DISFLUENCY DISRUPTS THE CONFIRMATION BIAS:
WHEN CHANGING THE FONT CHANGES YOUR MIND

BY

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ABSTRACT

Research on the confirmation bias (Nickerson, 1998) demonstrates that people selectively seek evidence that confirms their prior beliefs and expectations. This selective search for information allows people to analyze new information in an efficient, but shallow way. The present research discusses how experienced difficulty in processing (disfluency) can reduce the confirmation bias by promoting careful, analytic processing. In two studies, I found that participants with prior beliefs about an issue supported their own side less when given counter-arguments presented disfluently. The change occurred for both naturally occurring attitudes (i.e. political ideology) and experimentally assigned attitudes (i.e. positivity towards a court defendant). These results suggest that changing the style of an argument’s presentation can lead to attitude change by promoting more comprehensive consideration of opposing views.
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CHAPTER 1

INTRODUCTION

Imagine a teacher grading a collection of student papers. After a long day, there are only two essays left, and both are from students she feels are not the most academically inclined. However, unbeknownst to her, the two students spent a considerable amount of time perfecting their papers, hoping to show the teacher their improvement. When the teacher looks at the first paper, it appears normal—6 pages double-spaced in a 12 pt Times New Roman font. The teacher is tired, and knows what to expect, but also knows she has to read the paper before assigning a grade. She glosses over the words quickly and easily without having their meaning fully register. Feeling as though she completely understood it, she gives the paper a C, knowing the student probably performed as he always has. The next paper is different, though. It has a similar format to the previous paper—same font and spacing—but the student’s printer appears to have been low on toner and so the words are slightly difficult to read. She has to read the paper, but unlike the previous one, cannot read it as quickly. The low contrast forces her to take her time, giving her a chance to appreciate the quality of the paper. Despite having a prior bias against the student, the paper’s quality is evident. She gives the paper an A+, unaware of the effect that a subtle change in presentation can have.

The above example illustrates the importance of understanding the reader’s experience when evaluating a message because it can determine how the rest of the information is processed. In our normal reading experience, we often reason quite quickly and intuitively, being guided by our schemas and expectations. These expectations create biases that are efficient, so we can come to a solution quickly (Bransford & Johnson, 1972), but this ease and speed may come at the expense of not fully attending to all of the material (Shah & Oppenheimer, 2008). By
not giving full consideration to differing views, a reader may miss potentially informative details, and the writer is left unheard. In this paper, I will argue that a simple feature of a message, the clarity of the text, can overcome the detriments of selective information processing, such as the confirmation bias.

1.1 Fluency

This paper will discuss how fluency can play a role in attitude change. Fluency is a meta-cognitive feeling of how easy or difficult information is to process. When people encounter a stimulus, interpreting its meaning can be either effortless (fluent) or it can be effortful (disfluent) (Alter & Oppenheimer, 2009). Any time something has felt easy to understand, it means that the stimulus was fluent. Some examples of easy-to-process things in our daily lives are familiar names (Whittlesea, 1993; Laham, Koval, & Alter, 2012), clearly written text (Simmons & Nelson, 2006), and easy to pronounce words (Alter & Oppenheimer, 2006). From the perspective of the reader, fluency can have its advantages. Being able to quickly discern the basic characteristics of a stimulus (e.g. what letter is written, what is the word’s meaning) allows the person to continue with the rest of processing more quickly and effortlessly. Overall, the task feels simpler and easier to finish. Important, these feelings of ease are then used as information for our subsequent decisions concerning the stimulus (Schwarz, 2012). Most of the research on fluency examines how the pleasantness associated with fluency is misattributed to the target. Regardless of their actual attributes, easier to process stimuli are judged as being more true (Reber & Schwarz, 1999), having more value (Alter & Oppenheimer 2008), and being more attractive (Reber, Winkielman, & Schwarz, 1998). Fluency can therefore have a broad effect on our judgments through the ease and difficulty we experience when processing information.
In addition to altering how pleasant a stimuli feels, fluency can also affect how people process a message. That is, changing how easy or difficult a text is to read can change the way people think about or internalize the message. While a fluent message feels pleasant to read, it is also more easily skinned and finished. However, a difficult-to-process (i.e. disfluent) message must be read more slowly and carefully. This change in reading experience means that people will now approach the messages differently. Ordinarily, if people believed a message was irrelevant, they would not give a second thought to it, but, by increasing reading difficulty, people would need to pay careful attention just to understand what the message is saying. Suddenly, they are now forced to process the information slowly and deliberately, mimicking the way a highly interested person processes the message. By slowing the person down, that person now has the opportunity to truly consider what the message is saying. This forced consideration means that disfluency can offer effective strategies for persuasion. If disfluency can induce people to pay more attention to the content, we should expect to see the greatest attitude change in people who are most prone to avoiding counter-attitudinal information—those who have prior formed beliefs. Therefore a message that is more difficult to comprehend may lead to greater overall attitudinal change in biased individuals.

How we interpret a message depends on how the message is presented. Small changes to the features of the text, such as the typeface or contrast, can influence the reader’s evaluations of the message. Because a disfluent message is visually unclear, people have to spend more time and effort when reading. These changes mean that people are now approaching the message differently—they are reading it longer and trying harder to process everything. Most important, the changes produced by disfluency are similar to how highly motivated and analytic readers approach a message. Disfluency therefore has the potential to make people come to more careful
and comprehensive conclusions about the information than if they had merely given it a cursory read.

1.2 Literature Review

1.2.1 Fluency and Mental Processing

The subjective ease people experience when reading a fluent message can change the effort and attention given to a message, and lead to an overall change in processing. Traditional models of information processing (Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1986, Slooman 1996; Kahneman, 2003) specify that people reason with one of two systems: one that is fast, effortless, associative, and intuitive (heuristic) and a second that is slower, more effortful, analytic, and deliberative (systematic). If a person evaluates a communication with the systematic route, careful scrutiny is given to the arguments to determine their validity. Messages evaluated heuristically will lead to a more shallow evaluation of the argument, with people relying on superficial cues (e.g. how attractive is the speaker source, how many other people are following the message) in their assessment. In general, people evaluate fluent information more heuristically, while disfluent presentation leads to a more analytic approach (Oppenheimer, 2008). For example, people rely more on peripheral versus systematic cues when evaluating a message presented fluently (Alter, Oppenheimer, Epley, & Eyre, 2007, Study 2). When reading a review for a music player, participants emphasized heuristic cues, such as its physical attractiveness, in their evaluations when the title of the review was fluent. But, when the title was presented in a disfluent font, participants placed more emphasis on the systematic cue (e.g. the quality and number of features of the player). Other research has found that information is better remembered when presented in a difficult to read format. For example, high school students who received classroom materials in a disfluent style scored higher on their
examinations than when the material was presented fluently (Diemand-Yauman, Oppenheimer, & Vaughn, 2010). Similarly, people are less likely to give intuitive responses when questions are presented disfluently. Questions that require the respondent to pay close attention to the question such as, “How many animals of each kind did Moses take on the Ark?” were answered correctly more often when presented disfluently (Song and Schwarz, 2008). Likewise, disfluent presentation led to more correct responses on the Cognitive Reflection Test (CRT) (Frederick, 2005), which requires participants to overcome a gut-response to answer correctly (Alter et. al., 2007, Study 1). On one item of the CRT, participants are told that a bat and a ball cost $1.10 in total, and the bat costs $1.00 more than the ball. For most people, the initial response is to subtract $1.00 from the total cost and say the ball costs $0.10, but the correct answer requires deliberate reconsideration of that initial reaction. When the question is presented disfluently, people are more likely to give the correct answer of $0.05. This increase in systematic processing is supported by brain imaging studies finding that disfluency promotes activity in the anterior cingulate cortex (Boksman et al., 2005), which signals to activate the controlled and effortful thoughts of the prefrontal cortex (Botvinick, Braver, Carter, Barch, & Cohen, 2001). By promoting analytic processing, disfluency can lead to people processing the information more deeply and relying less on heuristics. In contrast, the ease and processing speed that fluency facilitates promote greater use of shortcuts, and sometimes more mistakes.

1.2.2 Heuristics and Biases

By making people more analytic and systematic, disfluency may lead to less biased evaluations. In other words, disfluency should stop people from thinking too quickly about a message and not giving full consideration to the information. A specific example of this is the confirmation bias, where people seek out and selectively interpret information that is consistent
with their existing beliefs (Koriat, Lichtenstein, & Fischhoff, 1980; Nickerson, 1998). Studies examining this bias use participants who have, or are given, a prior belief and then measure the extent they give or seek confirmatory interpretations of a stimulus. For example, Darley and Gross (1983) gave participants an initial expectation about a child’s socio-economic background (either “high” or “low”) and then had all participants view the same video of that child taking an academic test. Participants tended to rate the child’s academic ability as consistent with their assumed socio-economic status. Past reviews on the confirmation bias have conceptualized it as, at least in part, a cognitive shortcut or heuristic that simplifies complex inferential tasks (Friedrich, 1993; MacCoun, 1998). As with most heuristics, the confirmation bias can lead to beneficial outcomes, but may also lead to poorer decisions because evidence is not being considered fully. Given the emphasis on careful analysis associated with disfluency, making text more difficult to read may make an argument more completely understood and accepted.

1.3 Present Research

In the present studies, I examine whether presenting a message in a disfluent format reduces the confirmation bias and makes people’s judgments more moderate. As discussed, previous research has shown that disfluency can impact judgments and analytical processing devoted to new information (Alter, Oppenheimer, Epley, & Eyre, 2007). However, no work has examined whether disfluency can also affect information processing where a person has already formed attitudes, as in the confirmation bias. Fluency can promote heuristic thinking when making initial judgments, and fluency may lead people to ignore the alternative viewpoints to an argument. In other words, when people can easily read through a message, they may believe they have completely understood the message and not devote any more attention to it. Thus, when making evaluations people reading fluent information should rely more on efficient vs.
comprehensive processing and selectively attend to information that confirms prior beliefs. Considering alternative viewpoints requires mental effort, which people may not be willing or even expect to exert. Disfluency, on the other hand, leads people to analyze the message more fully, taking more into account such as alternative viewpoints. Therefore, I predict that the confirmation bias should be reduced when information is presented in a disfluent style, which prompts systematic, analytical reasoning.

In two studies, I test whether prior biases are attenuated when new information is presented in a disfluent format. In Study 1, I examine if people who are politically partisan could become more moderate in their evaluation of ideologically relevant information. Participants take part in a study where they first provide their political beliefs and then read a brief essay supporting capital punishment. This essay is presented in either an easy-to-read (fluent) or hard-to-read (disfluent) format. Participants then list how much they agree with the essay. I expect that participants will give partisan responses when the essay is easily read and not given much consideration. However, when the essay is presently disfluently, participants should give more scrutiny to the arguments and disconfirm their prior bias. Thus, disfluency should lead to a more moderate pattern of response.

For Study 2, I examine this disconfirmation effect in an experimental setting for legal decisions. Participants take part in an online study where they were asked to read various court documents and then decide the outcome in this hypothetical court case. In this study, they are first assigned either a positive or negative expectation about a defendant. They then read an ambiguous description of the crime, presented in a clear (fluent) or degraded (disfluent) format. After reading both documents, participants are asked to give a verdict and sentence to the defendant. I expect participants to give responses consistent with their biases when the
description is fluent and they do not have to think much about the case. However, when the
description is presented in a disfluent format, participants should consider the alternative
viewpoints to the facts, and give more moderate responses. Together, these studies would show
that disfluency can reverse people’s tendency to make judgments consistent with their prior
expectations (confirmation bias), and produce more moderate evaluations of information.
CHAPTER 2

STUDY 1

2.1 Overview

Study 1 examined whether the confirmation biases produced by ideological beliefs may be reduced when new information is presented in a disfluent format. Previous studies on the confirmation bias have found that participants with strong prior beliefs on social issues such as capital punishment tend to evaluate evidence related to the issue in a manner that is consistent with their beliefs (Lord, Ross, & Lepper, 1979). In this study, I predict that disfluency will reduce partisan biases when evaluating capital punishment arguments. Participants first read a pro capital punishment argument presented in either a fluent or disfluent font and then gave evaluations of the argument. Because conservatives show greater support for capital punishment than liberals do (Gallup, 2004), I expected that people would use their attitudinal bias (political ideology) to guide their evaluation of the arguments when they are presented in a fluent font. However, when presented in a disfluent font, I expected that people would moderate their evaluations of the argument, demonstrating a reduced confirmation bias.

2.2 Method

2.2.1 Participants

133 undergraduates (60 women, 73 men, $M_{age} = 19$) participated in the study for partial course credit in an introductory psychology course during the fall. No prescreening restriction was applied to the participants other than that they had to be at least 18 year old.
2.2.2 Procedure

Participants were told the experiment was about studying “reading comprehension” and seated in front of a computer in a private lab room. All instructions and stimuli were presented on the computer with a program written in the Flash programming language.

Participants first completed a short demographics questionnaire, which included questions about age, gender, ethnicity, religious affiliation, and political ideology. The ideology question asked, “How would you describe your ideology on social issues?” on a 7-point scale, with endpoints 1 = “Strongly Liberal”, 7 = “Strongly Conservative.”

2.2.3 Persuasive Message

All participants read a brief passage advocating the use of capital punishment (see Appendix A). This has been previously used as a persuasive essay in other research and offers several arguments such as acting as a deterrent for crime and reducing taxes associated with lengthy incarcerations (Blanchard-Fields & Horhota, 2005; see Appendix A). Participants were randomly assigned by the program to either a fluent or disfluent condition at the beginning of the survey. In the fluent condition, the pro capital punishment passage was presented in a 12 point Times New Roman font. In the disfluent condition, the passage was presented in a light gray bold and italicized Haettenschweiler font. Previous research has used this font to study the effects of fluency (Diemand-Yauman, Oppenheimer, & Vaughn, 2010). Participants were given no explicit instruction on how much time to take reading the article and could move on to the next section when ready.

2.2.4 Dependent Measures

After reading the article, participants answered a variety of questions relating to their acceptance of various aspects of the arguments: “How reliable is the message?”, “How
intelligent do you consider the argument?” “How much do you believe the facts that were in the reading?” All questions were asked individually on 5-point Likert scales with endpoints 1 = “Not at all”, 5 = “Extremely”.

2.3 Results

The three dependent measures (message reliability, intelligence of argument, belief in the argument) showed good scale reliability, Cronbach’s $\alpha = .77$, and so the average of the items was computed to create a single composite measure of agreement. Because the hypothesis concerns disconfirmation of prior beliefs and expectation, I used participants’ stance on social issues as a proxy for their prior belief on the death penalty. Political ideology was standardized with a mean of 0 and a standard deviation of 1. Fluency was dummy coded by having participants who saw the fluent arguments scored as a 1 on the variable, and participants who saw the disfluent variable scored as a 0. The standardized measure of ideology was multiplied by the dummy coded variable for fluency to create the interaction term for the multiple regression.

A multiple regression was conducted by entering in the variables of fluency, standardized ideology, and the interaction term to predict the composite measure of agreement. There were no significant main effects for ideology ($\beta = .04, ns$) or for fluency ($\beta = .02, ns$). However, the lack of main effects were qualified by the significant predicted interaction between expectation and fluency ($\beta = .26, p < .05$). The positive coefficient implies that fluency was associated with conservative participants agreeing more with the arguments, and disfluency was associated with less partisan agreement (see Figure 1).

To test whether participants used ideological biases only in the fluent condition, I conducted the simple slopes procedure for a dichotomous moderator recommended by Hayes and Matthes (2009). This test examines the relation between a continuous predictor (i.e. political
ideology) and a continuous response (i.e. argument agreement) at both levels of the moderator (i.e. fluency) using a single degree of freedom for each level. The conditional effect test reveals that, as predicted, political ideology affected agreement in the fluent condition ($\beta = .19, t(132)=3.33, p < .01$). For participants who saw the arguments presented fluently, a person who is one unit higher on unstandardized conservatism is estimated to agree by .19 units in their agreement with the arguments. However, participants who saw the arguments in a disfluent format were not affected by their bias ($\beta = .02, t(132)=.28, \text{ns}$). For participants who saw the arguments presented disfluently, a person who is one unit higher on conservatism is no more/less likely to agree with the pro-capital punishment arguments than a person lower on conservatism. Therefore, simple slopes test reveal that disfluency attenuates the influence political ideology on political judgments.

2.4 Discussion

These results provide evidence in support of the hypothesis that disfluency can attenuate the biasing influence of political ideology on judgment of political issues. Participants were less extreme in their evaluations, in the disfluent condition, suggesting they were able to disregard prior beliefs when information is presented disfluently.

There are several limitations to this study, however. The biases involved in Study 1 are self-selected; people came into the study as either liberal or conservative. The self-selected factor could mean that these effects are contingent on another variable than the one proposed. That is, perhaps the effect of fluency is not interacting with bias, but rather with whether the person develops strong beliefs or not. People who develop very strong beliefs naturally may regress to the mean because the factors that made their beliefs so extreme are unlikely to be present when they must reconsider information. This explanation still invokes a processing explanation of the
effects, but suggests that we would not see similar disconfirmation when a bias is assigned to a person.
2.5 Figures

Figure 1. Predicted values of agreement with pro capital punishment arguments from the interaction between standardized conservatism and fluency of arguments (Fluent/Disfluent). Higher values on the y-axis scale indicate greater agreement with capital punishment. Higher values on the x-axis indicate greater self-reported conservatism.
CHAPTER 3

STUDY 2

3.1 Overview

In Study 1, people’s political ideologies had less biasing influence on evaluations of political arguments, when those arguments were presented disfluently. However, because the biases observed in Study 1 were pre-formed attitudes (ideology), and not randomly assigned to the participants, it is possible that the effect observed may not be due to fluency interacting with prior beliefs, but due to fluency interacting with a self-selective factor (e.g. people who naturally form strong attitudes). Additionally, the first study only examined one type of bias: prior political beliefs. Any effect that reduces the confirmation bias should apply across a range of situations where the confirmation bias has also been observed. The second study sought to address these issues by experimentally manipulating the bias people have when they approach a story, and by extending the effect to a different domain.

One domain that has been used extensively in confirmation bias research is juror decision making. For example, the final verdicts that juries give are usually the same as the tentative ones they initially form (Lawson, 1968). Pennington & Hastie (1993) found that this confirmation bias may be due to fast processing that only considers a subset of information. Participants in mock-jury trials were more likely to remember statements consistent with their chosen verdict as having been presented as trial evidence than statements that were inconsistent with this verdict. Therefore, the present hypothesis that disfluency leads to more comprehensive consideration of information implies that the confirmation bias in juror decisions can be attenuated by having them consider more bias-inconsistent statement, and jurors should give less biased verdicts.
In Study 2, participants played the role of a juror where they would be assigned a bias towards a target and then make decision about that target based on fluent/disfluent information. Participants first read a positive or negative evaluation of a suspect before reading a description of the crime presented in either a clear (fluent) or degraded font (disfluent). I expected guilty verdicts and sentencing to be consistent with the prior impression when the description of the crime was easy to read, but this conformation bias should be reduced when information about the crime was presented in a disfluent format.

3.2 Method

3.2.1 Participants

197 participants (131 women, 65 men, and 1 no response; $M_{age} = 37$) completed a brief two-part questionnaire on Amazon.com’s Mechanical Turk online survey program. Participants clicked on a link through Mechanical Turk that advertised a mock-trial study where they would read various documents pertaining to a court case and then be asked to give their verdict. Each participant’s IP address was recorded to prevent participants from completing the same questionnaire more than once. Six participants were removed from the study for double participation.

3.2.2 Witness Statement

When participants clicked on the link, they were randomly assigned by a script on the page to a manipulation of the witness statement (Bias: Positive/Negative) and to a manipulation of the description of the crime (Fluency: Fluent/Disfluent). To experimentally assign a bias, the first document participants read was a witness testimony that described the defendant either positively or negatively. This description did not directly relate to the crime, but instead was meant to create an expectation about the defendant (Donald Smith) before the facts about the
crime were given. The document was ostensibly written by the defendant’s school psychologist that described her relation with him using positive anecdotes or negative anecdotes. In the positive bias condition, Donald was described as having a history of great remarks from teachers, polite, warm, good sense of humor, respectful, easy to work with, and a good listener (see Appendix B). In the negative bias condition, Donald was described as having a history of disciplinary issues, rude, cold, criticizing, disrespectful, difficult to work with, and interrupting.(Appendix C). This document was then printed and scanned to give a greater sense of authenticity.

3.2.3 Description of Events

Participants were then presented the stipulated facts of the case. The instructions read, "The following document provides the stipulated facts of the case. The stipulated facts provide a summary of the case, which both sides agree upon. Please read the document carefully and then move on to the final questions." Participants then read a description of the objective facts, where Donald was accused of a robbing a gas station, but his guilt is ambiguous. There was an incident involving three youths earlier in the day, where a gas station was robbed; and when police were searching the area, they found Donald alone holding a bag full of money. He claimed he found it thrown under the dumpster when he was taking out the trash. The gas station attendant could only say that Donald had a similar physical build to one of the perpetrators. The passage purposefully left Donald’s guilt ambiguous, which allowed us avoid ceiling or floor effects due to the variability that responses could take. This document was also printed and scanned to achieve the look of an authentic court document.
3.2.4 Disfluency Manipulation.

The description of the facts of the crime was presented in either a Fluent or Disfluent format. In the Fluent condition, the text was written in Times New Roman 12-point font (see Appendix D). In the Disfluent condition, the document was exactly the same as in the Fluent condition, but was photocopied recursively for three times on the lowest contrast setting. The document achieved a level of degrading where it was still readable, but required effort on the reader’s part to read the words (see Appendix E). Previous research has used this disfluency manipulation to induce analytic thinking via disfluency (Oppenheimer & Frank, 2005; Diemand-Yauman et al., 2010).

3.2.5 Dependent Measures.

After reading the stipulated facts, participants gave their judgment of Donald's guilt. Specifically, participants were asked, "What verdict would you give Donald?", with options 0=Not Guilty and 1=Guilty, and "How long would you sentence Donald to spend in juvenile detention?", on a 6-point scale with endpoints 0= “0 months”, 5 = “5 months or more”).

3.3 Results

A 2 (Bias: Positive/Negative) X 2 (Fluency: Fluent/Disfluent) ANOVA on the mean of verdict (coded as a 1 for guilty and 0 for not guilty) revealed a significant main effect for bias, $F(1,193) = 15.55, p < .001 \; \eta^2 = .08$). Participants who received the positive impression by the school psychologist were more likely to find the defendant not guilty ($M=.50, SD=.50$) than participants who read a negative description ($M=.78, SD=.41$). There were no main effects for fluency $F(1,193) = 1.75, ns)$. Most importantly, there was the predicted significant interaction between bias and fluency $F(1,193) = 3.85, p = .05 \; \eta^2 = .02)$. Further inspection of the means found that participants presented the objective information disfluently were less likely to show a
confirmatory pattern. Participants who had a positive bias and who read a fluent version of the stipulated facts gave less guilty verdicts ($M=.41, SD=.05$) than participants who read a disfluent version of the facts ($M = .63, SD=.05$). Participants with a negative bias were more likely to see the defendant as guilty when the facts were presented fluently ($M=.80, SD=.40$) than when it was disfluent ($M=.75, SD=.43$). I followed the analysis with a simple effects test that looked at how polarized the participants were in the fluent and disfluent conditions. Simple effect tests reveal that participants given a fluent description of the crime were affected by the bias, and gave significantly different responses ($F(1,193)=19.27, p<.001$). However, as predicted, having a positive or negative expectation in the disfluent condition did not significantly affect responses ($F(1,193)=1.79, p=.182$).

The sentences given to the defendant showed the same trend. There was a main effect for bias, $F(1,193) = 27.65, p < .001 \eta^2=.13$, and no main effect for fluency, $F(1,196) = .80, p = .37 \eta^2 = .004$. Supporting the hypothesis, there was a significant interaction between bias and fluency, $F(1,196) = 5.10, p < .05 \eta^2 = .03$. Participants with a positive bias gave lesser sentences when the facts were presented fluently ($M=1.15, SD=1.65$), than when presented disfluently ($M=1.98, SD=1.97$). In contrast, participants with a negative bias gave harsher sentences when reading fluent information ($M=3.15, SD=1.94$) vs. disfluent ($M=2.79, SD=1.96$) (see Figure 2). A simple effect test reveals that participants who saw a fluent description of the crime gave significantly different sentences, depending on their initial bias ($F(1,193)=31.12, p<.001$). However, unlike the result for the verdicts, a simple effect test finds that the sentences of people with a positive and negative bias were also significantly different in the disfluent condition ($F(1,193)=4.12, p<.05$).
3.4 Discussion

These results provide evidence in support of the hypothesis that disfluency can attenuate the influence of the confirmation bias. Participants are more likely to interpret an ambiguous description of events less extremely when information is presented disfluently.

This study further supports the results of Study 1. When participants received a bias, they gave verdicts of the defendant that were consistent with that bias, showing a very polarized pattern of response. However, participants that received the information in a disfluent format gave verdicts that diminished the extremity of evaluations. Sentences showed a similar pattern for the fluent condition, where participants who had a negative bias gave significantly longer sentences than those with a positive bias gave. Unlike the verdicts though, participants who saw a disfluent description of the crime also gave significantly different sentences depending the bias. Because the difference was still significant, but less than the difference of the sentences given in the fluent condition, it is possible that disfluency can only minimize the influence of biases, but not eliminate them completely.

In addition to providing support for the first study, Study 2 improves upon the previous findings as well. Rather than using a student population, a more general adult sample was used that allowed for greater diversity in the participants and suggest these effects can generalize to a wider sample. Furthermore, the experimental nature of the study supports the notion that the effect is not specific to one type of person, such as those who are more likely to have a bias. Rather, disfluency can disconfirm general biases that have been be assigned randomly.
3.5 Figures

Figure 2. Mean sentence length given to defendant (0-5 months), by Fluency condition and prior impression of the defendant.
CHAPTER 4
GENERAL DISCUSSION

These results demonstrate that making it more difficult to process a message can reduce the influence of prior beliefs. Study 1 demonstrated how reading political arguments in a disfluent format leads to less biased evaluations. Conservative and liberal participants became more moderate after reading capital punishment arguments presented disfluently. Study 2 showed that this effect holds in a more general population and in settings involving legal judgments. By experimentally assigning a bias, Study 2 also provides evidence that this disconfirmation effect is not restricted to any particular self-selected trait, but more likely applies to confirmation biases in general. These findings are both consistent with past research on fluency and the confirmation bias, while also demonstrating how it is important to understand people’s expectations when examining fluency.

Although altering the contrast of a font is a minute change, this manipulation was strong enough to show a noticeable effect in persuasion. It is possible that the subtlety of the manipulation is precisely why the effect occurs. Previous studies of fluency have found that the effects of fluency disappear once people are aware that the clarity of visual presentation is being manipulated (Whittlesea, Jacoby, & Girard, 1990). A large problem in persuasion is avoiding individual resistance such as reactance (Brehm, 1966). For these particular studies, readers may not feel as though they are not being manipulated, because they may not know the intended effect of disfluency. Therefore the present results could offer a method to subvert general suspicion and in a way that can be applied to most settings (i.e. changing the font).

I argue that disfluency leads respondents to more carefully process the content of a message. Further research in our lab (Hernandez & Preston, in press) supports the notion that
participants in the disfluent condition were engaging in more careful processing, by showing that cognitive load disrupts effects such as those shown in Studies 1 and 2. Thus, participants who are taxed with a memorization task or who are given only a short time to read the message do not have the cognitive resources left over for careful processing. In this case, participants presented with a disfluent message and under cognitive load seem to not process the new information as thoroughly and thus they show a confirmation bias (just as those in the fluent condition do).

While the current paper establishes that disfluency can reduce the confirmation bias, further research should be conducted to explore the full extent of the effect and possible applications. The current research examined immediate attitudes toward the fluent and disfluent stimuli, but it is unclear how long these attitudes persist. If the change is due to a more comprehensive analysis of the information, we would expect attitudes to endure longer than changes produced by misattribution of subjective ease. Future studies may wish to address if even the strongest held biases are susceptible to the effect of disfluency. The current studies used political and legal judgments as examples of confirmatory domains. However, there are a multitude of other situations where people’s tendency to seek confirmatory information may lead to poor consequences, and reducing this bias may be desired. In medical situations, doctors may rely too heavily on prior expectations about a disease and not consider alternative explanations. Research has found that failing to generate a correct initial hypothesis has been a common cause of incorrect diagnosis (Barrows, et. al., 1978). Also, reducing confirmation biases may help improve self-esteem for low self-esteem people. People tend to attend to and remember information that is consistent with their current self-image (Swann & Read, 1981). Presenting positive statements to people with negative self-views may be easier if those statements are disfluent. The present findings explore just some of the many avenues for further research, but
research examining the relation between fluency and prior expectation has many possibilities that can provide a greater understanding in different areas of psychology.

When addressing the question of how to persuade others, it is important to realize the many methods at one’s disposal. The effect found for disfluency provides a promising avenue for persuasion because changing the clarity of a text is an easy to implement modification that can be applied to many arguments. Most important, this research shows that this change in processing ease is effective for changing the beliefs of biased people—a group that is often the most difficult to persuade. This change in attitude from disfluency is hypothesized to be caused by inducing a more analytic style of thinking, where the reader is considering more alternatives. Therefore, disfluency should be especially beneficial in promoting lasting attitude change. People who wish to persuade others would ideally like others to agree with them, not simply out of complaisance, but because the recipient actually agrees with the underlying message. By making a message disfluent, messages that people would have disregarded now have a chance to be heard and create lasting change.
REFERENCES


APPENDIX A

Pro capital punishment passage used to serve as stimuli in Study 1.

Capital punishment should be legal in all states.

There are many reasons for having this position.

Capital punishment decreases crime because it acts as a deterrent to criminals who engage in serious or life-threatening crimes.

It also is useful because capital punishment reduces the amount of government taxes necessary for the upkeep of prison facilities by reducing the number of criminals who are incarcerated at a given time.

Another benefit is that capital punishment teaches youths morality by making clear the line between right and wrong.

Finally, capital punishment is the only just means to punish a murderer.

Clearly, there are many good reasons why capital punishment should be legal in all states.
APPENDIX B

Positive Witness testimony seen by participants assigned the positive expectation condition in Study 2.

I am the school psychologist where the defendant, Donald Smith, goes to high school. Donald was referred to me last year by several of his teachers on account of some recent decreased performance in his classes. He has had no previous disciplinary issues and a record of great remarks from his teachers about his attitude. After he was referred, I met with him on multiple occasions over the course of 6 months. In the sessions that followed, we discussed various aspects about his life. What struck me as particularly unusual when we first met was that he was extremely polite and introduced himself with a warm handshake. During our conversations, he always tried to go out of his way to make me feel comfortable with his wonderful sense of humor and showed a lot of respect for his classmates, especially the ones going through difficult times. Additionally, when I would begin to say something, he made sure to listen closely. He has a very positive demeanor and overall, I would characterize him as one of the easiest students to work with that I have met.
APPENDIX C

Negative Witness testimony seen by participants assigned the positive expectation condition in Study 2.

I am the school psychologist where the defendant, Donald Smith, goes to high school. Donald was referred to me last year by several of his teachers on account of some recent decreased performance in his classes. He has had a repeated history of disciplinary issues and a record of poor remarks from his teachers about his attitude. After he was referred, I met with him on multiple occasions over the course of 6 months. In the sessions that followed, we discussed various aspects about his life. What struck me as particularly unusual when we first met was that he was extremely rude and refused to shake my hand when I introduced myself. During our conversations, he always tried to go out of his way to make me feel uncomfortable by making sexist and criticizing remarks and show a lot of disrespect with his jokes about a classmate who had recently passed away. Additionally, when I would begin to say something, he made sure to interrupt. He has a very negative demeanor, and overall, I would characterize him as one of the most difficult students to work with that I have met.
**APPENDIX D**

Fluent version of stipulated facts used as a stimulus in Study 2.

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**Overview**

**Stipulated Facts**

The following description below lists the facts that all parties agree upon.

Donald Smith, a 16-year-old juvenile, is accused of the Class B+ offense of robbery in the first degree. On the night of July 15, Officers Tina Rogers and George Ryan saw three youths come out of the Excel Station and run toward the alley behind the gas station. Confirmed by a radio call that station had just been robbed, the police with a back-up car apprehended Donald Smith, James Anson, and Raymond Carr in the alley. Donald Smith was found with a paper bag with $227.58 in his hands. Donald explains that he found the money underneath a dumpster in an alley as he was disposing of trash in area. The station attendant could not clearly see the three perpetrators, but stated that the robbers were all male and under the age of 18 and had a similar physical build to Donald.

Donald Smith went to juvenile court where he is pleading not guilty to the charges. If he proves the defense, he must be found not guilty.
APPENDIX E

Disfluent version of stipulated facts used as a stimulus in Study 2.

Stipulated Facts

Donald Smith, a 16-year-old juvenile, is accused of the Class B1 offense of robbery in the first degree. On the night of July 15, Officers Tina Rogers and George Ryan saw three youths come out of the Excel Station and run toward the alley behind the gas station. Confirmed by a radio call that the station had just been robbed, the police with a back-up car apprehended Donald Smith, James Anson, and Raymond Carr in the alley. Donald Smith was found with a paper bag with $227.58 in his hands. Donald explains that he found the money underneath a dumpster in an alley as he was disposing of trash in area. The station attendant could not clearly see the three perpetrators, but stated that the robbers were all male and under the age of 18 and had a similar physical build to Donald.

Donald Smith went to juvenile court where he is pleading not guilty to the charges. If he proves the defense, he must be found not guilty.