this study because this kind of writing is so widely used and because it often addresses emotionally triggering subjects. If ever there were a need for writers to be

aware of how visual rhetoric impacts their readers' emotions, it would be in journalism. The technical report, the *Global Slavery Index*, is similar to journalistic writing in that it is meant to educate a broad audience rather than a select few. In fact, it has much the same purpose as Olivia's hypothetical report, and, arguably, many news articles: to facilitate change through widespread awareness. Therefore, the writers of this document also had to make ethical decisions based in their understanding of effective rhetoric.

Each excerpt was originally paired with a visual (a photo or data display) pulled from the same source as the excerpt. Though each participant read all seven excerpts, one or more visuals were systematically omitted from each questionnaire. For example, the data display for excerpt 2 was included in questionnaires 1, 3, 5, and 7, but left out in questionnaires 2, 4, and 6. This allowed the effect of excerpt 2 minus a data display with the effect of excerpt 2 and a data display. The data displays were not shown alone because this rarely happens in technical documents, and because the purpose of the study was to test how displays may affect reader emotions in the contexts in which they are typically encountered.

Accounting for Factors That May Affect Results. There is a possibility that using different subject matters could have changed the outcome of this study because the impact an additional photograph or data display has on a reader may depend on that reader's previous investment in the issue. This possibility was mitigated by selecting material relating to subjects that are relevant and highly discussed: mental health, the migration crisis and Syrian war, world slavery, and gun violence. Ideally, these issues, being relatively high-profile and associated with public debate, would be similarly impactful.

There is also a possibility that differing tones in the text could elicit duller or more intense emotional reactions from participants. To minimize the chance of this happening, each excerpt was purposefully selected to have a fairly uniform tone typical of technical documents: factual and straightforward. The first paragraph of excerpt 2, an exception to this rule, was included to provide context necessary to understand the rest of the excerpt:

“KPOVÉ, Togo — The church grounds here sprawled through a strange, dreamlike forest. More than 150 men and women were chained by the ankle to a tree or concrete block, a short walk from the central place of worship. Most were experiencing the fearsome delusions of schizophrenia. On a recent visit, some glared, while others slept or muttered to themselves. A few pushed to their feet and gestured wildly, their cries piercing the stillness.

“Every society struggles to care for people with mental illness. In parts of West Africa, where psychiatry is virtually unknown, the chain is often a last resort for desperate families who cannot control a loved one in the grip of psychosis” (Carey, 2015).

Focusing on Suffering. It is also worth noting that the information in these excerpts and the emotional responses expected from them are entirely negative. This is partly because the ethical discussion among Dragga, Voss, and Doumont, which prompted the present study, focused on data displays about human suffering. Indeed, the use of visual rhetoric to make readers feel *good* could arguably be considered a separate discussion requiring a separate investigation. Additionally, it is possible that data displays influence positive emotions slightly differently than negative emotions. Investigating excerpts that elicited only negative emotions helped the study maintain a focused, manageable scope.

Including Photographs. Excerpts 1 and 2 were paired with photographs rather than data displays (Nordland, 2015; Carey, 2015). Because photographs are so widely accepted to be emotional stimuli that they are regularly used in scientific studies of

emotion (Banks, Eddy, Angstadt, Nathan, and Phan, 2007; Bernston, Bechara, Damasio, Tranel, and Cacioppo, 2007; Hamann, Hoffman, and Kilts, 2002), the photographs were meant to be used as a measuring stick. Comparing the difference that the photographs make in emotional intensity with the difference data displays make in emotional intensity was meant to do one of two things: either begin to confirm the assumption that photographs are more emotionally powerful than data displays, or begin to accumulate proof to contradict that assumption. Instead of determining only whether data displays were very impactful or minimally impactful, the study would ideally determine whether data displays in excerpts 3-7 were *more impactful than the photographs in excerpts 1 and 2*, *less impactful than the photographs in excerpts 1 and 2*, or *equally impactful as the photographs in excerpts 1 and 2*.

Choosing Data Displays. Excerpts 3 and 4 come from the *Global Slavery Index*, an annual report and interactive data display published by the Walk Free Foundation (2014). Excerpt 3 describes conditions that contribute to the prevalence of slavery in Syria, while excerpt 4 describes how vulnerable populations are typically exposed to slavery in the United States. Each of these is paired with a choropleth map that shows slavery rates around the world. A color range of light yellow to bright red indicates the relative severity of the issue (with red indicating the most severe slavery situations based on a combination of statistics, cultural factors, and government policies). These maps have the advantage of being relevant to the participants: The U.S. is relevant because the study participants were attending or working in a U.S. school, while Syria has been at the forefront of much recent news and debate, including the policies of upcoming electoral candidates.

Excerpts 5, 6, and 7 come from *Washington Post* articles on gun violence;. Excerpt 5 compares gun-related deaths to other causes of death (Swanson & Guo, 2015). Excerpt 6 compares causes of gun-deaths in older people and younger people (Swanson & Guo, 2015). Excerpt 7 shows the increasing number of mass-killings in the U.S. over the past years (Ehrenfreund, 2015). These displays are also relevant to current politics (and policies that are prone to causing heated discussions). They consist of two line graphs and one bar graph (see Appendix A).

Procedure

Participants were interviewed individually at times and places determined by their convenience. They were given questionnaires containing seven excerpts from real articles and reports. Before opening the questionnaires, participants were instructed to voice their thoughts aloud as they read each excerpt, and then to answer a set of written questions relating to each excerpt.

Because it was uncertain whether previous knowledge might have an effect on emotional responses, the following questions were included:

1. Were you previously aware of this issue? Circle one: Yes Somewhat No
2. Were you previously concerned about this issue? Circle one: Yes Somewhat No

The other questions included for each excerpt focused on the intensity and causes of emotional responses:

3. On a scale of 1-7, with 7 being the most intense, rate your reaction(s) to this information by circling the appropriate number for each emotion.

Not Horrified	1	2	3	4	5	6	7	Horrified
Not Angry	1	2	3	4	5	6	7	Angry

Not Sad 1 2 3 4 5 6 7 Sad

Not Disturbed 1 2 3 4 5 6 7 Disturbed

4. Do you feel anything not listed above? If so, how do you feel?
5. Why do you think this is your reaction?

Participants were encouraged to keep thinking aloud as they answered the written questions; these comments were recorded and saved as video files. The think-aloud part of the procedure was meant to gather information about how participants perceived the excerpts they were given, while the written portion was meant to measure the emotional impact of the excerpts on each participant.

RESULTS AND DISCUSSION

Both quantitative and qualitative results were collected from this study.

Quantitative results were drawn from responses to Likert scale questions (in the Methods section, see Materials) in which participants were asked to rate the intensity of their reactions to the excerpts provided. Qualitative results were drawn from verbal feedback and revealed recurring themes that seemed to affect the intensity of the participants' emotions.

Quantitative Analysis

For each of the seven excerpts, independent samples *t* tests were conducted to determine whether participants who saw text paired with a corresponding visual stimulus (a photo or data display) experienced more or less intense emotion than participants who saw only text. After reading an excerpt, participants rated their responses to that excerpt on Likert scales measuring the intensity of four distinct emotions: horrified, angry, sad, and disturbed. Ratings for these distinct emotions were averaged to find a mean indicating the intensity of emotional response for each group—the group that was exposed to a visual stimulus and the group that was not exposed to a visual stimulus. (Note that members of these groups did not remain consistent for each excerpt.) These average emotional intensity responses were compared for each excerpt.

Groups that saw a stimulus were not consistently more or less emotional than the groups that did not see a stimulus (see means in Table 1). The difference between the emotional responses for the group that was exposed to a visual stimulus and the group that was not exposed to a visual stimulus was not statistically significant for any excerpt;

as can be seen in Table 2, there were no cases where Sig. ≤ 0.05 . However, the data is not robust enough to draw generalizable conclusions from these findings and may have turned out differently if the study had been structured in such a way that t tests for individual excerpts could have been combined. Unfortunately, in the current study, combining t tests would have caused some participants to be counted twice.

Table 1: Group Statistics

	Was a visual stimulus present?	N	Mean	Std. Deviation	Std. Error Mean
Emotional response for excerpt 1 (photo)	Yes	8	4.625	1.885	0.666
	No	9	4.389	1.431	0.477
Emotional response for excerpt 2 (photo)	Yes	10	5.350	1.573	0.497
	No	7	5.678	1.760	0.665
Emotional response for excerpt 3 (data display)	Yes	9	6.125	1.118	0.373
	No	8	5.343	1.762	0.623
Emotional response for excerpt 4 (data display)	Yes	6	5.000	1.458	0.595
	No	11	5.432	1.662	0.501
Emotional response for excerpt 5 (data display)	Yes	10	4.575	1.620	0.512
	No	7	5.214	2.038	0.770
Emotional response for excerpt 6 (data display)	Yes	7	4.428	1.305	0.493
	No	10	5.000	1.878	0.594
Emotional response for excerpt 7 (data display)	Yes	7	6.000	1.495	0.473
	No	10	5.286	1.590	0.601

Additionally, a one-way ANOVA was conducted for each excerpt to determine whether or not previous knowledge of any issues addressed in the excerpts affected participants' emotional responses (see Appendix B). Though the data is not robust enough to make a concrete statement, the tests did not seem to suggest that previous knowledge has a significant effect on emotional response.

Table 2: Independent Samples Tests

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Emotional response for excerpt 1 (photo)	Equal variances assumed	1.642	0.220	0.293	15.000	0.774	0.236	0.806	-1.482	1.954
	Equal variances not assumed			0.288	13.021	0.778	0.236	0.820	-1.534	2.006
Emotional response for excerpt 2 (photo)	Equal variances assumed	0.201	0.661	-0.404	15.000	0.692	-0.328	0.813	-2.062	1.405
	Equal variances not assumed			-0.396	12.070	0.699	-0.328	0.831	-2.137	1.480
Emotional response for excerpt 3 (data display)	Equal variances assumed	3.081	0.100	1.105	15.000	0.286	0.781	0.707	-0.725	2.288
	Equal variances not assumed			1.076	11.605	0.304	0.781	0.726	-0.807	2.369
Emotional response for excerpt 4 (data display)	Equal variances assumed	0.001	0.975	-0.533	15.000	0.602	-0.432	0.810	-2.159	1.296
	Equal variances not assumed			-0.555	11.673	0.589	-0.432	0.778	-2.132	1.269
Emotional response for excerpt 5 (data display)	Equal variances assumed	0.311	0.585	-0.721	15.000	0.482	-0.639	0.887	-2.529	1.250
	Equal variances not assumed			-0.691	11.042	0.504	-0.639	0.925	-2.675	1.396
Emotional response for excerpt 6 (data display)	Equal variances assumed	0.617	0.445	-0.693	15.000	0.499	-0.571	0.824	-2.328	1.185
	Equal variances not assumed			-0.740	14.996	0.471	-0.571	0.772	-2.217	1.074
Emotional response for excerpt 7 (data display)	Equal variances assumed	0.241	0.630	0.945	15.0000	0.360	0.714	0.756	-0.897	2.326
	Equal variances not assumed			0.934	12.525	0.368	0.714	0.765	-0.944	2.373

Qualitative Analysis

The qualitative analysis was begun by searching for comments that indicated intense emotional reactions and dull emotional reactions. However, it quickly became clear that responses were more nuanced and that intense or dull reactions may be caused by multiple factors. For example, while participants sometimes indicated the strength of their emotions verbally, they also showed stronger emotional reactions by using an assertive or upset tone of voice and making decisive statements. This was apparent in many responses that made explicit political references. Participants also expressed emotion and strong opinions when confronted with human suffering, though it quickly became clear that reactions to suffering usually came from one of two sources: empathy for specific situations gained from personal experience and a more general response to other peoples' pain.

In contrast, several participants made explicit statements about not having strong emotional reactions because of their previous exposure to a topic. Others indicated less-intense responses with more relaxed and thoughtful demeanors. These participants were often critiquing the excerpts in some way and were more likely to speak in terms of their own perspectives (“I think, “I wonder,” “I feel”) than to present their opinions as facts. Those who assessed the excerpts either addressed the content or the verbal and visual ways in which the content was presented.

The qualitative responses have been organized into tables. Many responses include more than one theme and have been dissected to reflect this. For example, if the first participant's response to question 3 involved references to both politics and personal experience, the part that involved politics would have been placed in one table, while the part that involved his or her personal experience would have been placed in another table.

Though the following tables contain a mix of oral and written feedback, not every part of every qualitative response was included: One participant's oral responses to excerpts 3-7 were not recorded properly due to a technical malfunction. The following kinds of information have also been left out:

- comments that are difficult to read or hear
- comments that are too ambiguous to interpret
- repeated information
- comments that do not seem to relate directly to the participant's response to the excerpt—for example, if the he or she became sidetracked while thinking aloud

After participant responses had been sorted, the average emotional intensity recorded for each response was added to the tables in order to compare what people said about their emotions with the quantitative interpretation of those emotions. While some participants' verbal responses matched their responses to the Likert scale questions, others recorded emotional intensities that seemed at odds with the qualitative portion of their feedback.

Relating Excerpts to Politics. Only responses making explicit connections to politics were included in Table 3. Responses to excerpts 1, 3, and 4 were mostly related to the issue of immigration, while responses to excerpts 5 and 7 were related to the issue of gun-control laws. (Responses to excerpts 2 and 6 did not make explicit connections to politics.) While many participants expressed awareness of the political climate, some did not, and some were ambiguous about their awareness of politics or the connection an excerpt may have to politics.

Table 3: Responses Relating Excerpts to Politics

Presentation	Comments
Excerpt 1: Migration crisis	
Photo	I know we had some situation recently where refugees were trying to come here, and Donald Trump and that political party didn't want them to come here, and that makes me sad because America was built on immigration and people coming from other countries and bringing their cultures. (Average emotional intensity: 3.75)
No photo	I'm not somebody whose gonna rise up and say "but not in my back yard"...I'm disturbed about this but not in the same way as other people. (Average emotional intensity: 5.75)
Excerpt 2: Treating mental illness in West Africa	
N/A	
Excerpt 3: Modern slavery in Syria	
No display	We have people that are flooding countries that—some of them have the best interests of the people they're moving to in mind, but we can't just sustain people who may not have job skills or who are unwilling to assimilate to cultures. I'm more angry that we're just allowing people who could or could not be enactors of terror into our countries without having a good vetting process. I am sad that these people are dealing with this...I don't think running away from it is the best solution, although a good portion of them are women and children. (Average emotional intensity: 4.00)
Excerpt 4: Modern slavery in America	
No display	It's mind blowing that these things are still snuck behind the radar so well, and that we obviously don't do a good job of keeping up with citizenship, who's coming in and what they're coming in for, and it really bothers me, too, when we have problems that should be handled at the presidential or the congress level but they're too worried about what party they should support instead of actually working on what America needs to fix. The fact that people are being exploited due to a lack of government in America is not surprising at all. (Average emotional intensity: 6.75)
Excerpt 5: Gun deaths compared to car deaths in America	
No display	<p>I'm very pro-gun...I think it's sad that instead of trying to help change the culture that is causing the largest percent of these gun deaths, we attack gun culture or we attack those people in general by over-policing them, and that's not right either. The issue is not about guns; it's about the people using the guns, and how do we help those people. (Average emotional intensity: 4.75)</p> <p>I know there are a lot of people that are killed in motor vehicle accidents each year; to know that gun deaths are even more prominent is pretty surprising. I know the Rifle Association is really fighting for freedom of firearms, but when you look at this, maybe something does need to be done about stricter firearm rules, especially for younger people. (Average emotional intensity: 4.75)</p> <p>Don't get me started on guns. "Guns don't kill people, people kill people." It's so stupid, these gun nuts. I just don't understand. (Average emotional intensity: 6.00)</p> <p>I'm upset that people twist this into—when we're trying to say that people who are mentally ill shouldn't have guns or shouldn't provide them, it gets twisted into saying</p>

Table 3: Responses Relating Excerpts to Politics, continued

Presentation	Comments
	Obama's gonna come get your guns and you won't be able to go deer hunting anymore. (Average emotional intensity: 7.00)
Excerpt 6: Elderly gun deaths vs. youth gun deaths	
	N/A
Excerpt 7: Increasing active shooter incidents	
Display	Look at the people who do this: they're uneducated, they're mentally ill, and they are the ones seeking vengeance, because we're talking about active shooters.... there are so many issues, and you're not focusing on that. You're just focusing on the average person who has the money to donate and pay taxes and influence. You're giving him information to manipulate him into whatever campaign you do. If you're gonna give this information to people, they're gonna be like "oh my god, you're right." That's like the rich and educated exploiting the poor and uneducated. (Average emotional intensity: 6.00)

Excerpts 1, 3, and 4 were related to immigration, albeit from different countries. Some participants seem to have interpreted the focus on the woes of the immigrants in excerpts 1 and 3 as a pro-immigration argument rather than a simple attempt to raise awareness of a global issue. (Considering the current political climate and the fact that these are only pieces of larger articles, the paragraphs could easily belong to either.) They indicate this by responding to each piece as they would respond to another person in a political conversation: by bringing their own opinions to the table seamlessly rather than placing the political discussion in context:

“I’m not somebody who’s gonna rise up and say ‘but not in my back yard.’”

“We can’t just sustain people who may not have job skills or who are unwilling to assimilate to cultures.”

In contrast, another participant separates the broader political discussion of immigration from excerpt 1, treating it as something that is related to the excerpt but not

necessarily part of it: “I know we had some situation recently where refugees were trying to come here, and Donald Trump and that political party didn’t want them to come here.”

As in excerpts 3 and 4, several responses to excerpt 5 seem to indicate that some participants treated excerpt 5 as if it were part of a political argument on gun control. One response even indicated that the excerpt had swayed that participant’s opinion in favor of stricter gun laws: “But when you look at this, maybe something does need to be done about stricter firearm rules.”

Interestingly, most of the comments on politics were made for excerpts without data displays, which may be why they did not reference the use of data displays or other visuals in political arguments. It is also likely that people are more prone to referencing the use of visuals in such arguments if they have been trained to analyze visual rhetoric, or that participants who made political comments were more focused on the wider political issues than the excerpts themselves. Future studies might provide more insight here by exploring whether certain subject matters or genres are more likely to invite readers to analyze the visual rhetoric of a text than others.

Relating Excerpts to Personal Experience. Responses citing personal experience (Table 4) included references to situations participants had been in, situations that participants’ close friends and family members had been in, and important parts of participants’ fields of study or personal identities that affected their reactions to specific excerpts.

The response to excerpt 1 is particularly interesting because this participant differentiates between the pre-existing emotions about an issue and the immediate response to writing about that particular issue. If we assume that other participants

Table 4: Responses Relating Excerpts to Personal Experience

Presentation Comments	
Excerpt 1: Migration crisis	
Photo	My family were affected by this...I already know all of this, so, when I read it, I didn't feel these emotions, not as intense as I actually feel about the issue. (Average emotional intensity: 6.50)
Excerpt 2: Treating mental illness in West Africa	
Photo	I've been around mentally ill people—they are exhausting and unpredictable and dangerous. (Average emotional intensity: 5.25)
No Photo	Mental illness is my passion and what I plan to go into...I just picture one of my kids having an episode and someone chaining them to a tree instead of walking them through it and getting them the medication and the help that they need. (Average emotional intensity: 7.00) That's not the way Christians should treat other Christians. I am a Christian—horrifying that this is what some people think it is. (Average emotional intensity: 6.50)
Excerpt 3: Modern slavery in Syria	
Display	I feel like this makes me feel so strongly about this because it (hits) home for me with having nieces and nephews probably the same age as these children. (Average emotional intensity: 5.75) Because I work with children, when kids are brought into the situation, it bothers me a lot more. The fact that girls are being sold as brides, forced into marriage, sexually exploited—it's so sad because that has long, long term effects. A lot of people never will recover from anything like that. And the fact that these young boys are being forced to be child soldiers. There are full grown men in the united states that have been trained and exposed and prepared for war and still come back completely mentally bankrupt, so the fact that these children are being exposed to it is pretty insane. (Average emotional intensity: 7.00)
No display	I'm not so much angry because I've been experiencing this since 2013. I personally know girls that have been married... (Average emotional intensity: 6.25)
Excerpt 4: Modern slavery in America	
No display	My family is Hispanic, so thinking this could have been one of them is an awful thought to have. (Average emotional intensity: 6.00) I know most of this... I've seen labor slaves before. (Average emotional intensity: 5.75)
Excerpt 5: Gun deaths compared to car deaths in America	
Display	I feel there should be much better laws in place to keep guns from private ownership. Hand guns should be banned. Personal experience. Knew a person murdered by a family member with a handgun. (Average emotional intensity: 7.00)

Table 4: Responses Relating Excerpts to Personal Experience, continued

Presentation	Comments
Excerpt 6: Elderly gun deaths vs. youth gun deaths	
Display	It makes sense. Somewhat previously concerned, because suicide—I’ve witnessed it before. (Average emotional intensity: 2.00) I’m not disturbed about death because it happens. Maybe I’m too...I’ve known a couple people, one was a really good friend and one was a teammate of mine for years when I used to play team sports. They both killed themselves with guns. I’ve never known anyone to be killed by a gun personally. I mean I read stories about self-defense shootings all the time or about people getting killed in gang-related shootings. My reaction’s just personal experience. (Average emotional intensity: 3.75)
No Display	More angry, just because I know my dad has to deal with stuff like this every day being a police officer. It just makes me angry to think that he’s out there risking his life when it’s just, like, younger people are just being stupid and thinking that all their problems can be solved with guns, which is not the answer at all. (Average emotional intensity: 4.75)
Excerpt 7: Increasing active shooter incidents	
Display	We used to never talk about active shootings in the classroom, and now all my teachers do. I am gonna put horrified on this one, even though it’s oversaturated, because I am in a classroom every day. (Average emotional intensity: 6.00)
No display	It’s something now we’re supposed to talk about in the first week of class: run, hide, or fight. Where we’d go in a certain classroom. I’m sad that it’s come to that, but we are where we are. (Average emotional intensity: 5.75)

experience the same dichotomy of feeling—which is likely, considering the number of participants who clearly had pre-existing feelings about each issue—we have to wonder how many Likert scale responses were immediate reactions to the text, how many were reactions to the issue as a whole, and how many were some combination thereof.

Unsurprisingly, there didn’t appear to be a strong correlation between whether participants saw a display and whether they related an excerpt to personal experience.

Also unsurprisingly, participants whose personal experiences affected the way they viewed the excerpts tended to react with emotional intensities in the upper half of the available scale (or with an average intensity rating above 4, as the maximum average possible was 7). Two notable exceptions recorded lower emotional intensities for excerpt

6 (2.00 and 3.75) despite their personal experiences with suicide. Interestingly, both low-intensity responses were associated with a data display, though no participants directly linked either photographs or data displays to personal experiences. (As with political responses, participants were more inclined to connect their personal experiences to the general content than the method of its presentation—text, photographs, data displays, etc.)

With this information, we cannot be sure whether these participants recorded lower emotional intensities because they had become emotionally distanced from their own experiences or because they only loosely associated these experiences with the text. One participant did go on to comment on overexposure to media portrayals of suicide, but did not seem certain that overexposure was the cause of his or her numbed reaction. (This comment is included in Table 6.) Regardless, it is clear that even tragic personal experiences do not always cause readers to have intense emotional reactions. Future studies might investigate what experiences or circumstances are more likely to make readers connect more with technical information, or whether there are ways to portray technical information that discourage readers from connecting it to their personal experiences.

Indicating Sensitivity to Human Suffering. There is a difference between being sensitive to another person's pain and being unhappy that things are not the way one thinks they ought to be; responses sorted into Table 5 were chosen specifically because they fell into the first category, though some responses contain elements of the second. These participants asked questions or imagined details that went beyond what the text

provided, or that acknowledged in some way their shared humanity with the subjects of the excerpt.

Table 5: Responses Indicate Sensitivity to Human Suffering

Presentation	Comments
Excerpt 1: Migration crisis	
Photo	All these pictures kind of tug at your heartstrings. ² It's sad just thinking about all the people, all their struggles. (Average emotional intensity: 6.00)
No photo	I have empathy for those people, and I worry about where they're all gonna go and how many are gonna die along the way. (Average emotional intensity: 5.75) As Americans, we count on our stability. When you don't even know where you're going to live or if you'll have a home at all in a year or two...that kind of uncertainty is just something were not used to. (Average emotional intensity: 4.25) Shocked by the large number, but also imagining individuals rather than the collective. (Average emotional intensity: 5.00)
Excerpt 2: Treating mental illness in West Africa	
Photo	I feel sad for those people because you can't control schizophrenia. I think I feel angry for these people because they cannot control that and there's so many more steps that need to be taken. Who's feeding them? Who's taking care of them? (Average emotional intensity: 6.50)
No photo	It makes me sad to picture people chained to a tree; it makes me sad to see a picture of a dog chained to a tree, especially a person that can't help themselves. (Average emotional intensity: 7.00)
Excerpt 3: Modern slavery in Syria	
Display	I guess angry because of the little girls and little boys; the things they're forced to do in these situations. It kind of makes me angry that they're not being protected. I think this is my reaction because of the way I grew up and our culture, and just how protected the kids are here and how we put so much emphasis on education, and that's just taken away from them, and they don't really have a say in it. (Average emotional intensity: 6.00) The anger mostly comes from the fact that these children lose so much opportunity. (Average emotional intensity: 5.50)
No display	The part about no longer receiving an education does hit me harder than the first two pieces because without education, children become adults, and they don't have the skills they need to succeed and get out of their situation. (Average emotional intensity: 4.25)

² Bolded table text indicates explicit references to photographs or data displays.

Table 5: Responses Indicate Sensitivity to Human Suffering, continued

Presentation	Comments
Excerpt 4: Modern slavery in America	
No display	I feel frustrated for these people—that they are being forced into these positions for probably little pay, yet strenuous work. (Average emotional intensity: 6.00) My first thought is that all of these people coming from other countries are probably just trying to get away from everything that they’re just getting put right back into. (Average emotional intensity: 6.25)
Excerpt 5: Gun deaths compared to car deaths in America	
	N/A
Excerpt 6: Elderly gun deaths vs. youth gun deaths, N/A	
	N/A
Excerpt 7: Increasing active shooter incidents	
No display	This is pretty low key, so it’s hard to be horrified, but I’m more horrified than not horrified, more angry than not angry. Just because it’s so against my nature, and ought to be human nature, to corner a bunch of people and shoot them, and it’s hard to think about what would drive somebody to that desperate of a situation, why they would think that’s the answer. I certainly would feel empathy for the people who are confined. (Average emotional intensity: 5.75)

In this table, we see right away that one participant admits to being affected by the photo in excerpt 1. However, as was the case for comments relating to politics and personal experience, no participants who indicated a general sensitivity to human suffering connected this sensitivity with data displays. One participant (in a response that did not deal with human suffering) said that associating people to large numbers, “figures and ... theories,” makes them appear less human—a similar assertion to the one Dragga and Voss made in 2001. Though the participant does not make an explicit connection to data displays, his or her observation may still be relevant to them, as data displays are often required to make studies done with large sample sizes meaningful. The fact that no participant who indicated a general sensitivity to human suffering did so when confronted with a data display may support this theory of dehumanization by numbers, though it is

far from enough evidence to really prove data displays have such an effect. Future studies could help fill this knowledge gap by evaluating which circumstances (if any) are more likely to make data displays dehumanizing. Still, we can be sure that participants who only *read* about statistics clearly made a connection with the humanity and the suffering of the people they read about.

Indicating Previous Exposure Dulls Emotion. Previous exposure (indicated in Table 6) often came from mass media outlets (predominately the news and the Internet), though some exposure also came from personal experiences. Comments from Table 5 indicating that a participant’s personal experiences had dulled his or her reaction to an excerpt are repeated in Table 6.

Table 6: Responses Indicate Previous Exposure Dulls Emotion

Presentation	Comments
Excerpt 1: Migration crisis	
Photo	<p>My family were affected by this...I already know all of this, so, when I read it, I didn’t feel these emotions, not as intense as I actually feel about the issue. (Average emotional intensity: 6.50)</p> <p>So I’ve seen this exact story. That 60 million number is still pretty startling, and I wonder how my reaction has been mitigated because I’ve had some months to absorb it. (Average emotional intensity: 6.75)</p> <p>I heard about the Syrian crisis on NPR, and for a while there, in the elections, they were talking about it...not so much now. I’m pretty desensitized now. I think of the father holding is two-year-old son on the beach—that’s what I think of about the Syrian crisis now...the pictures I’ve seen. (Average emotional intensity: 2.75)</p>
No photo	<p>I think your response is probably somewhat affected by age in the sense that (response becomes difficult to hear) see that this is an ongoing problem, whereas I imagine someone your age would be more horrified...there are some things you just can’t fix. (Average emotional intensity: 4.75)</p>
Excerpt 2: Treating mental illness in West Africa	
Photo	<p>I’m not angry because I’m very familiar with Africa, and I understand that they have a very different world over there, and they have to live a very different way. It’s sad to realize people have to resort to such horrible measures in dealing with their sick because they lack the tools—be it financial or material—to fix the problem. (Average emotional intensity: 5.00)</p>

Table 5: Responses Indicate Previous Exposure Dulls Emotion, continued

Presentation	Comments
Excerpt 3: Modern slavery in Syria	
No display	Despite talking and feeling some things, there's some apathy on my part. Maybe it's the order these are in, but oversaturation both from the news and other sources have dulled the extremes of my emotions. (Average emotional intensity: 4.25)
Excerpt 4: Modern slavery in America	
Display	I would say that my anger has lessened a lot over the years. I've seen it so much, and I'm so removed from it, that sometimes I feel apathetic about it. I'm not part of the sex or slave trade, I don't know anyone who is, and it's not talked about in any of the news. (Average emotional intensity: 3.75)
Excerpt 5: Gun deaths compared to car deaths in America	
Display	<p>I'm exposed to children that have experienced these issues every day, making (me) somewhat numb to the statements. I know that for every 1 kid I work with, there are 50 that will never get any kind of help. (Average emotional intensity: 4.50)</p> <p>My dad, he's a police officer, so we hear a lot more about what's happening than the average person would. There's a lot of gun violence in the inner city. I won't say I was horrified with these statistics just because the culture and the society we live in now kind of makes you numb to it because it's a daily occurrence, so it's not surprising. (Average emotional intensity: 4.5)</p>
Excerpt 6: Elderly gun deaths vs. youth gun deaths	
Display	The media portrays how so many people have been shot now—how often people have been shot. I guess maybe I'm numb to it. (Average emotional intensity: 3.75)
Excerpt 7: Increasing active shooter incidents	
Display	<p>I'm really tired of hearing about guns and shootings. (Average emotional intensity: 6.25)</p> <p>My response to this report, again, is fairly neutral because it's so widely discussed. (Average emotional intensity: 2.00)</p>

It can be seen in Table 6 that, while several participants claimed that they felt apathy toward or disengagement from the text because of overexposure to a certain topic, some responses to the Likert scale questions indicated that participants still had intense emotional reactions to the excerpts. Two responses to excerpt 1 and one response to excerpt 7 included an average emotional intensity of at least 6.25, with 7 being the highest average possible. It may be that these participants felt that, without previous exposure to these subjects, they would have an even more intense reaction to the

excerpts. It may also be that the participants' perception of their emotional intensity ratings on four separate Likert scales is slightly different than the average of those ratings. If nothing else, this seeming contradiction between qualitative and quantitative responses implies a complicated relationship among participants' experiences, their feelings, and their perception of both—all of which might affect their responses differently.

Though five of these comments were made in the presence of a data display and four were made in the presence of a photograph, only one deals explicitly with visuals. This participant connects the photo in excerpt 1 to other photos of refugees circulating in the media. (Once again, participants did not relate data displays to overexposure.) Despite the fact that photos are generally assumed to be emotional stimulants, and the fact that these photos in particular are widely considered to be heart-wrenching, the participant's average emotional intensity is only 2.75—quite the opposite reaction from the participant in Table 5 who said such images “tug at your heartstrings.” It may be that the participant from Table 6 is simply not affected by photos, or that photos are more effective emotional stimulants when they still have some shock value. It may also be that these photos of Syrian refugees have only lost their effectiveness for this participant because the refugee crisis has received so much attention for so long. Future studies might benefit the field of visual rhetoric by determining when and how photographs become more effective emotional stimulants.

Assessing Claims. Participants assessed claims (Table 7) by agreeing with them, providing counter-arguments and context they felt was missing from the excerpts, and expressing the desire for more information. Comments expressing agreement with the

text were included in Table 7 because saying “I agree” indicates that there was room not to agree; to do so, the participant had to assess the text and make a conscious decision rather than unconsciously accept what was presented. Likewise, participants who provided counter-arguments or asked for more information showed that they were evaluating the information presented rather than taking it at face value.

Table 7: Responses Assess Claims

Presentation	Comments
Excerpt 1: Migration crisis	
Photo	I definitely agree with what it’s saying. (Average emotional intensity: 6.00) The way that it was phrased wasn’t, like, super heart wrenching or anything. (Average emotional intensity: 4.25)
No photo	That seems pretty factual to me...I don’t have a strong emotional response because I feel like it’s probably correct. (Average emotional intensity: 5.75)
Excerpt 2: Treating mental illness in West Africa	
Photo	This sounds more like creative writing even though it says it comes from the <i>New York Times</i> I think of men and women being chained by the ankle...it seems more creative than factual. He’s very thin. (Average emotional intensity: 3.5)
Excerpt 3: Modern slavery in Syria	
Display	Child soldiers...I wonder what age range that is. (Average emotional intensity: 7.00) I don’t think this is all slavery; most of this is not about slavery. I think it’s mislabeled. I think even the Syrian girls sold as child brides is a lot of cultures’ total subjugation of women and ... I guess that results in slavery. Frustrated in the inability of us to really affect change. Most groups don’t want to be us. We need to recognize that. (Average emotional intensity: 6.12)
No display	They say children no longer receive an education. Really, though, what education do a lot of them get? Women aren’t allowed education under Sharia law (Average emotional intensity: 4.00)
Excerpt 4: Modern slavery in America	
Display	If I were reading this online, I would click to learn more because I want to know who the Walk Free Foundation is. I guess I almost think this is preposterous, and I can’t believe it’s accurate. I don’t doubt that those people are exploited and underpaid, but forced labor and slavery? That’s not anything I was aware of. If it’s true, I’m horrified, angry, sad, and disturbed, but I would want some validation. It seems too bad to be true. (Average emotional intensity: 7.00)

Table 7: Responses Assess Claims, continued

Presentation	Comments
Excerpt 5: Gun deaths compared to car deaths in America	
Display	<p>What's the point of this discussion? Is this an argument against people having firearms? ...I don't know who they're targeting...I don't know what drugs and drowning have to do with vehicles and firearms. They're deaths, sure, but there are so many differences in the causes, the reasons, the people who die from it. I am more disturbed by the data's organization the fact that this stuff represents people who are dying.³ When you associate such a huge number to people, and they become figures, and they become theories, it's hard to see them as humans. I don't know; I am a person who's ok with death. It's a fact. I don't like it when people use it as a tool to influence people. I just hate information that's not exact and that doesn't serve an argument that I can argue against. (Average emotional intensity: 2.50)</p>
No display	<p>When I read this, I think about all the different possibilities that could contribute to this statistic. Someone dying by gunshot, they could be holding a gun, too. Just a bunch of different things. Three on angry because it's a statistic that's been formed to sound a certain way. (Average emotional intensity: 1.75)</p> <p>I feel like some graphics would be helpful for this piece, just to help me understand the information a little bit better, especially when it differs between homicide and suicide. Those statistics, I'd like to see how they compare because those are definitely different. (Average emotional intensity: 4.75)</p> <p>The thing that always bothers me about gun control statistics is that a high majority of gun deaths are self-defense in police-related shootings...we also have a cultural problem with guns that no one wants to talk about in poor parts of the city. (Average emotional intensity: 4.75)</p>
Excerpt 6: Elderly gun deaths vs. youth gun deaths	
Display	<p>I was aware that older individuals were more prone to suicide. But as to younger people getting shot, I think a lot has to do with stereotypes against younger generations. (Average emotional intensity: 5.75)</p> <p>I wish this data was broken down by gender and by race. (Average emotional intensity: 3.75)</p> <p>I'm a little angry that people...if somebody wants to kill themselves, they're going to find a way to kill themselves, guns notwithstanding. (Average emotional intensity: 3.75)</p>
No display	<p>I think this trend would carry out for other things: most younger people get killed by other sources, but older people tend more to suicide. I don't believe—I find the fact that it's associated with shooting—that's targeted information. I mean it's a fact, it could be, but it's also a fact that these people die in the same trend from other causes...You really can't use this for a specific argument. Well, you can, but this is easily argued against...It's probably true, but there are more things to it than actual guns. Guns are not the issue because guns are an instrument here...if you replace it with a knife, it's going to be the same statement. (Average emotional intensity: 1.5)</p>

³ This participant used hand gestures to indicate that this comment referred to the data display.

Table 7: Responses Assess Claims, continued

Presentation	Comments
	<p>I mean suicide is definitely a problem among teenagers, so when it says that it's likely younger people are going to be shot by someone else and older people from suicide, it just makes me wonder, too, where accidental death goes—accidental shootings. (Average emotional intensity: 6.00)</p> <p>I believe that statistic because, unfortunately, older people have seen more and have been influenced by personal tragedy more. However, younger people have been mass-shooting victims, so that's believable as well. (Average emotional intensity: 5.50)</p> <p>When is that from...2015, so last year. I just want to look at this because it's weird...It doesn't seem to make sense with how I perceive younger people. But I guess all those emotions, all the anger...it doesn't say by other younger people; it just says by someone else, so I don't know. I would want to know a lot more about the statistics behind that. (Average emotional intensity: 6.00)</p>
<p>Excerpt 7: Increasing active shooter incidents, N/A</p>	
<p>Display</p>	<p>The point is why is it increasing. Always discuss the information you're getting at. I don't think firearms are more or less accessible than they were before. I mean, sure, they're sold at Walmart and other places. And I don't know if mentally ill people increased in number as the years go by.... I don't know. You need to study this a lot. That's the problem. Everything you talk about, you need to study a lot. I'm shooting my mouth off here, but if this data is true, it can be used as an argument against holding a gun... Don't blame the gun, it's gonna be a knife; it's gonna be a rope, a stick, or something else. Look at the people who do this: they're uneducated, they're mentally ill, and they are the ones seeking vengeance because we're talking about active shooters.... There are so many issues, and you're not focusing on that. You're just focusing on the average person who has the money to donate, and pay taxes and influence. You're giving him information to manipulate him into whatever campaign you do. If you're gonna give this information to people, they're gonna be like, "oh my god you're right." That's like the rich and educated exploiting the poor and uneducated. (Average emotional intensity: 6.00)</p> <p>Wow. I believe it though.... I guess I didn't know there was a difference between active shootings and mass killings. That makes sense...and a graph.... yep, I believe it. (Average emotional intensity: 6.00)</p>
<p>No display</p>	<p>I'd be interested to know—I can't help thinking what the numbers are for the mass killings. (Average emotional intensity: 5.75)</p>

Claim assessments were more frequent in excerpts 5 and 7, which is likely because these excerpts were typically perceived as part of a political argument for stricter gun control laws—a reasonable conclusion, considering how often statistics concerning firearms and mortality are used for such arguments. Participants who perceived this claim and did not agree with it were quick to voice their own counterarguments, and some of

the intensity in their responses may come from this disagreement rather than the content of the excerpts themselves. Another case where a participant felt an intense emotional reaction in seeming contrast with his or her claim assessment can be found in excerpt 3, where one participant believed the word “slavery” had been misapplied to subtler and more varied situations. However, despite his or her skepticism, that participant’s average emotional intensity was 6.12 out of a possible 7.

The likelihood that participants would assess a claim did not seem to depend on whether a data display was present. However, two claim assessments did explicitly reference data displays. One participant simply noted that a graph was present; it is difficult to ascertain whether the graph contributed to his or her agreement with the claim in excerpt 7. The other participant, however, took issue with the categorization in the graph paired with excerpt 5, claiming that it was misleading to compare certain causes of death because the factors leading to those deaths were so different. It is difficult to determine whether these participants were the only ones who read the data displays in depth, or whether the other participants who saw the data displays simply did not think they were worth mentioning. Future studies may provide further insight by attempting to determine how often users read data displays or text critically.

Assessing Presentation. Presentation assessments (Table 8) addressed the kind of language used in each excerpt, and, if there was a data display, how much the display helped or hindered the participants’ understanding.

Participants who assessed the verbal and visual presentation of excerpts showed that they were viewing the text or data displays as constructions rather than raw information. Some participants even began to discuss rhetorical elements of the excerpts:

Table 8: Responses Assess Presentation of Information

Presentation	Comments
Excerpt 1: Migration crisis	
Photo	<p>The text is really dispassionate; it seems to be making a summary statement. The photograph is more emotive. (Average emotional intensity: 1.50)</p> <p>The way that it was phrased wasn't, like, super heart wrenching or anything. (Average emotional intensity: 4.25)</p>
Excerpt 2: Treating mental illness in West Africa	
Photo	<p>As...someone who deals with visuals, the photograph holds more power than the text. The text is less effective than the photograph in keying me into what the primary issue is. The first sentence is really ambiguous and like creative writing or something, and it takes a little while to get into this. I don't find that this is really clear writing at all. (Average emotional intensity: 2.00)</p> <p>This one is more detailed, and it has more descriptive language, and it creates a better imagery as far as what's going on, so I would be more interested in this article because there's more given to me, and it's in more of a descriptive manner. The picture is pretty bad. (Average emotional intensity: 6.00)</p> <p>"Sprawled through a strange, dreamlike forest"—that's not a clear picture. (Average emotional intensity: 6.75)</p> <p>This sounds more like creative writing, even though it says it comes from the <i>New York Times</i>.... I think of men and women being chained by the ankle...it seems more creative than factual. He's very thin. (Average emotional intensity: 3.5)</p>
No photo	<p>Just from my English standpoint, I didn't understand what I was reading until I got further down...There wasn't a whole lot of context. But the last few lines had a lot more detail. (Average emotional intensity: 6.5)</p>
Excerpt 3: Modern slavery in Syria	
Display	<p>I think it's very informative, but the chart up here, I guess the "Rank: 9" and "Government Response: D" and "Vulnerability"—it doesn't really explain what that is, and I think it could be explained a little bit better because, if I were just to stumble upon this, I would have no idea what that was. I could probably guess, and it would probably be pretty close to it, but I think that could be explained better. I think the writing's pretty informative. (Average emotional intensity: 6.00)</p> <p>I really like the graph; I think it's really helpful. I think it adds to the emotion, especially with the ranking, government response, and vulnerability; I think that's really useful information. The bright colors kind of make it like a warning color. I think the way the material is presented adds to the disturbedness but it's not offensive, just intense. (Average emotional intensity: 6.25)</p>
No display	<p>This to me seems clearer in getting to the essence of the problem communicated. The first thing I encounter is the title, and that shocks me. <i>The Global Slavery Index</i>. That's something I don't usually consult or was even aware of, so even that title predisposes me to a sort of emotional reaction. And then the writing here seems to be clearer and not illusory, it's effective writing instead of nebulous writing...So, starting off with "the conflict affected population of Syria," instantly, I get a reference for that from other things</p>

Table 8: Responses Assess Presentation of Information, continued

Presentation	Comments
	I've read, even if I'm not aware of (the) <i>Global Slavery Index</i> or what this particular article is referring me to. (Average emotional intensity: 2.00)
Excerpt 4: Modern slavery in America	
Display	I don't know how I feel about this because I'm still confused about this issue. I think the information's a little more confusing on this one. It's so brief that, for this one, I'm not sure what it's talking about. I mean, the graphics are still helpful—very professional looking. The colors in this one aren't as serious looking. Pretty neutral all around on this one. (Average emotional intensity: 4.00)
No display	<p>I thought it was written well even though it was a very brief synopsis of it. (Average emotional intensity: 6.00)</p> <p>I might have to read that again; it went over my head. Well, with the other pieces, I felt like I could connect to it more. There's a lot of statistics here, and there's examples of what forced labors are with the beauty salons and janitorial services. I don't connect with it. I guess words like "janitorial services" and "factories" and "garment manufacturing" don't elicit the same kind of emotional response. Even though I see the words slavery and commercial sex industry, I guess I kind of don't care—which is really bad to say—not like with the other ones. (Average emotional intensity: 2.5)</p> <p>The language is more or less the same, the title <i>Global Slavery Index</i> is the same. Now I'm reading these consecutively so I have a context of the United States in relation to what I've just read, the position of this country in a more global perspective. I was already aware of this situation, and the language presents the facts in a way similar to the article that I just read. (Average emotional intensity: 2.00)</p>
Excerpt 5: Gun deaths compared to car deaths in America	
Display	<p>I think this is kind of confusing to read because, when you first start, you think it's going to be predominately about firearms, and then it's about car deaths, and then it switches back to firearms. I feel like it could have been explained a little better. (Average emotional intensity: 4.50)</p> <p>Now this one also has statistics, but I am immediately connecting more because gun violence is a domestic issue. That death of one person every fifteen minutes really sticks with me and I'm also in the eighteen to twenty-five-year-old age group, so I'm affected more. [Participant is briefly confused by the graph but then figures it out]. We're just talking about motor vehicles and gun violence—I would think drugs and drowning—it just makes the article look more confused. I connected for a second; now I just feel kind of—hm. Again, desensitized. I was angry about gun violence, but not anymore, no. I couldn't read the graph like it thought I would. (Average emotional intensity: 3.5)</p> <p>The graph was helpful in my understanding. The wording can be a bit distracting but the graph helps a lot. (Average emotional intensity: 4.25)</p> <p>This information is surprising, but the language in which it is presented is not inflammatory or terribly emotional. (Average emotional intensity: 2.00)</p> <p>The high numbers make sense given the age of mass shootings and all, but you don't think of it as severe as when you see it compared to numbers like car crashes and drugs. (Average emotional intensity: 5.25)</p>

Table 8: Responses Assess Presentation of Information, continued

Presentation	Comments
No display	I feel like some graphics would be helpful for this piece, just to help me understand the information a little bit better, especially when it differs between homicide and suicide. (Average emotional intensity: 4.75)
Excerpt 6: Elderly gun deaths vs. youth gun deaths	
Display	That’s interesting. I feel like this chart is really helpful , and the age component is really interesting also. I like that this is recent, but this definitely puts perspective on the subject and puts a little more depth to it and emotion, possibly, but in a respectful way. It’s not too emotionally triggering for me. (Average emotional intensity: 4.00)
No display	I’m surprised, but the language doesn’t produce an emotional response. (Average emotional intensity: 2.00) I’m not apathetic on this one...It’s so little, just one line telling me that as a young person I am more likely to be shot by someone else takes control away from me like there’s nothing I can do, like I have no control over my destiny, and when we mention older deaths or suicides, that makes me think that, in 40 years, if I’m not happy, I’m going to be one of those people that have the gun. It just seems like a no-win scenario, and one that I can relate to. (Average emotional intensity: 4.75)
Excerpt 7: Increasing active shooter incidents, N/A	
Display	It sort of shows the power of rhetorical language because just reading that very first sentence, "active shooting" creates a sort of adrenaline response, not because of anything inflammatory in the article, but because of the cultural climate that we live in—and especially working in a university community and being present among the potentially vulnerable population. (Average emotional intensity: 2.00) I think what was a little confusing was the end where they say a lot of active shootings turn into mass killings. I think that could have been explained a little more or just left out altogether; maybe another article could be about that. I just think it might confuse someone, and they might not even worry about that. I definitely think it was informative, and I guess I didn’t realize it had jumped that much in such a short amount of time. (Average emotional intensity: 6.75)
No display	I really like the second paragraph; it helps us understand the difference between the size of shootings...the difference from mass shootings and just killings. (Average emotional intensity: 4.25) It’s not a mass killing unless 3 or more people are killed...I guess a mass killing, the word “mass”—I guess in this context, the rhetoric of “mass” seems like a ton of people...3 is a lot of people to die, but it doesn’t strike me as a “mass killing.” (Average emotional intensity: 5.75)

“I think the way the material is presented adds to the disturbedness.”

“I guess in this context, the rhetoric of ‘mass’ seems like a ton of people.”

For the most part, this treatment of text and data displays as a construction seemed to distance readers emotionally from the excerpts; while some explicitly said that the text was not particularly engaging or inflammatory, several others recorded lower emotional intensities and generally spoke more calmly than when discussing politics, personal experiences, or sensitivity to human suffering.

There were several responses that indicated more specific ways data displays might affect reader emotions by limiting or aiding understanding. One of these can be found in a comment on excerpt 5, where one participant was engaged with the text at first, but lost this engagement when he or she became confused by the data display. This is one way in which data displays can make a significant difference in reader response: if the reader is unfamiliar with a display type or if the display is clumsily constructed, it can cause confusion, which in turn disengages the reader from the text. For the same excerpt, however, two other participants who thought the graph was helpful recorded higher emotional intensities than the participant who was confused by it. One of these even indicated that the data display had contributed to the intensity of his or her emotional reaction: “but you don’t think of it as severe as when you see it compared to numbers like car crashes and drugs.” Another participant responding to excerpt 3 specifically said the data display “adds to the emotion,” though whether this is because the display helped his or her understanding or because of the use of color in the data display is unclear.

Other participants who critiqued the presentation of information displayed a range of emotional intensities in reaction to each excerpt, so it is difficult to say how greatly this aspect of reader response affects emotion. Future studies may gain more insight by determining how strong a link there might be between the intensity of readers’ emotional

responses to a document and the clarity of any data displays within the document.

Alternatively, future studies could investigate whether there is a link between specific visual elements of display design (color, form, etc.) and emotional intensity.

CONCLUSION

Up to this point, technical writers have generally attributed different kinds of rhetorical power to different kinds of visuals: data displays have been associated with logos and ethos, while photographs and non-technical illustrations have been associated with pathos. Many technical writers base ethical decisions on this understanding of rhetoric and their own intuitive sense of how the audience will react to such visual elements. Dragga and Voss (2001) are a prime example; they believe that data displays are so tied to logos and ethos that additional rhetorical elements are required to counterbalance the distance data displays create between readers and human subjects. However, their assertion is based in intuition and rhetorical theory rather than empirical evidence. Doumont (2002), who argues that technical writing should *not* be accompanied by elements of pathos such as non-technical illustrations and photographs, also bases his argument in theory and intuitive sense of reader response.

Experts agree that emotion and intuition are heuristic ways of making ethical determinations. Most people—writers and readers both—deal with ethics in this way, and these beliefs can affect the way technical writers practice their craft. For example, writers like Dragga, Voss, and Doumont have set beliefs about whether or not it is ethical for a technical document like an accident report to affect readers emotionally. They make conscious decisions about what kind of visuals to include in their documents based on these ethical beliefs and their beliefs about whether (or how much) different kinds of visuals will affect readers emotionally. However, if their perceptions of how readers interact with visuals are incorrect, these writers may fail to accomplish their ethical goals. For example, a writer who means to help readers distance themselves from the text may

engage them with compelling data, while a writer who means to make readers feel sadness or anger may instead alienate them with images that are perceived as irrelevant or staged.

A more reliably accurate approach to understanding the interaction between rhetoric, technical writing, and emotion should incorporate close, evidence-based examinations of reader responses to different devices in technical writing. Usability studies are a practical way to do this for individual documents, but genre-wide, academic research could provide technical writers with a more reliable foundation for their ethical codes. It would also provide a point of reference for situations in which conducting usability studies is not an option.

This study began the examination of emotion and technical writing by trying to determine how data displays affected the intensity of readers' emotional responses to technical writing excerpts involving human suffering—essentially, it began collecting evidence to explore the perceptions driving the ethical debate between Dragga, Voss, and Doumont. Perhaps unsurprisingly, participants interpreted text through a complex series of lenses including their personal experience, pre-existing beliefs, and cultural context, which included contemporary political issues and mass media fixations. Several of these lenses (politics, personal experience, and sensitivity to human suffering) seemed to affect the participants' emotional responses much more than data displays, as was indicated by both the participants' uses of tone and comments on their own emotional states.

Photographs were also assessed as a means of measuring the effectiveness of the data displays. However, the quantitative analysis was not robust enough to draw generalizable

conclusions, and the qualitative feedback suggested that photographs are not consistently effective in triggering reader emotions.

Data Displays

Participants did not make connections between data displays and politics, personal experiences, or sensitivity to human suffering, all of which seemed to be tied closely to readers' more intense emotional reactions. Participants also failed to connect data displays with comments indicating overexposure had numbed their emotional responses to particular subjects. Though this lack of connection between data displays and most lenses through which participants' interpreted their own emotional responses does not prove that data displays actively distance readers from their feelings, it nevertheless lends itself to Dragga and Voss's argument for the inclusion of humanizing details in technical reports. If one believes it is the writer's ethical responsibility to encourage emotion in readers, the evidence here suggests he or she might need some means other than data displays.

Data displays did have some impact in cases where participants assessed the claims and presentations of each excerpt, especially when the displays noticeably helped or hindered a participant's understanding. In such cases, the participant would assess the usefulness of the display in his or her response. Some participants who assessed the displays positively seemed to react with more emotional intensity than participants who thought the displays were unhelpful. In some cases, the act of assessment seemed to distance participants emotionally from the excerpts, as they began to see the text and data displays as constructions rather than unfiltered information. This evidence may lend itself to an argument for good data design: to engage readers with the data emotionally, one

could make the data design so clear in order to facilitate readers' engagement with the data rather than asking themselves why it was put together a certain way. (Whether or not this *should* be done is an ethical matter beyond the scope of the current argument.)

Photographs

Because photographs seemed to be widely accepted as having emotional impact in multiple fields (most notably psychology), the study also measured reader reactions to photographs in order to use this information as a measure of the impact of the data displays. In contrast to the common understanding of how photographs should impact readers, the quantitative analysis did not seem indicate that participants were affected by the photographs presented. Participants who did connect their emotions to images also referenced other images they had seen in the media. This may mean that photographs could be made more emotionally impactful if cultivated to resonate with current culture and media, or that photographs would be less likely to distract readers from the subject matter if they are cultivated to be specific to that situation. Or, as was the case for one participant, photos that resonate too much might lose their potency. At this point, it is difficult to tell and to be sure whether participants would be more affected by different kinds of photographs, a larger body of images, or another factor that was not accounted for.

Consequences for a Hypothetical Document

So what does this feedback mean for Olivia's hypothetical report? Though the evidence is far from conclusive, it seems to suggest that readers' emotional reactions to any document are derived from different interpretive lenses. Interpretive lenses that were

more likely to intensify emotion (politics, personal experiences, and sensitivity to human suffering) were not associated with data displays at all. Participants were most conscious of data displays when they interpreted documents as constructions (rather than raw information), which often seemed to distance them from emotional responses to the content of the document. However, data displays that lent themselves to participants' understanding sometimes seemed to intensify emotional reactions. Unexpectedly, photographs were rarely associated with the more emotional lenses and only seemed to gain power through resonance with other media; one participant even associated photographs with reduced emotional intensity.

If Olivia wants to engage her readers on an emotional level, she might attempt to do so with photographs or well-designed data displays. However, the surest path to success appears to be engaging readers through relevant, well-written text, as participants had mixed reactions to photographs and data displays and often reacted emotionally to the text regardless of whether either kind of visual was present. Additionally, Olivia she should be wary of using potentially confusing data displays, which have the potential to make readers disengage from the document.

Future Studies

Readers are complex, and their interpretation of information is often unpredictable and heavily influenced by the individual backgrounds that they bring to any piece of writing. Examining how these backgrounds, these lenses, interact with rhetorical theory to impact readers' emotions is an essential part of writing ethically, especially when dealing with sensitive issues, and one that requires more concentrated study from

the field of technical writing. Future researchers might gain further insight to these issues by investigating the following topics:

- Whether certain demographics react to data displays with different emotions or different emotional intensities
- Whether certain genres are more likely to invite critical analysis of data displays than others
- Whether certain circumstances are more likely to cause readers to connect data displays with interpretive lenses that typically induce intense emotional reactions
- Whether certain circumstances or aspects of data display design make data displays dehumanizing, or, conversely, if any aspects of design can cause readers to engage with data displays on an emotional level
- Whether certain circumstances make photographs more or less effective as emotional stimulants
- How often users assess the truthfulness or usefulness of data displays
- Whether there is a link between the clarity of a data display and the intensity of emotional response
- Whether certain kinds of data displays are more likely to engage readers emotionally

The relationship between visual rhetoric and emotional response is complex, and we may never understand it completely. However, if we feel it is our ethical duty to use visual rhetoric wisely, then it should also be our duty to study this relationship with every available process, both theoretical and empirical.

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APPENDICES

Appendix A Questionnaire Materials

Excerpt 1:
New York Times

There are more displaced people and refugees now than at any other time in recorded history — 60 million in all — and they are on the march in numbers not seen since World War II. They are coming not just from Syria, but from an array of countries and regions, including Afghanistan, Iraq, Gaza, even Haiti, as well as any of a dozen or so nations in sub-Saharan and North Africa.



(Nordland, 2015)

Excerpt 2:
New York Times

“KPOVÉ, Togo — The church grounds here sprawled through a strange, dreamlike forest. More than 150 men and women were chained by the ankle to a tree or concrete block, a short walk from the central place of worship. Most were experiencing the fearsome delusions of schizophrenia. On a recent visit, some glared, while others slept or muttered to themselves. A few pushed to their feet and gestured wildly, their cries piercing the stillness.

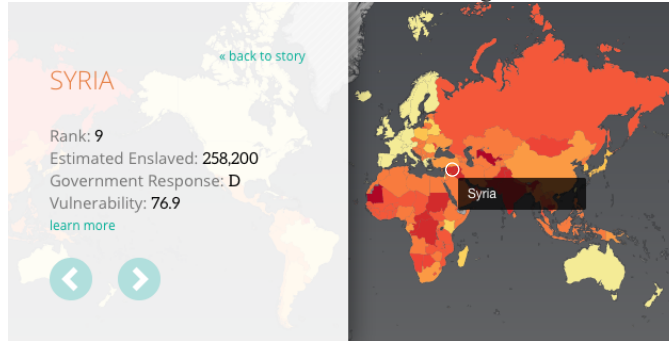
“Every society struggles to care for people with mental illness. In parts of West Africa, where psychiatry is virtually unknown, the chain is often a last resort for desperate families who cannot control a loved one in the grip of psychosis. Religious retreats, known as prayer camps, set up makeshift psychiatric wards, usually with prayer as the only intervention. Nine camps visited recently in Togo ranged from small family operations to this one, Jesus Is the Solution, by far the largest and most elaborate.”



(Carey, 2015)

Excerpt 3:
Global Slavery Index

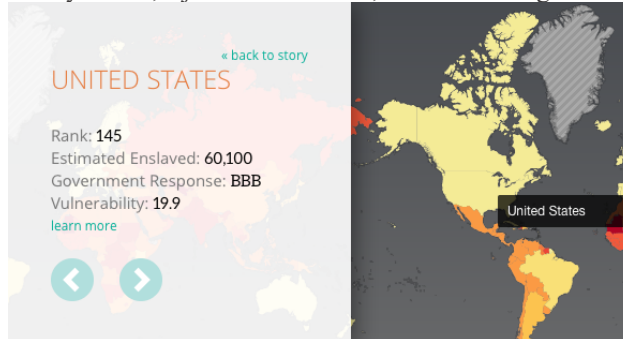
The conflict affected population of Syria is highly vulnerable to different forms of modern slavery. Nearly one in every two Syrians has been forced to flee their home either as a refugee or Internally Displaced Person (IDP) since violence erupted three years ago. The strain on families to sustain their livelihood is enormous and many children no longer receive an education. Instead, men and children are recruited into the armed forces inside Syria and, as refugees, work for little to no wage in neighboring countries. Child soldiers have been recruited into government forces, the Free Syrian Army (FSA), the Kurdish People Protection Units (YPG), Ahrar al-Sam, Islamic State (IS) and Jhabat al-Nusra among other armed groups.² Syrian girls are sold as child brides or forced into marriage and commercial sexual exploitation.



(Walk Free Foundation, 2014)
Location circle added by author

Excerpt 4:
Global Slavery Index

The United States (US) is a destination of exploitation for both US citizens and foreign nationals, predominately from Mexico, the Philippines, Thailand, Honduras, Guatemala, India and El Salvador.¹ Men, women and children are exploited as forced labourers, and in the commercial sex industry. In 2013, potential modern slavery cases were reported in fifty states of the US.² Victims of forced labour have been identified in domestic work³ and home healthcare,⁴ the food service industry,⁵ construction⁶ and agriculture,⁷ nursing,⁸ factories and garment-manufacturing,⁹ beauty salons,¹⁰ janitorial services,¹¹ and travelling sales crews, among other sectors.



(Walk Free Foundation, 2014)

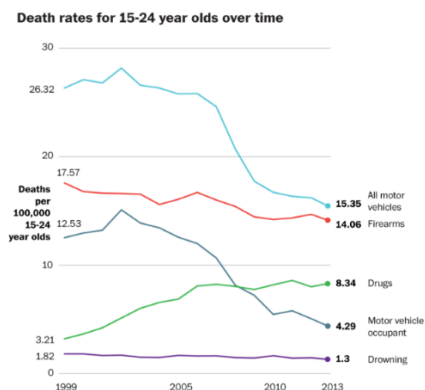
Excerpt 5:
Washington Post

“Gun deaths, by homicide and suicide, are pretty common in the U.S. According to the Centers for Disease Control, 33,636 Americans died by firearm in 2013 -- about one person every 15 minutes. And they disproportionately happen to young people. In fact, more 15-25-year-olds die due to firearms in the U.S. than are killed while in motor vehicles.

The top blue line shows the rate of deaths by motor vehicle per 100,000 15-24-year-olds -- a figure that includes people driving cars, riding in cars, riding motorcycles or bikes, pedestrians who are struck by cars, and various other situations. Taken all

together, this is a bigger cause of death for young people than firearms, shown by the red line, are.

However, if you just look at motor vehicle occupants -- what most people think of when they think of kids dying in a car crash -- you can see that firearms are actually the bigger cause of death. This data, which comes from the Centers for Disease Control and Prevention, just looks at fatal deaths by injury, so it doesn't include diseases like cancer."⁴

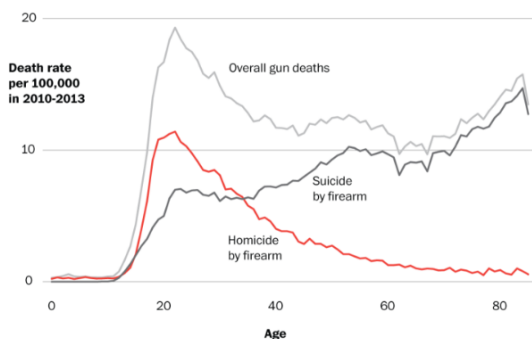


(Swanson & Guo, 2015)

Excerpt 6:
Washington Post

“Younger people are more likely to be shot by someone else, while most older gun deaths are suicides.”

Younger people get shot. Older people shoot themselves



(Swanson & Guo, 2015)

Excerpt 7:
Washington Post

Active shooter events have become more common in recent years.

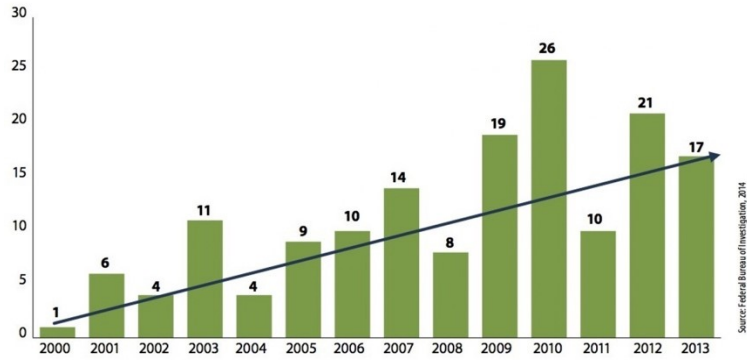
A report published by the FBI last year, studying active shooting situations between 2000 and 2013, found that these kinds of incidents were happening more and more recently. The first seven years of the study found an average of 6.4 active shootings per year, while the last seven years of the study found that number jumped up to 16.4 incidents per year.

Active shooting incidents are defined by federal agencies as "an individual actively engaged in killing or attempting to kill people in a confined and populated area."

⁴ Because the last two paragraphs explicitly reference the graph, they were left out when the graph was left out.

(This is different from mass killings, which are episodes in which three or more people are killed, according to the FBI. While many active shooting incidents wind up being mass killings, more than half of the episodes in the FBI study did not meet that definition.)

A Study of 160 Active Shooter Incidents in the United States Between 2000 - 2013:
Incidents Annually



(Ehrenfreund & Goldfarb, 2015)

Appendix B: ANOVA for Emotional Response

		Sum of Squares	df	Mean Square	F	Sig.
Excerpt 1	Between Groups	2.761	2	1.380	0.499	0.618
	Within Groups	38.739	14	2.767		
	Total	41.500	16			
Excerpt 2	Between Groups	0.290	1	0.290	0.106	0.749
	Within Groups	41.019	15	2.735		
	Total	41.309	16			
Excerpt 3	Between Groups	0.114	2	0.057	0.023	0.977
	Within Groups	34.214	14	2.444		
	Total	34.327	16			
Excerpt 4	Between Groups	0.637	2	0.318	0.154	0.859
	Within Groups	26.922	13	2.071		
	Total	27.559	15			
Excerpt 5	Between Groups	2.808	2	1.404	0.414	0.669
	Within Groups	47.435	14	3.388		
	Total	50.243	16			
Excerpt 6	Between Groups	3.537	2	1.768	0.623	0.551
	Within Groups	39.772	14	2.841		
	Total	43.309	16			
Excerpt 7	Between Groups	2.097	1	2.097	0.891	0.360
	Within Groups	35.307	15	2.354		
	Total	37.404	16			