FROM ATTITUDES TO ANCHORING (AND BACK AGAIN): INCORPORATING KNOWLEDGE, PLAUSIBILITY, AND EXTREMITY

DISSERTATION

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ABSTRACT

“Attitudinal” models of anchoring have produced a series of clear predictions about how anchors should function over levels of extremity, as well as introducing the potential for differential consequences of initial anchored judgments based on the extent to which perceivers elaborate on the initial anchored response. The current research expands on existing anchoring literature in two distinct ways. First, the research examines differential effects of knowledge across multiple levels of anchor extremity. Past research in both the attitudes and anchoring domain has largely treated knowledge as having a dampening effect on the degree of attitude change or anchoring. However, the current work demonstrates that relatively moderate anchors (or messages that are relatively attitude-consistent) can influence judgments based on relatively high or low levels of knowledge rather equally. It is when anchors or persuasive messages become more extreme that knowledge results in different levels of influence. Second, the research examines the potential for knowledge to create differences in consequences of anchored estimates that are initially influenced equally by the high or low anchor. In each of these contexts, the research also examines the role of perceived plausibility of the anchor as a mediating mechanism for the impact of knowledge on changes in judgments. Study 1 demonstrates the important role of plausibility as a mechanism underlying the traditional knowledge effects on anchoring. Studies 2A and 2B qualifies this by demonstrating that
anchoring follows an inverted-U-shaped pattern of influence and knowledge has a differential impact over levels of extremity. Finally, Studies 3 and 4 demonstrate differential resistance to change for low- and high-knowledge individuals who have initially been influenced to the same degree (by numeric anchors or information about the target, respectively).
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# TABLE OF CONTENTS

Abstract ....................................................................................................................... ii

Acknowledgments....................................................................................................... iv

Vita................................................................................................................................... v

List of Tables ................................................................................................................ x

List of Figures .............................................................................................................. xi

Chapters:

1. Introduction ................................................................................................................ 1

   Anchoring and Adjustment ....................................................................................... 2
   Confirmatory Testing ................................................................................................. 4
   An Attitudinal Approach ......................................................................................... 7
   Elaboration .................................................................................................................. 9
   Message Extremity ..................................................................................................... 11
   Knowledge and Anchoring ....................................................................................... 13
   Knowledge and Attitudes .......................................................................................... 15
   Unique Predictions ................................................................................................... 16
   The Present Research ............................................................................................... 19

2. Study 1 ....................................................................................................................... 21

   Method ......................................................................................................................... 22
      Participants and Overview of Procedure ............................................................... 22
      Independent Variables ............................................................................................ 23
      Dependent Measures .............................................................................................. 24
   Results ......................................................................................................................... 25
      Perceived Knowledge ............................................................................................... 25
Perceived Anchor Plausibility .......................................................... 26
Target Estimates .............................................................................. 26
Mediational Analysis ...................................................................... 26
Discussion ....................................................................................... 29

3. Study 2A .................................................................................. 30
Method ........................................................................................... 31
  Participants and Overview of Procedure ........................................ 31
  Independent Variables .................................................................. 32
  Dependent Measures .................................................................... 33
Results ............................................................................................ 34
  Perceived Knowledge .................................................................. 34
  Perceived Plausibility ................................................................. 34
  Target Estimates ......................................................................... 35
Discussion ...................................................................................... 39

4. Study 2B .................................................................................. 41
Method ........................................................................................... 41
  Participants and Overview of Procedure ........................................ 41
  Independent Variables .................................................................. 42
  Dependent Measures .................................................................... 42
Results ............................................................................................ 43
  Perceived Knowledge .................................................................. 43
  Perceived Plausibility ................................................................. 44
  Target Estimates ......................................................................... 44
Discussion ...................................................................................... 49

5. Study 3 .................................................................................... 52
Method ........................................................................................... 54
  Participants and Overview of Procedure ........................................ 54
  Independent Variables .................................................................. 55
  Dependent Measures .................................................................... 57
Results ............................................................................................ 58
  Perceived Knowledge .................................................................. 58
  Perceived Plausibility ................................................................. 58
  Target Estimates ......................................................................... 58
Plausibility and Knowledge on Estimates ....................................... 59
Discussion ...................................................................................... 60
6. Study 4 ......................................................................................................................... 62

Method .......................................................................................................................... 63
   Participants and Overview of Procedure .................................................................. 63
   Independent Variables ............................................................................................ 65
   Dependent Measures ............................................................................................... 67
Results .......................................................................................................................... 68
   Perceived Knowledge .............................................................................................. 68
   Attitudes Towards Bob ............................................................................................ 68
Discussion ..................................................................................................................... 71

7. General Discussion ................................................................................................. 74

   An Attitudinal Approach ......................................................................................... 78
   Knowledge and Position Change ........................................................................... 80
   Conclusion ............................................................................................................... 84

List of References ....................................................................................................... 86

Appendices:
A. Sample Materials from Study 1, 2A, 2B, and 3 ..................................................... 91
B. Sample Materials from Study 4 .............................................................................. 96
C. Figures .................................................................................................................... 100
D. Tables ..................................................................................................................... 107
LIST OF FIGURES

Figure 1. Curvilinear pattern of anchoring, Study 2A ........................................ 101
Figure 2. Curvilinear pattern of anchoring, Study 2B ........................................ 102
Figure 3. Differential resistance in attitudes domain, Study 3................................. 105
LIST OF TABLES

Table 1. Anchoring items used in Study 1 ................................................................. 108
Table 2. Anchoring items used in Study 2A, 3 ......................................................... 109
Table 3. Anchoring items used in Study 2B .............................................................. 110
Table 4. Attitude items used in Study 4 ................................................................. 111
CHAPTER 1

INTRODUCTION

Every day, people are bombarded with information – on television advertisements, billboards, on social media and occasionally from a person shouting on the street. These messages can be long and complicated but, more often, they are brief; people change the channel, glance at the billboard, or walk quickly by street vendors. However, some bits of information, such as a product number, may be so minor or inconsequential as to seem irrelevant to a person’s judgments – and yet they can play a large role in human decisions (see Critcher & Gilovich, 2008).

Social psychologists have long been interested in the capacity for persons to be influenced by seemingly-inconsequential components of their environment. In times of uncertainty, people may seek out and rely on any additional information they can acquire - even random or irrelevant bits that are immediately accessible. In particular, a variety of numerical judgments have been shown to be influenced by largely uninformative pieces of information - from factual beliefs about the year Einstein first visited the United States (Strack & Mussweiler, 1997) to the value of products (Ariely, Loewenstein, & Prelec, 2003) to decisions about criminal sentences (Englich, Mussweiler, & Strack, 2006) to the
likelihood of nuclear war (Plous, 1989). In each of these cases, an uninformative numerical starting point for judgment, such as writing down a portion of one’s Social Security Number (Ariely et al., 2003), influences the judgments to be higher when the starting point was a high number than when it was a low number. Originally discussed in Tversky and Kahneman’s seminal 1974 work, the “disproportionate influence of an initially-presented value on judgments of a decision-maker” is called numeric anchoring, or the anchoring effect (see Epley, 2004; Tversky & Kahneman, 1974). The breadth and consistency of the influence of even random numerical anchors that are rejected by the social perceiver has resulted in a wealth of research into the mechanism of such numeric influences.

In a standard anchoring paradigm, participants are exposed to some numeric value (the anchor), asked whether the real value of the estimate is higher or lower than that value, and then asked to provide an estimate of the true value. A consequence of this format is that, despite correctly rejecting the anchor for being ‘too high’ or ‘too low,’ participants judgments are pulled in the direction of the anchor (e.g., higher responses when exposed to a high anchor, lower responses when exposed to low anchor). In an effort to explain the key underlying mechanisms of anchoring, several widely-discussed theories have been proposed.

Anchoring and Adjustment

The first, and one of the most widely-cited and discussed explanations for numeric anchoring is that it functions in an “anchor-and-adjust” heuristic fashion; people start by considering the anchor value, and then adjust away from this starting position to a
more plausible value (see Jackowitz & Kahneman, 1995; Tversky & Kahneman, 1974, Quattrone, Lawrence, Warren, Souza-Silva, Finkel, & Andrus, 1984, in Plous, 1993). In a classic study, Tversky and Kahneman (1974) had participants participate in a rigged wheel-of-fortune-style game. The wheel landed on an ostensibly random number (either 10 or 65), and participants were asked whether the percentage of African countries in the United Nations was higher or lower than this number. Participants viewing the high anchor, 65%, produced larger estimates than participants viewing the low anchor, 10%.

Subsequent work examining an anchoring-and-adjustment heuristic has focused on serial adjustment or readjustments. As the traditional anchoring effect is discussed as a consequence of insufficient adjustment away from the starting position (see Epley & Gilovich, 2004), the body of this work suggests that longer processing times, or less distraction, tend to lead to smaller anchoring effects (see Epley & Gilovich, 2001; 2005; 2006). Although initial evidence supported such results only for self-generated, rather than experimenter-presented anchors (see Epley & Gilovich, 2002; 2004), more recent work suggest that such results can occur even with experiment-presented anchors as long as the direction of adjustment is clear (e.g., Simmons, LeBouf, & Nelson, 2010).

A key component of anchoring-and-adjustment is plausibility; anchors that are extreme may be rejected on the basis of being implausible (or less plausible than another response). In addition, people are thought to stop adjusting away from an anchor once they reach the first reasonable, plausible value for an estimate (see a discussion of Quattrone et al., 1984, in Plous, 1993). As such, early anchoring authors suggested that decision-makers have some range of perceived plausible answers for any given judgment.
Anchoring is a consequence of the fact that the ‘closest’ plausible value to a high anchor will be on the high side of this range, and vice versa with a lower anchor. When an anchor is provided that is outside of this range of plausible values, people will adjust their estimates to reach the nearest plausible boundary value.

One implication of this perspective is that if the anchor falls within the range of plausible values, little adjustment would be necessary (as the anchor itself would already be somewhat plausible). Within this plausible domain, then, more extreme anchors should produce larger anchoring effects (as the anchor becomes more discrepant from a person’s perspective of reasonable responses), and in addition, as the boundary of plausible values will necessarily be a more extreme value than any value within this boundary, anchors outside of the range of plausible values should produce larger effects than values inside the range (see Strack & Mussweiler, 1997). However, further extremitization, beyond this range of plausible values, should not produce consistently larger anchoring effects, because adjustment will always bring them back to the same value: the most extreme plausible boundary value. In this prediction, anchoring-and-adjustment is consistent with another approach to anchoring: confirmatory hypothesis-testing.

Confirmatory Testing

Perhaps the currently most dominant perspective on anchoring is that anchoring is a consequence of confirmatory hypothesis testing (see Chapman & Johnson, 1994; Chapman & Johnson, 1999; Mussweiler & Strack, 1999; Mussweiler & Strack, 2001). When people consider a plausible numeric anchor, the idea is that they will test the
hypothesis that the anchor is the correct value for the relevant judgment of interest. This process involves a confirmatory search for information that potentially supports the initially-presented anchoring value as an answer to the judgment of interest (see Chapman & Johnson, 1999; Klayman & Ha, 1987). Even if the anchor value cannot be sufficiently supported, the activation of knowledge directionally consistent with the anchor influences estimates to be more consistent with the anchor value than if the confirmatory testing had not occurred (Strack & Mussweiler, 1997).

One noticeable difference between this confirmatory hypothesis testing perspective and the prior anchor-and-adjustment approach is in their description of the process of anchoring. In particular, anchoring-and-adjustment was largely presented as a heuristic: the anchoring part at least would represent a relatively low-effort, fast, and nonelaborative process. In contrast, confirmatory testing process has been argued by some of its proponents to involve a more elaborative, effortful process (see Mussweiler & Strack, 1999, 2001).

However, much like anchoring and adjustment, the confirmatory hypothesis testing approach (particularly the selective accessibility components) suggest that people contend with implausibly extreme anchors differently than more plausible anchors. When confronted with a plausible anchor (within the range of plausible values for the estimate), increasingly extreme plausible anchors should lead to increases in anchoring, because more and more extreme hypotheses are being tested. In contrast, when confronting an implausible anchor (beyond the range of plausible values), instead of testing the hypothesis that the anchor is the correct value, perceivers are thought to test the
hypothesis that the boundary value for a range of plausible values is the correct answer to such a judgment (Mussweiler & Strack, 1999). Much like anchoring and adjustment, then, no matter how implausibly large an anchor becomes, this test would remain constant - that this boundary of plausibility is the correct answer. As such, increasingly extreme implausible anchors should result in an asymptoting of anchoring effects. A large body of anchoring work has consistently shown that larger anchoring effects can be found with more extreme anchoring values, compared to more moderate anchoring values, consistent with a confirmatory testing hypothesis perspective (see Chapman & Johnson, 1994, Strack & Mussweiler, 1997; Mussweiler and Strack, 1999; Northcraft & Neale, 1987).

In addition, there have been several attempts at investigating asymptoting effects anchors as they become implausibly extreme. Work by Quattrone et al. (1984) found equal anchoring effects across relatively moderate and patently extreme anchors, and Chapman and Johnson (1994; Experiment 1, high-anchors) additionally found that moderately high anchors and extremely high anchors for the potential value of monetary gambles produced equal judgments among their participants. Even this evidence, however, is not without issue. In the Chapman and Johnson (1994) work, extremely low anchors continued to reduce judgments below the levels of the moderate low anchors, and in Experiment 2 of the same paper, anchors that were larger than those high anchors used in Experiment 1 continued to have an impact on amount of anchoring, increasing anchoring effects beyond more moderately high anchors.
An Attitudinal Approach

If anchoring occurs in both elaborative and nonelaborative fashions, one may be inclined to ignore elaboration as a useful predictive tool for anchoring effects. However, the amount of elaboration may be a key component to understanding the processes underlying anchoring, and making claims about when and how anchoring effects will impact participants. An attitude change approach to anchoring both incorporates thoughtful (elaborative) and nonthoughtful (nonelaborative) anchoring of the previous approaches, as well as suggesting a unique perspective on anchoring to implausibly extreme values.

Recently, Wegener and colleagues (Wegener, Petty, Detweiler-Bedell, & Jarvis, 2001; Blankenship, Wegener, Petty, Detweiler-Bedell, & Macy, 2008; Wegener, Petty, Blankenship, & Detweiler-Bedell, 2010) have provided initial evidence that classic theories of attitude change might shed light on anchoring phenomena. The core of the attitude change approach to anchoring is that anchors may function like any other persuasive claim, and as such, relying on attitude change models may help both explain anchoring mechanisms as well as provide new avenues for research. In both attitude change and anchoring research, people are presented with some information that is discrepant with their current position. Historically, work on elaboration theories (see Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1986; Petty & Wegener, 1999) have suggested that a number of persuasion factors determine how a person will respond to any given message, such as the expertise of the source, the mood of the recipient, or the type of the message provided (see Petty & Wegener, 1998 for a review).
Though some forms of persuasive messages may be quite complicated, many arguments take an abbreviated and simple form, such as many product advertisements (see Haugtvedt, Petty, & Cacioppo, 1992). Simplifying a persuasive message to its most fundamental level may consist of merely providing some position, without providing any additional information, arguments, or source details. Within this framework, the traditional anchoring paradigm contains the atomic structure of persuasion - contains a self-contained position (in the form of a numeric anchor) without additional accompanying information. In this fashion, numeric anchors may be conceptualized as minimalist persuasive messages. If so, then to the extent that various qualities of persuasive appeals might be present when encountering a numerical anchor, theories of attitude change might provide important insights into how numerical anchoring should behave.

Additionally, and importantly, many of the predictions made by anchoring theories are consistent with theory and research from attitude change that predated the work on anchoring. However, an attitudinal perspective on anchoring also makes a number of predictions that either diverge from anchoring theories or were simply not addressed by anchoring theories. For example, research and theory on attitude change suggests that the amount of elaboration engaged during anchoring should influence the extent to which the anchored estimate persists over time or resists further attempts at change (e.g., Blankenship et al., 2008). An attitudinal approach to anchoring also suggests that overly extreme anchors are likely to have less impact than more plausible (but moderately extreme) anchors (e.g., Wegener et al., 2001). Finally, an attitudinal
approach provides a useful framework in which to consider the role of various metacognitions, such as confidence, perceived knowledge, or perceived plausibility, might impact anchoring. In some cases, such perceptions would be expected to affect the extent to which numerical anchors influence numerical judgments. In other cases, initial anchoring might look similar, but the consequences of those anchored judgments might differ due to the strength-related properties of these estimates (as in studies comparing relatively low- versus high-elaboration anchoring). Each of these implications will be discussed in order, ending with a discussion of the unique predictions formed by combining an attitudinal view of knowledge, anchor extremity, and consequences of initial anchored judgments.

Elaboration

A central component of modern theories of attitude change is the role of elaboration (see Chaiken et al, 1989; Petty & Cacioppo, 1986; Petty & Wegener, 1999; Wegener & Carlston, 2005). In these models, a message recipient may be influenced by messages in relatively thoughtful fashion (e.g., central, systematic, high-elaboration) or relatively nontoughtful (e.g., peripheral, heuristic, low-elaboration) fashion. In the anchoring domain, this implies that the same anchor could influence judgments in relatively thoughtful or nontoughtful ways (e.g., by acting in a mere associative or heuristic sense under lower elaboration or by directing or biasing cognition under higher elaboration). The level of elaboration involved in anchoring is important, though, because high elaboration processes tend to produce predictably “stronger” outcomes- that is, the resulting attitudes (or anchored estimates) should be more resistant to subsequent
attempts at change, persist longer over time, and influence thoughts and behaviors to a
greater degree than those produced by less elaborative mechanisms (see Petty, Hagtvedt,
& Smith, 1995; for a discussion of elaboration in anchoring, see Wegener, et al., 2010).

A series of studies by Blankenship, et al. (2008), supported an attitudinal
approach by highlighting predictable, attitude change-style outcomes of differentially-
elaborated anchors. By inducing different levels of cognitive load (and thus allowing or
preventing relatively elaborative consideration of an anchor), Blankenship and colleagues
demonstrated that higher levels of ability to think allowed participants to use target-
relevant knowledge to a greater extent in forming anchored estimates (Experiment 1).
Higher levels of elaboration were also associated with longer lasting anchored
assessments (Experiment 2) and better resistance to later attempts at social influence
(Experiment 3). Beyond demonstrating that anchors can have relatively thoughtful or
nonthoughtful effects, the relevance of the Blankenship et al. (2008) work for the current
research is especially to note that initial anchored judgments might look similar, but
properties of those judgments or their bases can lead to different consequences of those
judgments.

If one assumes a similar process between both anchoring and attitude change
paradigms, then both predictions about how anchors should influence people under a
variety of conditions (e.g., high or low elaboration) and expectations about consequences
of anchoring under these conditions (e.g., more or less resistance to persuasion) may be
made on the basis of classic work in attitudes. The following sections are intended to
provide just a few relevant examples of classic and contemporary work in the attitudinal domain to inform predictions of anchoring patterns.

Message Extremity

Anchoring theories generally suggest that, as anchor extremity increases, either the influence on anchored judgments will increase (if comparing plausible to implausible anchor values) or the influence on anchored estimates will asymptote (if comparing different values of implausibly extreme anchors). An attitudinal approach would draw on classic research and theory in attitude change to make a different prediction. When a persuasive message becomes too extreme (implausible), it often results in less persuasion as a consequence of counterarguments or by people just ignoring the message entirely.

Social judgment theory (Sherif & Hovland, 1961) suggested that message recipients would be less persuaded by messages of high rather than moderate discrepancy between the position of the message and the pre-message attitude of the recipient. That is, Sherif and Hovland predicted an inverted-U-shaped function of communication discrepancy on persuasion, with the most persuasion occurring for messages of moderate discrepancy, and less attitude change for maximally and minimally-discrepant messages. In particular, Sherif and Hovland suggested that message positions might fall in people’s latitude of acceptance, rejection, or noncommitance. Messages were supposed to have greater influence as discrepancy increased within one’s latitude of acceptance (similar to anchor influence increasing within one’s range of plausibility), but messages were supposed to have decreasing influence as discrepancy increased within one’s latitude of rejection (unlike asymptoting effects of extreme anchors).
One classic demonstration of this inverted-U-shaped pattern of persuasion is work by Bochner and Insko (1966). The authors presented participants with a message prescribing anywhere between eight and zero hours of sleep per night. Participants showed increasing attitude change as the message became increasingly extreme and discrepant from their initial attitude. However, their attitudes did not asymptote at the most extreme levels (e.g., one or zero hours of sleep). Instead, participants showed less attitude change at these most extreme levels than at more reasonable values. Although the notion of latitudes bears some resemblance to people having a range of plausible numeric values, little work in attitude change provided support for a role of the latitude of rejection in determining the point at which a downturn in persuasive impact is observed (cf. Eagly & Telaak, 1972).

Cognitive response theory echoed the suggestion of decreased persuasion by extreme messages by suggesting that people would engage in more counterarguing of the message when it was extremely discrepant from their pre-message attitudes (Brock, 1967; Greenwald, 1968; Petty & Cacioppo, 1979). The cognitive response approach would also relate to the notion of confirmatory hypothesis testing in that attempts to “confirm” the conclusion of an appeal would equate to cognitive responses favorable toward that claim. When the message is extremely discrepant from the recipient’s view, however, the idea and the research suggest that people engage in more “disconfirmatory search.” Consistent with this idea, Wegener et al. (2001) provided participants with a variety of anchoring items (e.g., the age of George Washington when he died) that varied in both direction (whether the anchor was high or low) and extremity (e.g., high anchors of 91 years old;
167 years old; 167,054 years old). Over three separate data collections, extreme anchors consistently led to smaller anchoring effects (e.g., participants were less influenced by the anchors) than the more moderate anchors. In addition, perceived plausibility played a large role: the more extreme anchoring values were rated as less plausible by participants, and the lack of perceived plausibility was associated with smaller anchoring effects on judgments.

Knowledge and Anchoring

With anchoring effects being quite robust across a variety of domains, understanding variables that can attenuate such biases becomes particularly important. Generally, greater knowledge has been both hypothesized and found to be associated with smaller anchoring effects (see Mussweiler & Strack, 1999; Wilson, Houston, Etling, & Brekke, 1996). In one study by Mussweiler and Englich (2003), participants were provided anchoring tasks of price estimates using the Euro (e.g., “Does a new German midsize car on average cost more or less than <anchor>?”) both before and after the Euro was introduced to their country (Germany) in 2002. The authors found larger anchoring effects for estimates made with the Euro before it was introduced (when knowledge of the Euro would be low), compared to after (when knowledge of the Euro would be higher). Wilson et al. (1996) also found that participants showed smaller anchoring effects when estimating the number of physicians in a phonebook when they reported being more knowledgeable about this topic. Lastly, Smith, Windschitl, and Bruchmann (2013) ran four separate studies investigating the role of knowledge on anchoring effects, and consistently found that participants with higher knowledge, both
on the basis of self-reported amount of knowledge and in terms of unanchored estimates being close to actual values, produced smaller anchoring effects.

There are a number of conceptual reasons to link knowledge to decreases in anchoring effects. First, individuals with more knowledge about a topic are more likely to know the correct answer to the judgment (see Smith et al., 2013). Typically, anchoring effects are only expected on judgments under uncertainty – if one knows the actual value for any given judgment, they need not look for outside information to assist them in making their judgment. Additionally, having more knowledge about a target of interest may mean that a participant has more access to information that would allow them to counterargue an anchor, or have a knowledge-consistent cognitive structure in place such that it is inconsistent with discrepant anchoring values.

In addition, for both anchor-and-adjustment, as well as confirmatory hypothesis testing, one may expect that individuals with high levels of knowledge would have narrower ranges of plausible responses that they would accept for any given target of judgment. That is, the essential role of knowledge in the anchoring domain may be for the person to recognize implausibility. If people with higher knowledge perceive a smaller range of answers to be acceptable, they may have less information to support a confirmatory test (and to subsequently remain accessible). They might also adjust farther away from an extreme, implausible anchor to reach their boundary of plausible values. However, an attitudinal approach would again suggest a slightly different pattern of effects. To understand the role of knowledge on anchoring using this attitudinal approach, it is imperative to understand the role that knowledge plays in the attitude literature.
Knowledge and Attitudes

In research on attitudes, knowledge has long served as one of the properties of attitudes associated with attitude strength (see Petty & Krosnick, 1995). Sometimes, knowledge might be considered in light of elaboration-based theories of attitude change (e.g., the Elaboration Likelihood Model, ELM, Petty & Cacioppo, 1986; or Heuristic-Systematic Model, HSM, Chaiken et al., 1989). If knowledge comes from previous elaboration on the topic, this would suggest that knowledge should be associated with the same kinds of strength-related consequences of attitudes that have been studied for elaboration. That is, high levels of knowledge should lead to greater persistence of attitudes over time, greater resistance to change, and stronger influences of the attitudes on related thinking and behavior. Indeed, previous research has supported a number of these predicted relations.

For example, Lewan and Stotland (1961) provided experimental evidence for higher knowledge leading to greater resistance to change. The authors exposed participants to several pieces of neutral information about one of two countries (either Andorra or Etruria) and then verified that participants’ post-information attitudes toward the countries did not differ. Following this, participants were exposed to a scathing emotional appeal against the people of Andorra from a speaker who was said to be from the University of Washington. After this attack, the authors found that participants changed their attitudes towards Andorra (e.g., became more negative) to a greater extent when they had not been exposed to the neutral information about the country previously (i.e., when knowledge was relatively low; for conceptually similar results based on
measures of knowledge, see Wood, 1982). Lewan and Stotland (1961) suggested that knowledge allows one to resist persuasive claims by creating a cognitive, structural base for an attitude (similar to what cognitive elaboration is supposed to do; cf. Petty & Cacioppo, 1986).

Some subsequent work focusing on the role of knowledge in the attitudes domain has focused not on resistance, but on another strength-related property: attitude-behavior consistency. In three longitudinal studies by Davidson, Yantis, Norwood, and Montano (1985), participants with more information available about attitude objects (e.g., candidates for political office) moderated the consistency between these attitudes and subsequent behaviors (e.g., actual voting behaviors). The consequences of different levels of knowledge not only impacted immediate behaviors but did so over an extended period of time. Further research on the role of knowledge, for both anchoring and attitude change, could help illuminate important conditions under which one would expect such substantial effects.

Unique Predictions

Both anchoring and attitude change literatures generally suggest that one of the key consequences of increased knowledge about a topic is increased resistance to persuasion, whether it is in the form of an anchor or a counter-attitudinal message. However, if one of the central mechanisms underlying this effect is that high levels of knowledge allow participants to create narrow ranges of perceived plausible answers, then information that is not extreme, and still plausible even in this narrower range, should still result in change. That is, at least in my reading, if the information or claim is
consistent with one’s knowledge, that knowledge shouldn’t unilaterally lead to the claim or information being dismissed. In fact, if an anchor or message diverges from a person’s current views but still lies within a range of values that seem plausible or acceptable (i.e., still agrees with the thrust of the person’s knowledge), there is little reason to expect differences in anchoring or attitude change based on knowledge. It would primarily be when anchors or messages become extreme enough to reach implausibility or unacceptability that knowledge differences might occur.

When equal anchoring or persuasion occurs across levels of knowledge, there may still be different consequences of the resulting judgment or attitude based, in part, on the amount of knowledge underlying that judgment or attitude. Beyond the direct influence of knowledge on degree of anchoring (e.g., Mussweiler & Strack, 1999; Wilson et al., 1996), the attitudes literature suggests that knowledge should have secondary strength-related consequences: resistance to change, persistence over time, and guiding of related thinking and behaviors. However, at some point of extremity, the claim or message should reach a point where people with both relatively high and low levels of knowledge dismiss the claim or message out of hand. Thus, unlike previous anchoring theories that predict asymptoting at different boundaries of ranges of plausible values (e.g., Mussweiler & Strack, 1999), this approach would suggest that extreme enough anchors or messages would remove knowledge effects.

Combining the expected roles of knowledge and extremity leads to a number of predictions that can be differentiated from both previous research and theory on anchoring and previous research (at least) in attitude change. For both very low-extremity
anchors (close to unanchored values) and for low-extremity anchors that diverge somewhat from unanchored estimates, low and high levels of knowledge should result in similar amounts of anchoring (as higher knowledge would not lead perceivers to recognize these values as implausible). With anchor values close to unanchored estimates, there would not be much room or impetus for movement, so minimal anchoring might occur across levels of knowledge. However, as the discrepancy between unanchored estimates and anchor values increases, participants with both low and high levels of knowledge might be moved by those anchors and to similar degrees (as long as the anchor values are still supported by the knowledge perceivers hold). With greater (moderate levels of) extremity, a point should be reached at which high levels of knowledge are associated with a perception that the anchor value is less plausible compared with lower levels of knowledge. In these moderate ranges, then, knowledge differences in anchoring (or persuasion) should be observed. With added extremity of the anchor or message, however, the anchor or message will be viewed as implausibly extreme across levels of knowledge, leading to less influence overall and a relative lack of knowledge differences.

Lastly, the attitudes domain makes some clear predictions for patterns of resistance with differential knowledge. Importantly, stronger attitudes should demonstrate greater resistance to persuasion, even the attitude rating itself is equated across levels of knowledge. A similar pattern should be expected for anchoring, such that for some very-low or low-extremity plausible anchor that produces equal initial anchored estimates across low- and high-levels of knowledge, differential resistance to subsequent attempts
at change would be expected. For anchors of at least moderate extremity, however, one 
would expect differential amounts of knowledge to produce differential persuasion, as the 
anchor becomes less-consistent with the information a perceiver has about the anchor. In 
a resistance context, these sufficiently extreme anchors may be represented as an attack 
on a person’s unanchored estimates, and as such differences in anchoring estimates could 
be conceived of as differential “resistance” to the persuasive claim of the anchor.

The Present Research

The current research has several goals. The first is to replicate the traditional 
anchoring effect of greater knowledge leading to increased resistance to persuasion, at 
least for a moderately extreme anchor. Importantly, a key related objective is to 
demonstrate the importance of perceived plausibility of the anchor as a mediational 
mechanism for knowledge effects, both in the anchoring domain and (eventually) in the 
atitudes domain as well. If one central mechanism underlying resistance to persuasive 
content is due to perceivers differential ability to recognize implausibility (at least for 
claims of moderate extremity), then plausibility should mediate the impact of knowledge 
on anchoring. Study 1 will investigate the role of plausibility as a mechanism underlying 
classic knowledge effects in a manipulated anchoring paradigm.

Additionally, an important component for advocating an attitudinal approach to 
anchoring is to provide evidence demonstrating a full curvilinear pattern of anchoring 
over levels of extremity as predicted by an attitudinal approach. Although some work has 
been done demonstrating a downturn in anchoring effectiveness with extreme anchors 
(see Wegener et al., 2001), investigating the full curvilinear pattern of anchoring effects
over levels of extremity also allows for an examination of the differential impact of knowledge over scaled degrees of discrepancy. Some previous work from the same lab has provided an initial look at such a pattern, and this well be presented as Study 2A. However, due to the age of that study, its relatively small sample size, and in an effort to ensure confidence in these results, I have performed a higher-powered replication study with a separate subject pool. Study 2A and 2B will examine a curvilinear pattern of anchoring and knowledge effects.

Lastly, one of the central merits of an attitudinal approach, over other perspectives on anchoring, is the inclusion of clear predictions about the impact of metacognitive, strength-related properties, particularly that of perceived knowledge. Previous work in both anchoring and attitudes have focused on the impact of knowledge in a monolithic sense – as generally promoting less anchoring, or less attitude change. However, an unexplored aspect of knowledge in both domains is examining its influence under conditions of mild extremity (low discrepancy) claims. For claims that are consistent with one’s existing knowledge base, one would not expect a large difference in amount of persuasion across low- and high-knowledge participants. However, if the anchored estimates or initial changed attitudes are still associated with different levels of knowledge, then differences in strength-related properties of those judgments should still be observed, even when the initial anchored judgments or changed attitudes look similar across levels of knowledge. Studies 3 and 4 will demonstrate differential resistance to persuasion for participants that have initially been persuaded to the same degree in both the anchoring paradigm, and then in an attitudinal paradigm.
STUDY 1

Study 1 was designed to investigate the potential for differential resistance to anchoring across levels of target-related knowledge and to provide evidence for the mediating role that perceptions of plausibility may play in explaining such knowledge differences. A wealth of previous anchoring work has suggested a general trend of smaller anchoring effects when participant knowledge is high, as opposed to when it is lower (see Mussweiler & Strack, 1999; Wilson et al., 1996). An attitudinal approach suggested that such an effect would be particularly likely to occur given anchors of moderate extremity. In this first study, I aimed to replicate the classic pattern of knowledge on anchoring.

Additionally, as shown previously by Wegener et al. (2001), perceptions of anchor implausibility can relate to weaker anchoring effects, at least when anchor extremity makes the anchor seem implausible. At some more moderate level of extremity, however, knowledge differences might relate to perceptions of anchor plausibility. That is, instead of the extremity of the anchor creating differential perceptions of plausibility, higher levels of knowledge might be associated with
perceptions that a given anchor is implausibly extreme even when the same anchor is viewed as somewhat plausible by someone with a lower level of knowledge (or when the same anchor is applied to a target associated with lower levels of knowledge). In turn, this study was designed to examine the potential role of plausibility in determining knowledge-based differences in amount of anchoring, at least for moderately extreme anchors.

Method

Participants and Overview of Procedure

Eighty-seven (87) introductory psychology participants at the Ohio State University were recruited to participate in the study for partial course credit. The study design was a 2 (Knowledge: high versus low) x 2 (Anchor: high versus low) mixed design, with all participants receiving either a moderately-extreme high- or low-anchor, and all participants providing anchored estimates of both high- and low-knowledge items.

Participants were first exposed to a battery of filler anchoring items (e.g., the altitude of Denver, CO; the year Leonardo Da Vinci was born) in a traditional anchoring paradigm. In each item, participants were first asked whether they believed the real answer to a given judgment was higher or lower than an anchor value. After responding, they reported their level of knowledge of the target, their perceived plausibility of the anchor, and, finally, they generated their estimates of the true value. The anchors of these filler items included a mixture of extremity levels (from very low extremity to very high extremity) and high versus low anchors. These fillers largely served to train the participants in how to complete the anchoring task and formed a context within which the
target items would not particularly stand out. The key target anchoring items were included in the middle of the filler anchors: twelve filler items came before the first batch of four target anchoring items, and two more filler items separated the first batch from the second batch of four target items. Within each set of target items, the low- and high-knowledge items were alternated (e.g., low/high/low/high for the first set, and high/low/high/low for the second set). Items that shared an anchor were separated between sets. Following the anchoring portion, participants would complete a brief demographic survey, and were debriefed and compensated for their participation.

*Independent Variables*

*Knowledge* In this study, four yoked pairs of anchoring targets were created such that the same anchors could be applied to both a low-knowledge target and a high-knowledge target. As the participant pool of Study 1 was all undergraduate students of Ohio State, several high-knowledge items were about proximally close targets (e.g., average attendance at a basketball game at Indiana University) about which the students reported higher knowledge in pretests, as opposed to more distant targets (e.g., average attendance at a basketball game at Arizona State University). Some of the low-knowledge items also addressed targets outside of the United States (e.g., the year the University of Mannheim was founded). Participants were exposed to both high- and low-knowledge items (see Appendix D, Table 1 for the anchors and items used in Study 1).

*Anchors.* Anchors consisted only of moderately extreme high or low values. Anchors were varied between-participants, with each participant receiving either high or low anchors.
Manipulation Checks and Dependent Measures

Perceived knowledge. After reporting whether the target item was higher or lower than the anchor, participants self-reported knowledge was measured for each item using a 9-point scale (1 = absolutely no knowledge; 9 = extremely high knowledge) in response to the question “How much knowledge do you have about this judgment?”

Perceived plausibility. Plausibility was measured for each of the key target anchors using a 9-point scale (1 = completely implausible; 9 = completely plausible) in response to the question: “To what extent do you believe that <anchor value> is a plausible answer to the judgment?” Participants were exposed to the numeric anchor again in this question.

Estimates. This dependent measure consisted of participants’ responses to an open-ended question about their estimates for the actual value for any given anchoring judgment. The metrics for the four yoked pairs of anchoring items varied to a large extent (e.g., ages, years, attendance), and, as such, responses were standardized to combine all of the target items together into the same analysis. This standardization involved constructing z-score values for estimates of each target value across all conditions, including across both high- and low-knowledge targets that were associated with the same anchors (so any overall differences between the low- and high-knowledge items would not be “standardized out” of the dependent measure). Then standardized estimates were averaged within any given experimental condition to form one aggregated measure of the standardized estimates within that condition.
In addition, due to the fact that participant estimates were provided in an open-ended format, a Tukey fencing procedure for mild outliers was used (Tukey, 1977) before this standardization occurred. The Tukey procedure involves creating ‘fences’ to detect extreme outlier values by first multiplying the interquartile range (the difference between the 25th and 75th percentile of scores) by 1.5. This subsequent value is then subtracted from the 25th percentile and added to the 75th percentile to form “inner fences” of a normal distribution (Tukey, 1977). Values falling outside of an inner fence are considered to be outliers. In an effort to include these extreme values without allowing them an influence on the outcome of the analyses, instead of discarding values falling outside of the expected range, I “fenced” these values such that values falling above the upper inner fence or below the lower inner fence are instead changed to be equivalent to the upper and lower fence values, respectively (for similar procedures, see Greenwald, McGhee, & Schwartz, 1998; Wegener et al., 2001). All standardization occurred after this fencing procedure was performed (so the standard deviations for the standardization were not affected by the initial extreme values, but they did still include the fenced values).

**Results**

**Manipulation Check: Perceived Knowledge**

Self-reports of perceived knowledge for the high- and low-knowledge items were averaged, and as predicted, participants reported knowing more about the high-knowledge items ($M = 3.81$, $SD = 2.02$) than the low-knowledge items ($M = 3.26$, $SD = 1.92$), $t(87) = -4.46$, $p < .001$, $d = .48$. 

25
Perceived Anchor Plausibility

Participants’ reports of the plausibility of the low- and high-knowledge items were averaged across items. For these moderately extreme anchors, participants reported finding the anchors as less plausible ($M = 3.79, SD = 1.59$) when the anchor was applied to a high-knowledge target than when the same anchor was applied to a low-knowledge target ($M = 4.35, SD = 1.50$), $t(87) = 6.032, p < .001, d = .65$.

Target Estimates

A two-way ANOVA of Knowledge (low v. high-knowledge items) and Anchor (low v. high) produced a significant main effect of Anchor, $F(1, 83) = 140.20, p < .001, d = 2.60$, such that high anchors produced higher standardized estimates ($M = .60, SD = .47$) than low anchors ($M = -.63, SD = .52$). More importantly, there was a significant Knowledge X Anchor interaction on standardized estimates, $F(1, 83) = 11.85, p < .001, d = .76$, such the effect of anchor was larger when knowledge about the anchor was low (low anchor $M = -.66, SD = .60$, high anchor $M = .77, SD = .61$) than when knowledge about the item was high (low anchor $M = -.60, SD = .57$, high anchor $M = .43, SD = .42$). This replicates the classic effect of higher knowledge producing differential amounts of anchoring widely reported in the anchoring literature (e.g., Mussweiler & Strack, 1999; Wilson et al., 1996).

Mediational Analysis.

In order to address the question of whether the observed differences between high- and low-knowledge estimates can be accounted for by differences in perceptions of anchor plausibility, knowledge effects on anchoring plausibility and plausibility effects...
on anchoring were examined. The current data followed a mixed design where anchor was varied between participants and each participant was exposed to both low- and high-knowledge items (and subsequently provided reports of plausibility and estimates for both sets of items), whereas typical mediational analyses are either completely between-participants or within-participants. Therefore, I addressed mediation by conducting a series of regression analyses on each participant and using the obtained unstandardized regression coefficients for the variables of interest as dependent measures in a subsequent analysis.

I started by conducting within-subject regressions to predict the standardized target estimates with the knowledge manipulation (i.e., high-knowledge items v. low-knowledge items), rated anchor plausibility, or both. The unstandardized regression coefficients from these participant-level analyses were then used as outcome measures and compared across the high- and low-anchor between-subject groups. For example, in one set of analyses, measures of plausibility were used to predict estimates for each of the participants individually, and the plausibility regression coefficients were saved. Then, using these saved regression coefficients as dependent measures, a main effect of anchor on the regression coefficients (e.g., the plausibility $B$) would be equivalent to testing the Plausibility X Anchor mixed-design interaction. Similar analyses were conducted using the target knowledge item groups, anchor plausibility ratings, or both to predict the regression coefficients for target knowledge differences in standardized estimates.
Separate from these regressions, there was a significant relation difference in rated plausibility across the high- and low-knowledge items, $B = -.57, t(83) = -6.08, p < .001, d = 1.33$. That is, high-knowledge items were associated with lower perceptions of anchor plausibility. In the regression using anchor to predict the manipulated knowledge $Bs$ from the within-participant regressions, the manipulated knowledge regression coefficients were significantly influenced by anchors reflecting a Knowledge X Anchor interaction, $t(83) = 4.02, p < .013, d = .88$. That is, higher levels of knowledge were associated with lower judgments when anchors were high [mean knowledge $B = -.17, t(42) = -2.47, p < .018, d = .76$ for a test against zero], but higher levels of knowledge were associated with higher judgments when the anchors were low [mean knowledge $B = .15, t(41) = 3.78, p < .001, d = 1.18$, for a test against zero]. In the regression using anchor to predict the plausibility $Bs$ from the within-participant regressions, there was a significant effect of anchor on the plausibility $B$, reflecting a Plausibility X Anchor interaction, $t(81) = -2.34, p < .022, d = .52$. That is, increases in perceived plausibility of an anchor tended to lead to higher judgments when anchors were high [mean plausibility $B = .11, t(42) = 1.64, p = .11, d = .51$], but increases in plausibility led to lower judgments when the anchors were low [mean plausibility $B = -.06, t(39) = -3.08, p < .01, d = .99$]. Finally, when within-subject regressions for each participant included both the difference between high- and low-knowledge items and rated plausibility simultaneously (and as such, the resulting coefficients were each controlling for the other predictor), anchor effects on the manipulated knowledge $Bs$ were eliminated, $t(83) = .91, p = .37, d = .20$, whereas the anchor effects on the plausibility $Bs$ remained significant, $t(81) = -2.38,$
\[ p < .02, \ d = .53 \] This pattern is consistent with perceptions of plausibility playing a role in creating knowledge differences in anchoring, at least when the anchors are extreme enough to lead to knowledge differences in perceived anchor plausibility.

**Discussion**

Results from Study 1 suggested that knowledge effects on extent of anchoring may be mediated by differential perceptions of plausibility of the anchor when the anchors are moderately extreme. Importantly, plausibility uniquely predicted the amount of anchoring when controlling for differences between the high- and low-knowledge items (and, in supplemental analyses, beyond variation in rated knowledge as well). Although this pattern may help to account for a variety of knowledge effects on anchoring in the literature, an attitudinal view suggests that such knowledge effects would not occur equally across all levels of anchor extremity. That is, in addition to curvilinear effects of anchors overall (with increasing influences to a point followed by a decrease in impact of the anchor on judgments), the approach outlined in the introduction to this document suggests that knowledge effects might be due, in part, to greater resistance to anchors, producing a decrease in anchor effectiveness, occurring when knowledge is relatively high rather than low. That is, that predictable differences in anchoring effectiveness may well occur between high- and low-knowledge individuals, at least for some moderately extreme anchors. Thus, in a pair of studies examining multiple levels of anchor extremity, I sought to establish whether this curvilinear pattern (further moderated by knowledge) would occur.
CHAPTER 3

STUDY 2A

Study 2A was conducted at Purdue University in the late 1990s. Because it used many of the same stimuli and measures as my later work, and shared some of the initial goals, it seemed best to present it more thoroughly here than as a mere background study. There were two primary goals of the study. First, it was designed to examine the inverted-U-shaped, curvilinear pattern of anchoring across multiple levels of extremity, as predicted by classic attitudinal theories. Demonstrating this pattern would provide additional evidence of the relevance of an attitudinal approach to anchoring, as it uniquely suggests a downturn in anchoring effects for the most implausibly extreme anchoring values.

A second goal was to examine the role of knowledge over multiple levels of extremity. As discussed earlier, when anchors fall close enough to unanchored perceptions of the target that they remain somewhat plausible, the amount of knowledge might have little effect on the amount of anchoring. However, when anchors reach more moderate levels, where people with high levels of knowledge recognize the anchors as less plausible than people with lower levels of knowledge, anchoring should be greater
when knowledge is low rather than high. With the most extreme anchors, however, both high- and low-knowledge individuals should show decreased anchoring and perhaps to similar degrees (as the values become so implausible that it takes little knowledge to recognize them as ludicrous).

Method

Participants and Overview of Procedure

One hundred forty-three (143) introductory psychology participants at Purdue University were recruited to participate in the study for partial course credit. The study design had a 2 (Knowledge: high vs. low) x 2 (Anchor: high vs. low) x 5 (Anchor extremity: extremely low vs. low vs. moderate vs. high vs. extremely high) mixed design, with knowledge as a within-participants factor and anchor and extremity as a between-participants factors.

Instructions and measures were designed to follow those used in Study 1. Participants were first exposed to a battery of filler anchoring items. In each item, participants were first asked whether they believed the real answer to a given judgment was higher or lower than an anchor value. After responding, they reported their level of knowledge of the target, their perceived plausibility of the anchor, and, finally, they generated their estimates of the true value. The anchors of these filler items included a mixture of extremity levels (from very low extremity to very high extremity) and high versus low anchors. The key target anchoring items were included in the middle of the filler anchors: twelve filler items came before the first batch of four target anchoring items, and two more filler items separated the first batch from the second batch of four
target items. Within each set of target items, the low- and high-knowledge items were alternated (e.g., low/high/low/high for the first set, and high/low/high/low for the second set). Items that shared an anchor were separated between sets.

*Independent Variables*

*Knowledge.* Four pairs of key anchoring targets were yoked such that the same anchor values could be used for one target that had been pretested to be associated with relatively low levels of knowledge and one target that was associated with higher (but still rather moderate) levels of knowledge. Several of these items were adopted from Strack and Mussweiler (1997), for which participants in the sample were expected to be relatively unfamiliar, whereas other items were created for which participants were expected to be more familiar (see Appendix D, Table 2 for a listing of items and anchors across the various conditions of Study 2A).

*Anchors.* For the key target anchors, half of the participants received a high anchor for all targets (e.g., 91 years old for the age of Richard Nixon/Gandhi when he died) whereas the other half received a low anchor (e.g., 45 years old). Participants were exposed to the anchors by asking them to compare whether they believed the anchor value to be higher or lower than the actual value (e.g., The age of Richard Nixon/Gandhi when he died; Do you think the real answer to the judgment is higher or lower than 91 years old?) (cf. Tversky & Kahneman, 1974).

*Extremity.* Anchors varied on extremity levels, from “very low extremity” (e.g., not at all discrepant from the real value) (e.g., 91 years old for the age of Richard Nixon when he died) to “very high extremity” (e.g., unrealistic to clearly impossible) (e.g., 1109
years old for the age of Richard Nixon when he died; see Appendix D, Table 2). These values were chosen based on pretest information, such that each level of extremity was rated as more extreme and less plausible than the next less-extreme value (the absolute levels of extremity could often not be equated across low and high anchors because of lower bounds for low anchors, but ratings of anchor plausibility still decreased steadily for those extreme low anchors).

*Manipulation Checks and Dependent Measures*

*Perceived knowledge.* Participants reported on their knowledge about the anchoring items using the same scales and in the same fashion as Study 1.

*Perceived plausibility.* Participants reported on the plausibility of the anchors using the same scales and in the same fashion as Study 1.

*Estimates.* The standardization of target estimates involved constructing z-score values for estimates of each target value across all conditions including across both levels of target knowledge (so any overall differences between targets were not “standardized out” of the dependent measure). Then standardized estimates were averaged within any given experimental condition to form one aggregated measure of the standardized estimates within that condition. Given the different metrics for the different targets, fencing, the Tukey outlier fencing procedure was used (Tukey, 1977) as it was in Study 1 (see also Wegener et al., 2001).
Results

Manipulation Check: Perceived Knowledge

Self-reports of perceived knowledge for the high- and low-knowledge items were averaged, and as predicted, participants reported knowing more about the high-knowledge items ($M = 5.32$) than the low-knowledge items ($M = 3.65$), $t(141) = 19.41$, $p < .001$, $d = 1.63$.

Manipulation Check: Perceived Plausibility

Similarly, participants’ reports of the plausibility of the low- and high-knowledge items were averaged across items. A 2 (Anchor: high v. low) X 5 (Extremity) ANOVA demonstrated a significant effect for the extremity of an anchor on plausibility, $F(4, 138) = 24.73$, $p < .001$. The mean plausibility across levels of anchor extremity (from very low extremity to very high extremity) were: $4.99_a$, $4.58_a$, $3.69_c$, $2.97_d$, $1.75_e$. Means that share a subscript were not different from each other at the $p < .05$ level (very low and low extremity; levels 1 and 2).

In addition, an examination of the impact of knowledge on plausibility was performed. When anchor extremity was very low (level 1), low (level 2), and very high (level 5), there were no significant effects of knowledge on perceptions of plausibility (neither main effects of knowledge, nor a Knowledge X Extremity interaction, $F$s < 1.1). However, for moderate (level 3) and high (level 4) levels of extremity, knowledge effects were present on plausibility. A 2 (Knowledge: low v. high) X 2 (Anchor: low v. high) X

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1 As of the time of writing this document, I do not have access to the original data of these statistical tests. The report of differential knowledge on plausibility over levels of extremity was taken from an unpublished manuscript about the results of Study 2A. Additionally, standard deviations, errors, and some effect size calculations may not be accurately performed without access to the original data set, and as such do not appear in this section.
2 (Extremity: moderate v. high) ANOVA on perceptions of plausibility showed a main effect for Knowledge, $F(1, 53) = 26.57, p < .001, d = 1.42$, as well as extremity, $F(1, 53) = 4.29, p < .05, d = .57$. Anchors for items associated with high levels of knowledge were perceived as generally less plausible ($M = 2.89$) than anchors for items associated with low levels of knowledge ($M = 3.79$). Additionally, high-extremity anchors were viewed as less plausible ($M = 2.98$) than moderate-extremity anchors ($M = 3.71$). There was no Knowledge X Extremity interaction on perceptions of anchor plausibility for these anchors, $F<1$.

**Target Estimates**

The standardized estimates (judgments for each anchoring item) were examined using a 2 (Knowledge: low v. high) x 2 (Anchor: low v. high) x 5 (Extremity: not at all extreme to very extreme) ANOVA. This demonstrated a main effect of Anchor, $F(1, 133) = 60.93, p < .001, d = 1.35$, such that high anchors produced higher standardized estimates than low anchors ($Ms = .29$ and -.27, respectively). In addition, there was a significant Anchor X Extremity interaction, $F(4, 133) = 4.95, p < .001$, which demonstrated an overall curvilinear pattern of anchoring, as predicted by an attitudinal approach. For the high anchor condition, the means across levels of extremity (from very low to very high) were: .12, .44, .33, .43, and .13. For the low anchor conditions, the means across levels of extremity (from very low to very high) were: -.10, -.35, -.45, -.38, and -.01. There was also a Knowledge X Anchor interaction, $F(1, 133) = 6.80, p < .011, d = .45$, with larger anchoring when the same anchors were applied to low-knowledge items (low-anchor $M = -.31$; high-anchor $M = .36$) relative to high-knowledge items (low-
anchor $M = -.21$; high-anchor $M = .22$). This replicates previous studies of knowledge and anchoring (see Jarvis et al., 1995a; Mussweiler & Strack, 2000a).

These lower order effects were qualified by the predicted three-way interaction of Knowledge X Anchor X Extremity, $F(4, 133) = 4.47, p < .003$. Again, the prediction of an attitudinal approach to anchoring is such that both high- and low-knowledge items will consistently show a curvilinear pattern over levels of extremity, but the anchors will prove to less impactful for high-knowledge items, as compared to low-knowledge items, at least for moderately extreme anchors where knowledge differences may produce differential resistance (see Appendix C, Figure 1).

One way of decomposing this overall, three-way interaction is to examine the effect of both anchor and knowledge for each level of anchor extremity.

*Very low extremity (level 1):* When anchor extremity was very low (level 1), there was a small but nonsignificant anchoring effect, with high anchors leading to higher estimates ($M = .12$) than low anchors ($M = -.10$), $F(1, 25) = 2.67, p < .12, d = .65$. Additionally, there was no moderating effects of knowledge on anchoring, $F < 1$.

*Low extremity (level 2):* When anchor extremity was low (level 2), high anchors led to substantially higher estimates ($M = .44$) than low anchors ($M = -.35$), $F(1, 26) = 20.73, p < .001, d = 1.79$. Again, there was no moderating effect of knowledge on anchoring, $F < 1$.

*Moderate extremity (level 3):* However, as extremity increased, knowledge effects began to emerge. When anchors were moderately extreme (level 3), the significant anchoring effect (high- and low-anchor $M$s = .33 and -.45, $F(1, 25) = 13.81, p < .001, d =$
1.49) was moderated by knowledge as demonstrated by a significant Knowledge × Anchoring interaction, $F(1, 25) = 10.18, p < .004, d = 1.28$. Anchoring remained consistently strong for low-knowledge targets (high- and low-anchor $Ms = .53$ and -.61), but it was substantially reduced when higher knowledge items were associated with the same anchors (high- and low-anchor $Ms = .13$ and -.30).

**High extremity (level 4):** These knowledge differences persisted when extremity was high (level 4). Again, the significant anchoring effect (high- and low-anchor $Ms = .59$ and -.53, $F(1, 28) = 39.95, p < .001, d = 2.39$) was moderated by knowledge, $F(1, 28) = 8.97, p < .006, d = 1.13$, such that anchoring continued to persist to a greater degree when the extreme anchors were presented with low-knowledge items (high- and low-anchor $Ms = .59$ and -.53) compared to high-knowledge items (high- and low-anchor $Ms = .28$ and -.24).

**Very high extremity (level 5):** Lastly, as predicted by the hypothesized curvilinear pattern of anchoring, when anchors reached a level of very high extremity (level 5), there were small and nonsignificant anchoring effects, $F<1$ (high- and low-anchor $Ms = .13$ and -.01). In addition, there was no moderating effect of knowledge on anchoring, $F < 1$, with low- and high-knowledge items collapsing in effectiveness.

Another method of decomposing this pattern is to conduct a series of analyses comparing adjacent levels of anchoring extremity.

**Very low vs. low extremity:** Comparing standardized estimates at the very low and low levels of extremity produced a main effect of Anchor, $F(1, 51) = 20.88, p < .001, d = 1.28$, qualified by a significant Anchor × Extremity interaction, $F(1, 51) = 6.57, p < .014,$
d = .72, demonstrating that anchoring effects were larger for low rather than very low
levels of extremity. There was no Knowledge X Anchor X Extremity interaction, F < 1,
showing that the amount of anchoring did not depend on the amount of knowledge
associated with the target.

**Low vs. moderate extremity:** Comparing standardized estimates at the low and
moderate levels of extremity produced a main effect of Anchor, F(1, 51) = 33.45, p <
.001, d = 1.62, qualified by a significant Knowledge X Anchor interaction, F(1, 51) =
6.46, p < .015, d = .71. Lastly, and importantly, there was a significant Knowledge X
Anchor X Extremity interaction, F(1, 51) = 6.46, p < .015, d = .71, demonstrating that
knowledge effects on anchors were greater when extremity was moderate rather than low.

**Moderate vs. high extremity:** Comparing standardized estimates at the moderate
and high levels of extremity produced a main effect of Anchor, F(1, 53) = 43.85, p <
.001, d = 1.82, qualified by a significant Knowledge X Anchor interaction, F(1, 53) =
19.26, p < .001, d = 1.21. The lack of a significant Knowledge X Level X Anchor
interaction (F < 1) suggests that knowledge effects were remaining constant across these
levels of extremity – greater anchoring for low- than high-knowledge items for both
moderate and high-levels of extremity.

**High vs. very high extremity:** Comparing standardized estimates at the high and
very high levels of extremity produced a main effect of Anchor, F(1, 57) = 12.53, p <
.001, d = .94, that was qualified by a significant Knowledge X Level X Anchor
interaction, F(1, 57) = 4.48, p < .001, d = .56. This pattern suggests that the effects of
knowledge on anchor that were present for high levels of extremity were no longer present at these very highest levels of extremity.

**Discussion**

Results from Study 2A demonstrated a critical component of an attitudinal perspective on anchoring: a decrease in the effectiveness of anchoring to extreme values (cf. Wegener et al., 2001). This result falls in direct contrast to more traditional views of an asymptoting of anchoring as anchors reach extreme levels (e.g., Mussweiler & Strack, 1999; Quattrone et al., 1984). A greater downturn in anchoring effectiveness was produced at lower levels of extremity for high-knowledge items compared to low-knowledge items, but both showed an overall pattern of a downturn in anchoring effectiveness for the most extreme anchors. In this initial study, these highest levels were so extreme that they wiped out the robust anchoring effect, to the degree to which that anchoring effect itself was no longer significant.

One key ingredient this study has that, historically, other attempts at investigating extremity have lacked was a series of multiple levels of anchor extremity (rather than simply one or two levels). In the light of the curvilinear patterns demonstrated in this work, previous discrepant suggestions of the effects of extremity may begin to make sense, as one could see a wide variety of anchoring patterns depending on both the level of knowledge of the associated item as well as the extremity of that item. For example, only using low-knowledge items at very low extremity (level 1) and at high extremity (level 4) would have produced a similar pattern of anchoring judgments to that demonstrated by Mussweiler and Strack (1999; 2000b). However, using the low
extremity (level 2) and very high extremity anchors (level 5, for either low- or high-knowledge items) would produce results similar to those found by Wegener et al. (2001). Using only the low extremity (level 2) and high extremity items (level 4) may have produced what appeared to be an asymptoting effect, as the rest of the curvilinear pattern would have been obscured. Thus, by including all five levels of extremity, as well as comparing items of high- and low-knowledge, the expected pattern of an attitudinal approach to anchoring was obtained.

This study provided a strong initial demonstration of the expected pattern of curvilinear anchoring over levels of extremity, mirroring classic attitude change theories of curvilinear persuasion. However, the sample size was rather small given the large number of between-subject conditions. Thus, before moving on to provide more specific mechanistic evidence, it seemed reasonable to replicate the curvilinear pattern and moderation of that pattern by knowledge differences.
CHAPTER 4

STUDY 2B

Study 2B was designed as a replication of Study 2A. Given both the age of the initial data, as well as the limited number of participants, a replication study using a larger sample seemed prudent. However, because of the different nature of the sample, some of the items did not seem likely to produce the same knowledge differences as in the previous sample. Therefore, some adjustments were made in the specific items used. In addition, a separate, online subject pool was employed. Thus, one may be more confident both in the initial results of Study 2A, as well as that the anchoring effects demonstrated in Study 2A extend beyond a college-age population.

Method

Participants and Overview of Procedure

Two hundred sixty-three (263) online respondents from Amazon’s Mechanical Turk (MTurk) website completed this study in return for monetary compensation. The instructions and set-up of the study were the same as in Study 2A. In addition, participants were asked to provide estimates without seeking any outside help or looking for additional information online. The study design was a 2 (Knowledge: high vs. low) x
2 (Anchor: high vs. low) x 5 (Anchor extremity: extremely low vs. low vs. moderate vs. high vs. extremely high) mixed design, with knowledge as a within-participants factor and anchor and extremity as a between-participants factors. All materials were presented using Qualtrics survey software (Qualtrics, Provo, UT).

**Independent Variables**

**Knowledge.** Three sets of key anchoring targets were yoked between low- and high-knowledge items such that the same anchors could be applied across levels of knowledge. As participants were restricted to those inside the United States, the low-knowledge items were all about topics from outside of the United States (i.e., age of Gandhi when he died, average attendance of a soccer match in Caracas, Venezuela, and year when the University of Mannheim was founded), whereas the high-knowledge items were all about topics from within the United States (i.e., age of Richard Nixon when he died, average attendance of a Chicago Bears football game, and year when Ohio State University was founded).

**Anchors and extremity.** Specific anchor values (high vs. low and varying in extremity) were adopted from Study 2A (see Appendix D, Table 3 for a listing of items and anchors across the various conditions of Study 2B).

**Dependent Measures**

**Perceived knowledge.** Participants reported on their knowledge about the anchoring items using the same scales and in the same fashion as Study 2A.

**Perceived plausibility.** Participants reported on the plausibility of the anchors using the same scales and in the same fashion as Study 2A.
Estimates. Participants reported the estimates of their judgments of the anchors in the same fashion as Study 2A. Again, given the different metrics for the different targets, fencing and standardization of estimates proceeded in the same way as in Study 2A (see also Wegener et al., 2001).

Results

Manipulation Check: Perceived Knowledge

Self-reports of perceived knowledge for the high- and low-knowledge items were averaged, and as predicted, participants reported knowing more about the high-knowledge items ($M = 3.56$, $SD = 2.07$) than the low-knowledge items ($M = 3.00$, $SD = 2.04$), $t(262) = -5.67$, $p < .001$, $d = .35$.

Manipulation Check: Perceived Plausibility

A 2 (Anchor: high v. low) X 5 (Extremity) ANOVA demonstrated a significant effect for the extremity of an anchor on plausibility, $F(4, 253) = 55.70$, $p < .001$, $\eta_p^2 = .46$. The mean plausibility ratings across levels of anchor extremity (from very low extremity to very high extremity) were: 5.63a, 4.84b, 3.49c, 2.88d, 1.77e. Simple effects showed that all mean ratings of plausibility differed from one another at the $p < .05$ level. In particular, the means for very low and low levels of extremity significantly differed in this study, in contrast to Study 2A.

In addition, an examination of the impact of knowledge on plausibility was performed. A 2 (Anchor: high vs. low) X 2 (Knowledge: high v. low) X 5 (Extremity: very low – very high) ANOVA was run on perceptions of plausibility. This produced a significant Knowledge X Extremity interaction, $F(4, 253) = 10.78$, $p < .001$, $\eta_p^2 = .15$. 

43
Similar to Study 2A, when anchor extremity was very low (level 1) \((p = .22)\), and very high (level 5) \((p = .22)\), there were no significant effects of knowledge on perceptions of plausibility. However, for low (level 2) \((p < .05)\), moderate (level 3) \((p < .001)\) and high (level 4) \((p < .001)\) levels of extremity, knowledge effects were present on plausibility. A 2 (Knowledge: low vs. high) X 2 (Anchor: low vs. high) X 3 (Extremity: low vs. moderate vs. high) ANOVA on perceptions of plausibility showed a main effect for Knowledge, \(F(1, 146) = 66.78, p < .001\), \(d = 1.35\), as well as extremity, \(F(2, 146) = 22.13, p < .001\), \(\eta^2_p = .23\). Anchors for items associated with high levels of knowledge were perceived as generally less plausible \((M = 3.31, SD = 1.91)\) than anchors for items associated with low levels of knowledge \((M = 4.16, SD = 1.76)\). Additionally, high-extremity anchors were viewed as less plausible \((M = 2.90, SD = 1.62)\) than moderate-extremity anchors \((M = 3.46, SD = 1.28)\), which were in turn viewed as significantly less plausible than low-extremity anchors \((M = 4.87, SD = 1.61)\). There was no Knowledge X Extremity interaction on perceptions of anchor plausibility for these anchors, \(F(2, 146) = 1.06, p = .35\), \(\eta^2_p = .01\). Unlike in Study 2A, level of knowledge significantly impacted perceptions of plausibility for low extremity (level 2) anchors. However, as subsequent analyses will demonstrate, this impact did not relate to differential levels of anchoring between low- and high-knowledge participants for these low extremity items (perhaps because the anchors were viewed as relatively plausible when applied to both low- and high-knowledge items).
Target Estimates

The standardized estimates (judgments for each anchoring item) were examined using a 2 (Knowledge: low v. high) x 2 (Anchor: low v. high) x 5 (Extremity: not at all extreme to very extreme) ANOVA. This demonstrated a main effect of Anchor, $F(1, 246) = 118.23$, $p < .001$, $d = 1.39$, such that high anchors produced higher standardized estimates than low anchors ($M_{s} = .31$, $SD_{s} = .51$ and -.35, $SD_{s} = .52$, respectively). In addition, there was a significant Anchor X Extremity interaction, $F(4, 246) = 6.73$, $p < .001$, $\eta_{p}^{2} = .10$, which demonstrated an overall curvilinear pattern of anchoring, as predicted by an attitudinal approach (see Appendix C, Figure 2). For the high anchor condition, the means across levels of extremity (from very low to very high) were: -.02, .30, .59, .50, and .20. For the low anchor conditions, the means across levels of extremity (from very low to very high) were: -.23, -.42, -.59, -.31, and -.27. There was also a Knowledge X Anchor interaction, $F(1, 246) = 4.53$, $p < .034$, $d = .27$, with larger anchoring effects occurring when the same anchors were applied to low-knowledge items (low-anchor $M = -.39$, $SD = .66$; high-anchor $M = .35$, $SD = .60$) rather than high-knowledge items (low-anchor $M = -.31$, $SD = .56$; high-anchor $M = .27$, $SD = .58$). This replicates the findings of Study 1A, as well as previous studies of knowledge and anchoring.

Again, these lower order effects were qualified by the predicted three-way interaction of Knowledge X Anchor X Extremity, $F(4, 246) = 2.63$, $p < .035$, $\eta_{p}^{2} = .04$. Again, the prediction of an attitudinal approach to anchoring is such that both high- and low-knowledge items will consistently show a curvilinear pattern over levels of
extremity, but the downturn in anchoring efficaciousness will be to a greater degree for most levels of extremity for high-knowledge items, compared to low-knowledge items.

One way of decomposing this overall, three-way interaction is to examine the effect of both anchor and knowledge for each level of anchor extremity.

**Very low extremity (level 1):** When anchor extremity was very low (level 1), there was a small but significant anchoring effect, with high anchors leading to higher estimates ($M = -.02, SD = .32$) than low anchors ($M = -.23, SD = .42$), $F(1, 50) = 4.2, p < .046, d = .58$. Additionally, there was no moderating effect of knowledge on anchoring, $F < 1$.

**Low extremity (level 2):** When anchor extremity was low (level 2), there was a more significant anchoring effect, with high anchors leading to higher estimates ($M = .30, SD = .43$) than low anchors ($M = -.40, SD = .48$), $F(1, 46) = 29.42, p < .001, d = 1.60$. Again, there was no moderating effects of knowledge on anchoring, $F < 1$.

**Moderate extremity (level 3):** However, as in Study 1A, knowledge effects began to emerge as anchors became more extreme. When anchors were moderately extreme (level 3), the significant anchoring effect (high- and low-anchor $Ms = .56, SD = .50$, and $- .59, SD = .47$, respectively; $F(1, 46) = 70.53, p < .001, d = .248$) was moderated by knowledge as demonstrated by a significant Knowledge X Anchoring interaction, $F(1, 46) = 8.01, p < .007, d = .83$. Anchoring remained consistently strong for low-knowledge targets (high- and low-anchor $Ms = .72, SD = .56$ and $- .69, SD = .60$), but it was substantially reduced for estimates of high-knowledge items (high- and low-anchor $Ms = .45, SD = .51$ and $- .50, SD = .58$).
**High extremity (level 4):** These knowledge differences persisted when extremity was high (level 4). Again, the significant anchoring effect (high- and low-anchor Ms = .50, SD = .62 and -.31, SD = .52, \(F(1, 49) = 24.89, p < .001, d = 1.43\)) was moderated by knowledge, \(F(1, 49) = 5.40, p < .024, d = .66\), such that anchoring continued to persist to a greater degree when the extreme anchors were presented with low-knowledge items (high- and low-anchor Ms = .61, SD = .69, and -.41, SD = .66) compared to high-knowledge items (high- and low-anchor Ms = .38, SD = .72 and -.21, SD = .58).

**Very high extremity (level 5):** Lastly, directionally-consistent with both Study 2A and an attitudinal approach to anchoring, when anchors reached a level of very high extremity (level 5), the overall anchoring effect was diminished, though still significant, \(F(1, 55) = 10.40, p < .01, d = .87\) (high- and low-anchor Ms = .20, SD = .45 and -.27, SD = .63). In addition, there was no moderating effect of knowledge on anchoring, \(F < 1\), with low- and high-knowledge items collapsing in effectiveness.

Another method of decomposing this pattern is to conduct a series of analyses comparing adjacent levels of anchoring extremity.

**Very low vs. low extremity:** Comparing standardized estimates at the very low and low levels of extremity produced a main effect of Anchor, \(F(1, 96) = 31.19, p < .001, d = 1.14\), qualified by a significant Anchor X Extremity interaction, \(F(1, 96) = 9.20, p < .003, d = .62\), demonstrating that anchoring effects were larger for low rather than very low levels of extremity. There was no Knowledge X Anchor X Extremity interaction, \(F < 1\), showing that the amount of anchoring did not depend on the amount of knowledge associated with the target.
Low vs. moderate extremity: Comparing standardized estimates at the low and moderate levels of extremity produced a main effect of Anchor, $F(1, 92) = 96.48, p < .001, d = 2.05$, qualified by a significant Anchor X Extremity interaction, $F(1, 92) = 5.65, p < .02, d = .50$, demonstrating that anchoring effects were larger for moderate rather than low levels of extremity. Furthermore, there was a significant Knowledge X Anchor interaction, $F(1, 92) = 4.29, p < .041, d = .43$, and there was a marginal Knowledge X Anchor X Extremity interaction, $F(1, 92) = 3.52, p < .064, d = .39$, suggesting that knowledge effects on anchoring tended to be larger when extremity was moderate rather than low.

Moderate vs. high extremity: Comparing standardized estimates at the moderate and high levels of extremity produced a main effect of Anchor, $F(1, 95) = 84.99, p < .001, d = 1.89$, qualified by a significant Knowledge X Anchor interaction, $F(1, 95) = 12.90, p < .001, d = .74$. The lack of a significant Knowledge X Level X Anchor interaction ($F < 1$) suggests that knowledge effects were remaining constant across these levels of extremity - greater anchoring for low- than high-knowledge items, for both moderate and high-levels of anchor extremity.

High vs. very high extremity: Comparing standardized estimates at the high and very high levels of anchor extremity produced a main effect of Anchor, $F(1, 104) = 34.51, p < .001, d = 1.16$, that was qualified by a significant Knowledge X Level X Anchor interaction, $F(1, 104) = 5.36, p < .023, d = 0.45$, consistent with Study 1A. This pattern suggests that the effects of knowledge on anchor that were present for high levels of anchor extremity were no longer present at these very highest levels of extremity.
Discussion

Results from Study 2B both replicate previous work examining anchoring over multiple levels of extremity (Study 2A), as well as provide additional demonstrative evidence for the differential impact of knowledge over levels of extremity. In Study 2B, again a diminishment in the effects of extreme anchors were found to occur for both high- and low-knowledge items, just to a different degree over levels of anchor extremity. When knowledge associated with an item was high, for moderate-to-extreme anchors, smaller anchoring effects when knowledge associated with an item was low. But even for the low-knowledge items, a downturn in anchor effectiveness eventually did occur with very extreme anchors.

Unlike Study 2A, there was still a small but significant impact of anchors at the most extreme levels. One possible reason for this discrepancy is that in Study 2A, participants’ perceived knowledge was overall higher for both high- and low-knowledge items. Given lower overall levels of knowledge, it could be that one would need even more extreme anchors in order to entirely eliminate, rather than simply reduce, these anchoring effects. It could also be that there was something different about the sample or setting (online vs. lab; payment vs. course credit) that pulled for more overall use of even the extreme anchors in Study 2B.

In addition, in both Study 2A and Study 2B there was initial evidence that knowledge may predict perceptions of plausibility, particularly for anchors of those levels of extremity in which Knowledge X Anchor interactions were present (moderate and high). Initial manipulation check both Study 2A and Study 2B suggest that examining
potential knowledge-based differences in amount of anchoring may occur more for some levels of extremity (namely, moderate and high) than others. One of the possible mechanisms for the differential knowledge effect across levels of anchor extremity is that perceived plausibility of the anchor is affected by knowledge mostly at these moderate to high levels (more so than at low or extremely high levels of extremity), as demonstrated by Study 1.

However, this is not to say that there should be no impact of knowledge for those items that did not have a significant Knowledge X Anchor interaction on the degree of anchoring. As examined in the previous studies, one could regard sufficiently extreme anchors as constituting an “attack” on one’s perceptions of the target and conceptualize the knowledge differences as reflecting differences in resistance to that attack. In the anchoring domain at least, the previous studies suggest that one reason that knowledge creates different levels of resistance to the attacking anchor is that different levels of knowledge generally relate to different perceptions of how plausible the anchor value is as an estimate of the value. However, one particularly interesting implication of an attitudinal view for anchoring is that differences in knowledge might create differences in resistance even when initially anchored to the same degree (similar to differences in knowledge creating differences in resistance to persuasion when high- and low-knowledge attitudes are equal; e.g., Lewan & Stotland, 1961).

For example, in Studies 2A and 2B, low extremity (level 2) anchors created substantial anchoring effects (significantly larger than for very low extremity anchors) that were equally large for both low- and high-knowledge items. Thus, these kinds of
estimates would provide an ideal context in which to examine whether item-related knowledge would continue to create differential resistance to attempts to change the anchored estimates that have now been integrated into the person’s knowledge base. Thus, in Study 3, I first created the anchored perceptions of the high- or low-knowledge targets and then provided social information intended to diverge extremely enough to represent an attack on the anchored perceptions. The goal of this study was to examine whether the item-related knowledge differences create differential resistance to such “attacking” attempts at changing the previously (equally) anchored perceptions.
CHAPTER 5

STUDY 3

The primary focus of Study 3 was to demonstrate strength effects in the anchoring domain, particularly as a consequence of differential knowledge related to the judgment target. The role of knowledge in anchoring has been treated mainly in a main-effect, fashion: the more knowledge one has, the better one is able to resist an anchor and, as such, the smaller anchoring effects one should expect. However, an attitudinal (elaboration-based) approach to anchoring would suggest that even under conditions in which one’s amount of initial anchoring is objectively the same, if one’s judgment or estimations are based in a more elaborated cognitive structure, this should allow for predictions of differential impact on subsequent judgments and behaviors -- in the manner of the attitude strength literature. From an attitude strength perspective, more elaborated, high-knowledge judgments should produce longer-lasting effects that are more resistant to change and more predictive of related behavior. Some work directly examining the influence of ability to elaborate during an anchoring task has demonstrated consistency between attitude strength predictions and anchoring outcomes (see Blankenship et al., 2008). Even without differences in ability to think during the
anchoring task, however, I expected that a larger amount of target-related knowledge could create similar anchored judgments that are more resistant to change than judgments associated with lower amounts of knowledge. Importantly, this should occur even when the initial anchored judgments have been equally “anchored” (i.e., equally affected by the consideration of the anchor).

In the results of Study 2A and 2B, participants exposed to anchors of low extremity (extremity level 2) demonstrated equivalent anchoring between low-knowledge and high-knowledge items. This provided me with a unique opportunity to explore the role that strength-related properties of knowledge may take, even given identical starting positions. In some respects, this study conceptually replicated a variation on the Lewan and Stotland (1961) persuasion research: given equal starting positions between low- and high-knowledge participants, I anticipated that the initial judgments associated with high levels of knowledge would be more resistant to change than judgments associated with lower levels of knowledge. The difference is that Lewan and Stotland (1961) created different levels of knowledge without changing initial (neutral) evaluations of the fictitious countries. In the current setting, I attempted to create equal initial anchored judgments that differed from unanchored estimates (just as low extremity [level 2] anchors in Study 2A and 2B resulted in more extreme estimates than very low extremity [level 1] anchors, which did not differ much from each other or, presumably, from unanchored estimates). Then, these equally anchored judgments should show different levels of resistance to change based on the amount of knowledge associated with the judgment target.
Importantly, plausibility may again play a role in the predicted differential resistance to an anchoring attack. Presumably, the lack of a direct effect of knowledge on degree of anchoring for these low extremity anchors was a product of a lack of recognition of said anchor as being implausible. That is: the anchors were not so extreme that participants viewed them as being an entirely unreasonable option for the target judgment. However, an attack in the opposite direction of initial anchors may be discrepant enough from the anchored estimates that it would be viewed as differentially plausible depending on the level of knowledge associated with the target item. Higher levels of knowledge should lead to perceptions that the value of the attacking information is less plausible than when the information is considered with lower levels of knowledge. To the extent that this is the case, the influence of some attacking information should be diminished for anchored assessments that are initially associated with higher levels of knowledge.

**Method**

*Participants and Overview of Procedure*

Two hundred thirty-one (231) introductory psychology participants at the Ohio State University were recruited to participate in the study for partial course credit. The instructions of Study 4 closely followed that of Study 2: Participants were again told they would be evaluating several different judgment items, and the set of items began with a set of filler items presenting a variable set of high and low anchors of different levels of extremity so the target items would not stand out as unusual within the larger set of items. The only manipulated variable in this study was a between-subjects manipulation of
knowledge. Participants received target items associated with either relatively high or low levels of knowledge. Previous anchoring work has demonstrated that low and high anchors produce parallel results in opposite directions, and in order to simplify the study design, only high initial anchors were used in this experiment.

As in Study 1, participants were first asked to assess whether they believed the real answer to a given judgment was higher or lower than an anchor (which was always a low-extremity high anchor [cf. Study 2A and 2B, level 2]). Participants then provided a rating of knowledge associated with the item and were then asked for their target estimates (i.e., their estimate of the true value). Participants were then exposed to a brief set of additional filler anchoring items. After these filler items, participants encountered a message attacking their anchored position on each of the target items. The attack fell in the opposite direction of their initial anchor (i.e., a claim that other participants had provided estimates that were far lower than the initial anchor). Participants were asked to rate the claim for its plausibility and provide a second estimate of each target value. Following the anchoring portion of the study, participants completed a brief demographic survey and were debriefed and compensated for their participation.

*Independent Variables*

*Anchors.* All anchors provided in this study were high. The values for these anchors were equivalent to the ‘low’ extremity anchors from Study 2A (level 2). These anchoring values were chosen because in previous work (Study 2A and 2B), they produced equal anchoring between low- and high-knowledge participants (See Appendix D, Table 2 for a listing of the anchors that were provided in this study).
**Attacking claim.** After providing their initial estimates on target anchoring items, the participants were exposed to information that was contrary to their initial anchor. Participants saw each target they had initially encountered a second time (e.g., the average number of attendees at a Chicago Bears football game; anchor = 92,000 people), and were provided with the following additional information: “Earlier in this session, you estimated the average number of people who attend a Chicago Bears home football game. In previous studies of this type, 10% of participants provided an estimate of lower than 25,000 people.” The number of participants who disagreed with the participant was always 10%, and the attacking claim value was always lower than the initial anchor (approximately the value of low-extremity low anchors from previous studies). Given the initial assimilation of responses from both high- and low-knowledge participants to the low-extremity high anchor, an attack that went in an opposite direction may be considered more extreme than if the same anchor had been presented without any prior anchoring. This might open the claim to being perceived as differentially plausible by people who held different levels of knowledge about the target item.

**Knowledge.** In this study, three sets of anchoring targets were created in yoked pairs between low- and high-knowledge items such that the same anchors could be applied across levels of knowledge. The knowledge items used in this study were identical to those used in Study 2A and 2B, with a single exception: the items for Richard Nixon (high knowledge) and Gandhi (low knowledge) were included in the initial study, but were not included in the presented primary statistical analyses due to failing to
demonstrate knowledge consistent knowledge differences among participants in this study.²

Dependent Measures

Perceived plausibility. Participants reported on the plausibility of the attacking anchor using the same scales and in the same fashion as Study 1, 2A and 2B.

Estimates. This dependent measure consisted of participants’ responses to an open-ended question about their estimates for the actual value for any given anchoring judgment, identical to Study 1, 2A and 2B. Again, the open-ended responses were fenced using the Tukey outlier procedure (1977) before being standardized and combined. Participant estimates were collected two times throughout the study: once after the initial anchoring, and once after exposure to the attacking anchor value. Standardization occurred across the two responses by participants so as to retain any mean differences between the two instances.

² Study 4 was the most recent anchoring study performed in this line of work. The items used in this study had been initially calibrated in Studies 2A and 2B. Specifically, these four items were chosen, and a low level of extremity (level 2) because in these previous works, low- and high-knowledge items had demonstrated equivalent amounts of overall anchoring. As such, demonstrating secondary, strength-related properties at this level should produce the strongest evidence for attitudinal predictions of anchoring. However, a key component of using these equally persuasive items that differ in people’s perceptions of knowledge, is that they actually differ in perceived knowledge. Otherwise, one would expect equivalent levels of resistance as a consequence that both items in a yoked-pair are equivalent in levels of knowledge. As the anchoring research using these calibrated pairs becomes further separated from their initial calibration, the possibility that participant knowledge will change about any given item becomes more likely. This is particularly true for the participants’ knowledge about the age of Gandhi and Nixon when they perished. As time passes, it seems increasingly likely that the differences in participant’s knowledge would diminish. When initially conducted, Study 2A only followed the passing of Richard Nixon by 5 years, but that is now over 20 years in the past. Older respondents (as in Study 2B) may still recall when Nixon passed, but current college-aged participants would likely not. Consistent with these concerns participants’ knowledge about the age of death of Richard Nixon and Gandhi did not significantly differ, t(226) = 1.83, p = .07, d = .24, and did not show as much of a difference in resistance to change (see footnotes in the following sections for analyses including the Nixon/Gandhi items).
Results

Perceived Knowledge

Self-reports of perceived knowledge for the high- and low-knowledge items were averaged, and as predicted, participants reported knowing more about the high-knowledge items ($M = 2.64, SD = 1.45$) than the low-knowledge items ($M = 2.04, SD = 1.22$), $t(229) = 3.36, p < .001, d = .22$.

Perceived Plausibility of Attack

Similarly, participants’ reports of the plausibility of the attacking claim were averaged across items. Participants reported finding the attacking message less plausible for the high-knowledge items ($M = 4.83, SD = 1.64$) compared to the low-knowledge items ($M = 5.29, SD = 1.65$), $t(229) = -2.17, p < .031, d = .14$.

Target Estimates

Participants’ pre-attack (time 1) standardized estimates did not differ between high- ($M = -.06, SD = .59$) and low-knowledge ($M = .06, SD = .68$) items, replicating previous work (Study 2A, Study 2B) for anchors of low levels of extremity, $t(210) = -1.35, p = .18, d = .19$. In order to test the impact of the attacking message, a 2 (Knowledge: high v. low) x 2 (Time: preattack [time 1] v. postattack [time 2]) ANOVA was performed on the standardized estimates. This resulted in a significant main effect of time, $F(1, 208) = 43.50, p < .001, d = .91$, such that participants provided higher pre-attack estimates ($Ms = -.01, SD = .63$) than their post-attack estimates ($Ms = -.27, SD = .51$). That is, the attacking message affected both high- and low-knowledge items. However, the time main effect was qualified by a significant Anchor X Time interaction,
F(1, 208) = 3.94, p < .049, d = .28, which showed more change between pre-attack attack (high knowledge: Ms = -.07, SD = .58; low-knowledge: M = .05, SD = .67) and post-attack (high knowledge: Ms = -.25, SD = .51; low-knowledge: M = -.29, SD = .51) estimates for the low-knowledge items (MΔ = .34) than for the high-knowledge items (MΔ = .18), corresponding to the mean differences demonstrated above.3

Plausibility and Knowledge on Estimates

A series of regression analyses were run to investigate the role that both knowledge and plausibility played in participants’ change in estimations from their first exposure to the low-extremity anchor to their estimates after reading attacking information. As reported earlier, the manipulation of knowledge between items significantly predicted the degree of change in estimates, B = .153, t(208) = 1.98, p < .049, d = .27. That is, as with the previous ANOVA, the high-knowledge items demonstrated less change between pre-attack to post-attack estimates. In addition, perceptions of plausibility of the attacking claim were significantly associated with the degree of change in estimates, B = .053, t(208) = 2.27, p < .024, d = 3.15. The more plausible the attack was perceived as being, the more participants changed their estimates in the direction of that information. When both of these predictors were put into the same model, perceptions of plausibility remained a significant predictor of the degree of plausibility

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3 With the Nixon/Gandhi item included in the analyses, the manipulation of knowledge between items no longer predicted the degree of change in estimates, B = .097, t(226) = 1.34, p = .18, d = .18. However, consistent with the mediational model, there were still differences in perceived plausibility of the attacking claim between the low- and high-knowledge items (low-knowledge M = 5.25, SD = 1.54; high-knowledge M = 4.80, SD = 1.54; t(229) = 2.20, p < .03, d = .29), and plausibility still significantly predicted the degree of change in estimates, B = .047, t(226) = 2.02, p < .045, d = .18. When both were included in the model, plausibility marginally predicted the degree of change in estimates, B = .044, t(226) = 1.85, p = .065, d = .17, whereas knowledge differences were absent, B = .079, t(226) = 1.09, p = .278, d = .14. Furthermore, the bootstrapped confidence interval for the indirect effect of knowledge through plausibility was directionally consistent with the other results presented in this section (b=.02; 95% CI: -.0001; .0582).
change, $B = .048$, $t(208) = 2.03$, $p < .044$, $d = .28$, whereas the difference between high- and low- knowledge items was no longer significant, $B = .132$, $t(208) = 1.70$, $p > .09$, $d = .24$. This pattern is consistent with the idea that perceptions of plausibility play a role in mediating the impact of knowledge on participants’ change in estimates in response to an attacking message – similar to the role of perceived plausibility in determining the extent to which unanchored perceptions of target items were differentially influenced by moderately extreme anchors in Study 1. Essentially, at least in part, the mechanical route of the increased resistance towards new information enjoyed by high-knowledge items is as a consequence of differential perceptions of plausibility of the new information. Additionally, a bootstrapping analysis of the indirect effect of plausibility on estimates, working through knowledge, was significant, $b = .02$, $SE = .02$, 95% CI: .0006; .0675.

Discussion

The key result of Study 3 is that, for items chosen as previously resulting in equal anchoring between low- and high-knowledge items, differential resistance to an attacking message may be seen. High levels of knowledge associated with the target items allowed participants to better able resist the social influence and second anchor as compared to lower levels of target-related knowledge. This consequence of knowledge, on a domain beyond initial amount of anchoring, demonstrates a clear and expected impact of a more elaborated knowledge base when forming the initial judgment. Similar influences of metacognitions, such as confidence in one’s estimate, are additionally suggested by an elaboration-based theory of anchoring (e.g., Wegener et al., 2010). These possibilities will be further expanded upon in the general discussion.
Such differential consequences of anchored judgments were not anticipated by anchor-and-adjust or selective accessibility accounts. An attitude change approach not only lays down clear predictions for consequences of anchored estimates associated with metacognitions such as perceived knowledge, but additionally should suggest that similar results would be found if one could confront equally persuaded, low- and high-knowledge individuals, with an attack in the attitude change literature. Moving back from the anchoring to the implications of these effects for the attitudinal literature, the present work suggests that equally persuaded low- and high-knowledge individuals may still show differential resistance to persuasion to subsequent messages.

In Study 4, I endeavor to perform just that test.
CHAPTER 6

STUDY 4

Thus far, Study 2A and 2B have demonstrated that in the anchoring domain, low- and high-knowledge participants may show equal anchoring from a starting position to a relatively plausible, low extremity anchor. Additionally, Study 3 produced evidence suggestive of strength-based consequences for anchoring, even when these low extremity anchors have produced relatively similar initial positions across levels of knowledge. Although initial attitudinal work (see Lewan & Stotland, 1961; Wood, 1982) demonstrated differential resistance to persuasion from an equal initial position between low- and high-knowledge individuals, no existing work has demonstrated equal persuasion between low- and high-knowledge individuals as a consequence of relatively low-extremity information (i.e., in conditions of low message discrepancy).

Study 4 is designed first to conceptually replicate the differential knowledge outcomes of the anchoring work in Study 3 in the attitudinal domain. In addition, this study will uniquely provide evidence for (1) equivalent persuasion between low-and high-knowledge individuals following a mild, largely attitude-consistent message, and (2)
the differences in initial (pre-persuasion) knowledge producing differential consequences, especially differential resistance to subsequent counter-attitudinal information.

**Method**

**Participants and Overview of Procedure**

One hundred eighty-seven (187) online respondents from Amazon’s Mechanical Turk (MTurk) website (for monetary compensation) and introductory psychology participants at the Ohio State University (for partial course credit) completed this study. Participants were informed that the researchers were interested in how they would learn about another person, specifically how people engage with updating opinions when confronted with new information. In the cover story, they were told that previous participants provided information about several individuals, and that they would sometimes receive information about the same source from multiple perspectives.

Study 4 was a 3 (Time: initial attitude, post-mildly-discrepant information, post-counterattitudinal information) x 2 (Initial Attitude Valence: negative, positive) x 2 (Knowledge: low, high) mixed design, with valence and knowledge as between-subjects factors and time as a within-subjects factor.

Initially, participants were presented with filler information about the behaviors of a dummy target, Alex, before getting information about the target of interest, Bob. The information about Alex was always neutral on average (High Knowledge $M = 5.139$; Low Knowledge $M = 5.05$) in valence, and participants received a contrasting amount of information about Alex compared to Bob. That is, if the participants were in the high-knowledge condition, they received very little information about Alex, in terms of
number of behaviors they read about Alex (4), and were told that this is similar to a situation in which you do not know the person well. In contrast, participants would receive a far larger number of behaviors about Bob (12) and would be told that this is similar to a situation in which they know the person well. This pattern was reversed if the participant was in the low-knowledge condition. Pretesting demonstrated that this contrast in amount of information enhanced the differences in participants’ perceptions of their level of knowledge across the two knowledge conditions.

After this initial information, participants were asked about their attitudes towards Bob and their perceptions of knowledge about him (See Appendix D, Table 4 for all the different information sets a participant could receive). Then, they were exposed to a second set of information about Bob (6 items), that was in the same direction of their initial information (either positively valenced or negatively valenced), but this valenced information was more positive or negative than the initial information they received. Following that mildly-discrepant but directionally consistent information, participants were once again asked about their attitudes towards Bob. Lastly, participants were exposed to a third set of Bob’s behaviors (6 items) that was counter-attitudinal and, thus, more extremely different from their changed (extremified) attitudes. That is, the counter-attitudinal information was in the opposite direction of the previous two sets of valenced information.

Thus, if a participant was in the positively-valenced condition, they saw initial behavioral information that was mildly positive on average, a second set that was more positive on average, and a third set of behavioral information that was negative. If a
participant was in the negatively-valenced condition, they saw initial behavioral information that was mildly negative on average, a second set that was more negative on average, and a third set of behavioral information that was positive. After this (third) more extreme attacking message, participants provided one last rating of their attitudes towards Bob and answered a second series of questions about their perception of knowledge about Bob. An attention check was administered, to check whether the participants could correctly identify the name of the target they had received information about at three separate times throughout the study. Twenty-four (24) participants failed this attention check, and all analyses are based on the one hundred sixty-three (163) participants who successfully passed this check. Following this attention check, the participants were debriefed and thanked.

*Independent Variables*

**Valence.** Participants either received a baseline series of positive behaviors that Bob performed (e.g., Bob helped his friend plant a large vegetable garden) or negative behaviors (e.g., Bob destroyed a bookshelf that was a home-warming gift from his neighbor). A large set of behaviors were pretested, and a combination of valenced and neutral behaviors were presented to the participants for both low- and high-knowledge conditions (average of the independent ratings of each behavior on a 9-point scale [1=negative; 9=positive]; positive condition: High Knowledge [$M=6.41$], Low Knowledge [$M=6.37$]; negative condition: High Knowledge [$M=3.81$], Low Knowledge [$M=3.78$]).
In the initial persuasion phase (time 2), a second set of valenced behaviors was encountered. This set consisted of behaviors that an acquaintance of Bob suggests he would be likely to enact. The behaviors were in the same direction as the baseline information but were clearly more positive (e.g., Bob would stop to assist a motorist whose car had stalled during a snow storm; \( M=7.76 \)) or negative (e.g., Bob would butt to the front of a long line at the movie theater; \( M=2.24 \)) than the baseline information.

The last set of information participants received (time 3) was the reverse set of information from time 2. That is, if participants previously received positively valenced information about Bob at times 1 and 2, they received negatively valenced (attacking) information at time 3 (See Appendix D, Table 4 for all the different information sets a participant could receive). Thus, the counter-attitudinal attacking information at time 3 should have been clearly inconsistent with their existing knowledge and extreme enough to be viewed as implausible by at least some participants.

Knowledge. The amount of knowledge was manipulated via the first set of information participants received about Bob. Participants in the high-knowledge condition first received a series of four overall neutral behaviors that a filler person, Alex, enacted. Participants were further informed that, due to the lack of information provided, this condition was similar to a situation in which they did not know Alex well. In contrast, participants then received twelve behaviors that the target, Bob, enacted, and they were told that due to the amount and variety of information provided, the condition was similar to a situation in which they know the target well. The number of behaviors
and information about the situation was reversed between Alex and Bob if participants were in the low-knowledge condition.

**Dependent Measures**

*Attitudes.* Participants reported their attitudes towards the targets using four 9-point scales (e.g., To what extent is your impression of Bob positive or negative?; 1 = extremely negative; 9 = extremely positive). Their scores on these scales were averaged together to form one composite measure of attitudes towards a given target. Attitudes towards the key target of interest, Bob, were measured at the three separate time intervals: after exposure to baseline information, after exposure to attitude-consistent (mildly-discrepant) information, and after exposure to the attitude-inconsistent attack. The scales demonstrated high reliability at all time points (time 1 $\alpha = .97$, time 2 $\alpha = .99$, time 3 $\alpha = .98$).

*Perceived knowledge.* Immediately following a participants’ rating of their initial attitude, their perceived degree of knowledge about Bob was measured using four 9-point scales (e.g., To what extent do you have enough information to form a reasonable impression of Bob?; 1 = much too little information; 9 = more than enough information). These scales were averaged together to form one composite measure of perceived knowledge about Bob. A second, identical set of knowledge questions was included after the participants were exposed to the last set of information about Bob, the counterattitudinal attack. The scales demonstrated high reliability for both baseline knowledge ratings (time 1 $\alpha = .94$) and final knowledge ratings (time 3 $\alpha = .96$).
Results

Perceived Knowledge

As predicted, participants reported knowing more about Bob (the target) in the high-knowledge condition \( (M = 4.93, SD = 1.59) \) than in the low-knowledge condition \( (M = 3.43, SD = 1.48) \), \( t(161) = -6.24, p < .001, d = .98 \). However, these differences on reported amounts of knowledge diminished when knowledge was measured again after participants had reported on their attitudes towards Bob three times and read three separate sets of information about him, such that when reporting on knowledge at the end of the experiment, there was no longer a significant difference between the high-knowledge condition \( (M = 5.91, SD = 1.68) \) and the low-knowledge condition \( (M = 5.62, SD = 1.92) \), \( t(161) = -1.04, p = .30, d = .16 \). This is not an unanticipated effect: knowledge was initially manipulated via a differential amount of information about Bob. As the study persisted, the participants were exposed to multiple sets of behavioral information about Bob, and as such the proportional difference in number of pieces of information shrank as participants learned more about the target.

Attitudes towards Bob

Aggregated attitudes toward Bob were analyzed using a 2 (Knowledge: low v. high) x 2 (Initial Information valence: positive vs. negative) x 3 (Time: baseline attitudes vs. post-directionally-consistent message v. post-counter-attitudinal message) mixed design ANOVA with knowledge and information valence as between-subject factors and time as a within-subject factor (see Appendix C, Figure 3).
There was a main effect of valence on attitudes towards the target, $F(1, 159) = 481.71, p < .001, d = 3.48$, such that participants rated Bob more positively overall in the positive valence condition than the negative valence condition. That is, participants’ attitudes moved from a starting valenced position at time 1 (baseline) attitudes (positive $M = 6.47, SD = 1.05$, negative $M = 3.50, SD = 1.04; p < .001$) to a more extreme position of the same valence at time 2 (post-directionally-consistent information) (positive $M = 8.02, SD = 1.00$; negative $M = 1.83, SD = .85; p < .001$). At time 3 (post-counter-attitudinal information), previously-positive attitudes were pulled down and previously-negative attitudes were pulled up to a point where there was no longer a difference in attitudes across initial valence conditions (positive $M = 4.32, SD = 1.94$, negative $M = 3.91, SD = 2.00; p = .17$). This pattern resulted in a significant Valence X Time interaction, $F(1, 159) = 68.93, p < .001, d = 1.32$. That is, both positive- and negative-valence conditions saw attitude-consistent attitude change between time 1 and time 2 measurements (mean difference [time 1 – time 2]: negative $M\Delta = -1.67, p < .001$, positive $M\Delta = 1.55, p < .001$) and the opposite direction of attitude change in the wake of the counterattitudinal message, between time 2 and time 3 measurements (mean difference [time 2 – time 3]: negative $M\Delta = 2.08, p < .001$, positive $M\Delta = -3.69, p < .001$).

However, not all participants moved equally in response to this counterattitudinal message. My prediction of differential resistance, with equal initial and post-consistent messages, was borne out in a significant Time X Knowledge X Valence interaction, $F(1, 159) = 6.42, p < .012, d = .40$. For low- and high-knowledge items at time 1,
Valenced items resulted in the same attitudes towards Bob (low-knowledge, $M = 6.41$, $SD = 1.20$, and high-knowledge, $M = 6.53$, $SD = .87$, $p = .63$). Additionally, the negatively-valenced low- and high-knowledge items did not significantly different at time 1 (low-knowledge, $M = 3.58$, $SD = .88$ and high-knowledge, $M = 3.42$, $SD = 1.18$, $p = .49$). At time 2, participants reported both more extreme positive and negative attitudes, but again there was no significant difference between low- and high-knowledge items on the attitude measures, for either positively-valenced ($M = 8.10$, $SD = .87$ and $M = 7.93$, $SD = 1.12$, respectively; $p = .38$) or negatively-valenced conditions ($M = 1.77$, $SD = .78$ and $M = 1.90$, $SD = .92$, respectively; $p = .53$). Both of these largely follow my predictions of mostly-equivalent starting positions between low- and high-knowledge participants in their attitudes towards Bob and people being persuaded equally to a mildly-discrepant, attitude-consistent position after reading information that was directionally consistent with the information they had initially received about Bob. Lastly, at time 3, low-knowledge participants generally reported more attitude change than high-knowledge participants in response to the attack, resulting in a difference in their attitudes towards Bob, directionally in the positively-valenced condition ($M = 3.99$, $SD = 1.98$ and $M = 4.66$, $SD = 1.85$, respectively; $p = .12$) and significantly in the negatively-valenced condition ($M = 4.50$, $SD = 2.16$ and $M = 3.33$, $SD = 1.65$, respectively; $p = .007$).

Another way of decomposing the omnibus Time X Knowledge X Valence interaction is to examine whether the same interaction holds between time 1 and time 2 or between time 2 and time 3. These two parallel ANOVAs of adjacent time effects demonstrate where knowledge is producing differences in the amount of change.
**Time 1 and Time 2 ANOVA.** A 2 (Knowledge: low v. high) x 2 (Information valence: positive v. negative) x 2 (Time: 1 vs. 2) ANOVA was performed comparing attitudes (time 1) and post-consistent-message attitudes (time 2). There was not a significant three-way Time X Knowledge X Valence interaction, $F(1, 159) = 3.13, p = .08, d = .28$. That is, high- and low-knowledge participants did not significantly differ in the amount of attitude change between time 1 and time 2. This outcome is generally consistent with the directionally-consistent information influencing participants to similar degrees across levels of knowledge. However, because the nonsignificant simple effects of knowledge were in opposite directions at time 1 and time 2, the interaction comparing Knowledge X Valence effects on the amount of change was marginal.

**Time 2 and Time 3 ANOVA.** A 2 (Knowledge: low v. high) x 2 (Information valence: positive v. negative) repeated measures ANOVA was performed on post-directionally-consistent message attitudes (time 2) and post-counter-attitudinal message attitudes (time 3). This produced a significant three-way Time X Knowledge X Valence interaction, $F(1,159) = 11.02, p < .001, d = .53$, such that high- and low-knowledge participants did significantly differ in the amount of attitude change between time 2 and time 3. High-knowledge participants demonstrated less attitude change, or greater resistance, to this counter-attitudinal message.

**Discussion**

Results from Study 4 first provided clear, and expected, evidence that within the attitudes domain people may hold the same initial position with differential low- or high-levels of knowledge, replicating part of the earlier work of Lewan and Stotland (1961).
Additionally, however, people may be persuaded to change their attitude and, given a mildly-discrepant attitude-consistent message, high- and low-knowledge individuals may be persuaded equally, as evidenced by the lack of differential attitude change between low- and high-knowledge participants between baseline measurements and post-directionally-consistent, mildly-discrepant measurements (though this difference in amount of change was marginal and in a direction that low levels of knowledge were associated with greater influence of the mildly-discrepant information). The lack of attitude differences across both time 1 and time 2 ratings, though, suggest that knowledge differences can often occur without attitude differences. Nonetheless, just because knowledge does not produce immediate differences in the attitudes that are reported, they may still produce systematic differences in strength-related consequences: in this study, the high knowledge people were better able to resist an attack in the form of a clearly counter-attitudinal message. Parts of this work are conceptually consistent with the results from Study 2A and 2B and Study 3. In Studies 2A and 2B, plausible claims influenced judgments based on low- or high-levels of knowledge equally. Yet, in Study 3 those initially equal levels of anchoring based in different levels of knowledge still created difference in the amount of impact of later social influence information. In the current study, there were no differences in attitudes at time 1 or 2 between low- and high-knowledge conditions (though there was a tendency for overall amount of impact of the mildly-discrepant information to be greater when knowledge was relatively low rather than high). When later attacked, though, the attitudes at time 2 (that did not differ between low- and high-knowledge conditions) were differentially resistant to the
persuasive attacks that were more clearly discrepant from their existing attitudes. Thus, the present work suggests that the influence of knowledge on attitude change is more complicated than providing a general buffer against any information one experiences.

Importantly, the knowledge differences in resistance to new information seem to depend on the extremity of the claim that is being considered. Study 4 provided a demonstration that claims that generally fall in-line with one’s attitude (e.g., mildly discrepant, but consistent) might not generally not result in increased resistance, mirroring outcomes from level 2 (low extremity) anchors in Studies 2A and 2B. However, even under these conditions of equal initial persuasion, strength-related consequences of these knowledge effects may occur (as in Study 3 on the anchoring side). One possible mechanism for this has already been suggested by the previous anchoring studies: the role of perceptions of plausibility of messages, which seems particularly relevant when considering the extremity of discrepant claims. Other potential mechanisms will be considered in the general discussion that follows in Chapter 7.
CHAPTER 7

GENERAL DISCUSSION

One major goal of the present research was to provide evidence for the usefulness of an attitudinal approach to anchoring, in particular to examine how predicted patterns of persuasion over levels of extremity might be produced in the anchoring domain. In addition to (conceptually) reproducing previous curvilinear effects of anchor extremity on the amount of impact on judgments, the current work also incorporated insights from persuasion work on knowledge to make unique predictions regarding the role of knowledge in further moderating the impact of anchor extremity. That is, knowledge effects on resistance to change might be most likely when the “attacking” anchor or persuasive claim is extreme enough for high levels of knowledge to decrease perceptions of the plausibility of the position to the point that it undermines the impact of the anchor or claim on subsequent judgments. In the current work, this resulted in knowledge differences only at moderate levels of anchor extremity and for messages that were extreme enough to be counterattitudinal. Importantly, a central goal of this work was to further examine the interactive role plausibility and knowledge play in anchoring effects. Study 1 replicated classic knowledge differences on amount of anchoring for moderately
extreme anchors, and additionally demonstrated that perceptions of plausibility play a role in producing those knowledge differences.

However, when anchors lacked extremity, people viewed the anchors as relatively plausible regardless of their level of knowledge. Thus, substantial anchoring occurred without knowledge differences in the amount of anchoring. At moderate levels of anchor extremity, however, people were more likely to view the anchor as sufficiently implausible to undermine the anchor’s influence when they possessed relatively high, rather than low, levels of knowledge about the target. When the anchors were very extreme, however, everyone viewed the anchors as implausible, and knowledge differences in amount of anchoring were reduced. Study 2A and 2B demonstrated a curvilinear pattern of anchoring over multiple levels of extremity. Additionally, the influence of knowledge on amount of anchoring was most pronounced for moderately extreme anchors, as compared to mildly or very extreme anchors. Study 2B replicated similar results from a previous study (2A), lending greater credence to the pattern of effects.

One could think of the observed differences in influences of moderately extreme anchors as representing knowledge-based differences in resistance to the anchors. Another insight from the attitudes domain concerned differential consequences of initially anchored assessments associated with different levels of knowledge. That is, even when initial anchoring was substantial and equal across levels of knowledge (i.e., with low-extremity anchors), subsequent “attacks” on the anchored estimate changed perceptions more when knowledge was low than when knowledge was more substantial.
Study 3 showed that differential knowledge need not produce differential amounts of anchoring, but may still have a consequential impact on subsequent strength- and elaboration-related properties, such as resistance to persuasion.

An additional perspective afforded by this anchoring work is that anchors at low levels of extremity produced equivalent judgments between low- and high-knowledge items in terms of degree, but that subsequent evaluations of the anchored judgments still demonstrated strength-related properties in the form of differential resistance to further changes. However, this prediction is not limited to the anchoring domain, and such predictions should necessarily be extended back into a more classic attitude change paradigm. To this end, Study 4 used the attitudes domain to conceptually replicate the knowledge and anchoring findings of portions of Studies 2A and 2B and also of Study 3. That is, high- and low-knowledge individuals were able to be equally persuaded to a plausible position (as demonstrated with anchoring in Studies 2A and 2B), but when faced with a later more discrepant attacking message, people with higher levels of knowledge better resisted that attack (as demonstrated with anchoring in Study 3). Thus, aspects of the anchoring pattern informed and extended our understanding of knowledge effects on persuasion.

An overarching theme of this work was to demonstrate how standard understanding of mechanisms in both the anchoring and attitudes literature may be employed to make unique predictions in the other domain. This inter-literature marriage of attitudes and anchoring should produce fruitful future studies in both domains. One
way to illustrate the benefits of the current work is to contrast the work with previous treatments of the key constructs in each domain.

Although plausibility has played a central role in numeric anchoring theories since the inception of research on anchoring, plausibility has gone largely undiscussed in the attitudes literature before the current research. Similarly, a curvilinear pattern of persuasion over levels of extremity is a classic attitudinal effect that is wholly distinctive among anchoring theories for its predictions. Knowledge has been studied in both domains, but in the anchoring domain it has largely been discussed as having a main effect on amount of anchoring (with high levels of knowledge weakening anchoring effects), and knowledge has largely been treated similarly in studies of attitude change. However, research on attitude strength generally suggests that attitudes can differ in their consequences even when they look similar in their overall evaluation.

In the anchoring domain, this suggests that anchored judgments might still differ even when anchoring to non-extreme (plausible) anchors is substantial and equal across levels of target-relevant knowledge. At the same time, such effects in the anchoring domain suggest new predictions for how non-extreme (agreeable but still somewhat discrepant) messages could produce equal persuasion across levels of topic-related knowledge, even though more discrepant messages (of the type typically used in persuasion studies) tend to show knowledge differences. Perhaps the most critical advancement of this paper is clearly articulating that understanding the extremity of a persuasive claim (or anchor) is essential to predicting the impact of knowledge on
amount of attitude change (or anchoring), and that this differential impact may be seen as a product of plausibility.

**An Attitudinal Approach**

An initial reading of the anchoring literature may lead one to assume that extreme anchors will almost always lead to an increase in amount of anchoring compared with more plausible anchors (e.g., Mussweiler & Strack, 1999; Northcraft & Neale, 1987). However, initial work by Wegener et al. (2001) provided participants with even more implausibly extreme anchors, as compared to what they considered the more moderate anchors of previous work. The Wegener et al. (2001) research provided the first evidence for the usefulness of using the attitude change literature to make predictions of effects in the anchoring domain. However, the basis for the Wegener et al. (2001) predictions about a downturn in anchoring effectiveness with these extreme anchors suggested a larger pattern that had yet to be formally demonstrated – an inverted-U-shaped, curvilinear pattern of anchoring over levels of extremity. Study 2B of this dissertation provided a replication of initial evidence demonstrating this full pattern of increasing and decreasing persuasion over levels of extremity in the anchoring domain.

The consistency between anchoring effects and the attitude change literatures are not confined to anchoring over levels of extremity. Increased attitude change with credible sources of information (e.g., Hovland & Weiss, 1951; Lorge, 1936) is also paralleled by anchoring work demonstrating that expertise of source anchors increases amount of anchoring (e.g., Jarvis, Wegener, & Petty, 1995b; see also Wegener et al., 2010). In both domains, less knowledge has been associated with an increase in change
though the present research suggested a limitation to the generalizability of those findings. Even personality variables, such as openness to experience, generally increase persuasion in the attitudes literature (John, 1990) and show similar consequences in the anchoring domain (McElroy & Dowd, 2007).

The present research focused on a particular aspect of attitudinal predictions for amount of anchoring, but a huge volume of attitude change work has concerned itself with making predictions beyond more simplistic main effect accounts of persuasion and into the essential role of metacognitive components (see Petty, Briñol, & DeMarree, 2007; Petty & Briñol, 2010). Although knowledge seems particularly relevant to the anchoring domain, a host of other cognitive and metacognitive properties, from perceptions of confidence in one’s estimate to perceptions of relevance of one’s knowledge to the target, should additionally play a role in determining both the amount of anchoring that is observed and the differential consequences of those anchored estimates. Initial work by Blankenship and colleagues (2008) has begun to explore the role of elaboration and its consequences for anchoring, but manipulations beyond cognitive load (e.g., increasing motivation via incentives) and other methods of demonstrating thoughtful elaboration (e.g., thought-listings) await further examination (but see Wegener et al., 2010).

Largely, work on inducing a more careful consideration of an anchor (e.g., increasing accuracy motivation to think carefully about making the best estimates) has been shown to increase elaboration towards an anchor but failed to produce the
reductions in anchoring predicted by early theories (e.g., see Brewer, Chapman, Schwartz, & Bergus, 2007; Chapman & Johnson, 1999; cf. Simmons et al., 2010). However, an attitudinal approach may suggest that such inductions were actually creating stronger anchored positions, due to an increased degree of elaboration about one’s position (cf. Blankenship et al., 2008). Examining the relation between elaboration and extremity, and in particular how plausibility plays a role in more extreme anchoring values under conditions of both low and high-elaboration could prove interesting.

Knowledge and Position Change

The necessity of taking message extremity into account for predicting the impact of knowledge on position change cannot be overstated. Previously, both attitude change and anchoring literatures have largely investigated the impact of knowledge on resistance. However, as demonstrated by both Study 3 and Study 4, high- and low-knowledge individuals not only can have the same initial attitudes or estimates, but they can be persuaded or anchored to the same degree (when messages or anchors are plausible – not extreme). Critically, attending to the discrepancy of a persuasive claim, compared to a participants’ position, is important to understand. If an individual is high in knowledge about a particular domain and then receives a persuasive message in the same direction as their existing knowledge, one should not expect them to necessarily demonstrate greater resistance. These judgments - moving in the direction of persuasive information - diverge somewhat from traditional attitude strength properties of high knowledge leading to greater resistant to change. Even when high levels of knowledge allow change in the direction of plausible (non-extreme) messages, however, the resulting
judgments can still maintain differences in the strength of those perceptions. In these circumstances, it may be that participants’ knowledge is making them more committed to the position they’ve been persuaded toward, rather than more resistant toward the persuasive content. As noted earlier, though, the nature of such effects is crucially dependent on the plausibility/extremity of the information being considered. One future advancement on unpacking the interaction between knowledge and extremity for the attitude change domain could focus on demonstrating an important role of plausibility underlying these extremely discrepant persuasive messages.

Before closing it is important to note that several aspects of this area of research remain unexplored. First, the mechanism underlying how knowledge influences perceptions of plausibility has not been fully developed. Severally equally viable explanations present themselves: (1) knowledge decreases an individual’s ‘range’ of perceived plausibility (or latitude of acceptance), or (2) knowledge makes an individual better able to recognize values as falling outside of their range of plausible values (or in their latitude of rejection), perhaps by shrinking their latitude of noncommittal (in attitude terms). Importantly for non-attitudinal theories of anchoring, if one’s range of values can move or shift when presented with differentially extreme anchoring values, or between individuals with high- or low-levels of knowledge, then expectations of asymptoting of anchoring to extreme levels would also necessarily require adjustment. It is unclear in any of the present anchoring or attitudinal work whether people have a clear perspective of their ranges of plausibility (or latitudes of acceptance/rejection). It may be more likely that these are vague approximations somewhat subject to the whims of the situation and
state of the individual at any given time (see Bengal, 2012, for demonstrations of shifting ranges of plausibility following extreme anchors).

In addition, the current work did not distinguish between possession of relatively high versus low levels of knowledge and mere perceptions of high versus low levels of knowledge. The degree to which participants’ perceptions were correlated with actual amount of knowledge (e.g., number of facts about a topic one can recite) is as of yet unclear. It is likely in the present research there was a combination of both actual and perceived knowledge. Indeed, in the last study of this paper (Study 4), both actual (in terms of number of informative items provided) and perceived (in terms of contrast to another participant and directions) knowledge were manipulated. With such a manipulation, one cannot tell whether actual or perceived knowledge might have primarily produced the observed pattern of outcomes.

Although generally one would expect actual and perceived knowledge to be largely calibrated, this need not always be the case and indeed, the mechanisms underlying how knowledge may lead to resistance may differ depending on the base of this knowledge. For example, some knowledge effects may be more likely due to actual amounts of knowledge (e.g., perception of plausibility). However, perceptions of knowledge may also have in impact, in conjunction with or separate from these actual levels. For example, if a participant feels like they know a lot about a subject, they may be less inclined to second-guess an initial opinion, not by recognizing subsequent attacks as implausible, but due to the confidence that their perception of knowledge imparted.
Presumably the aforementioned role of knowledge on plausibility is a consequence of an actual improvement in participants’ capacity to in some sense recognize implausible values. Mistaken self-reports in which a person exaggerates their belief of their own knowledge in a topic should not produce a similar capacity to discern between plausible and implausible messages. However, these subjective perceptions of knowledge may be related to totally separate mechanisms that could influence perceptions of plausibility, such as confidence. Although this perspective would suggest that the plausibility-mediated findings of the role of knowledge in anchoring and attitude change over levels of extremity are a consequence of actual, objective knowledge rather than perceived knowledge, there is no evidence in the current work that this is necessarily the case. None of the present studies specifically attempted to dissociate the consequences of actual and perceived knowledge. Future work into the consequences and role of knowledge should attend to this particularly underexplored arena.

One limitation of the present research is a lack of a clear, directly-manipulated study of amount of knowledge and subsequently, the role of plausibility, in an attitudinal domain. As noted earlier, some of the current work manipulated amount of knowledge about the person, but then also made apparent to people that they were given relatively little or much information about the person. With such a manipulation, one cannot tell whether actual or perceived knowledge might have primarily produced the observed pattern of outcomes. Additionally, future work should explore the mechanism of plausibility underlying differential resistance between low- and high-knowledge individuals to persuasive messages, mimicking the effects demonstrated in the anchoring
domain, particularly for at least moderately-discrepant content. However, if one ascribes to an attitudinal theory of anchoring, then Study 1 and Study 3 already provide strong, direct evidence for what one may expect with what is essentially a different manipulation of the same theoretical effect. If anchors function like any other persuasive claim, then the results of these claims in an anchoring domain, or an attitudinal one, should produce similar outcomes. Indeed, the purpose of a majority of this paper is to demonstrate just that.

Conclusion

The current research provided a foundation for advancing research into two separate literatures: anchoring and attitude change. Importantly, this work provided four central advancements: (1) it demonstrated the critical role of plausibility as a mediator for knowledge effects on resistance in both domains, (2) it provided evidence for the differential impact of knowledge over multiple levels of extremity in the anchoring domain, and as such stressed the importance of attending to extremity, (3) it demonstrated conditions under which high- and low-knowledge individuals may be persuaded to the same degree, and (4) it showed that even when initial change is equal across levels of knowledge, the differences in knowledge can still create differences in strength-related outcomes such as resistance to subsequent change attempts. When taken together, the research emphasized the utility of cross-literature predictions for advancements in multiple fields.

Much past research in attitudes has been focused on strength-related attitude properties or elaboration-based models, and the anchoring domain has suggested an
essential role for plausibility as a key mechanism for years. By combining the predictions from these fields to focus on the interactive effect between levels of extremity, the impact of knowledge, and the role of plausibility, I hope to provide better predictive validity for the fields of both attitude change and anchoring.

Given the growing body of research suggesting the relevance of an attitudinal approach to anchoring (see Blankenship et al., 2008; Wegener et al., 2010; Wegener et al., 2001), further examinations of attitudinal properties, particularly strength-related properties, such as certainty and confidence, could prove to be illuminating in the anchoring domain. Additionally, a clearer understanding of the mechanisms underlying perceptions of plausibility in both domains could emerge from further research, particularly by examining its impact in relation to mere perceptions of knowledge, without any objective basis.
LIST OF REFERENCES


APPENDIX A

SAMPLE MATERIALS FROM STUDY 1, 2A, 2B, 3
Instructions

On the following pages you will see a number of different judgment items. You will be asked to perform some estimation tasks relating to a variety of topics. The goal of this experiment is to measure your initial responses, without using any outside information.

Please do not look up the answers to any of the questions in this experiment during the course of the session.

For each of the following judgments, you will be given a topic and be asked how the real answer compares to some number (none of the numbers given are actually correct answers to the judgment). Next, you will be asked to what extent you are knowledgeable about the target and to what extent you believe that the initial estimate is a plausible or implausible answer to the judgment. Finally, you will be asked what you think the real answer is.

Even if you don't know, please give your best estimate for each item.
The population of Alexandria, Egypt.

Do you think the real answer to the judgment is higher or lower than 30,000 people?

Higher

Lower

How much knowledge do you have about this judgment?

Absolutely no Knowledge

Exremely High Knowledge

To what extent do you believe that 30,000 people is a plausible answer to the judgment?

Completely Implausible

Completely Plausible

What is the population of Alexandria, Egypt?

Sample Filler Item
The year the University of Mannheim was founded.

Do you think the real answer to the judgment is later or earlier than 1948?

Later

Earlier

How much knowledge do you have about this judgment?

Absolutely no Knowledge

Extremely High Knowledge

To what extent do you believe that 1948 is a plausible answer to the judgment?

Completely Implausible

Completely Plausible

What was the year the University of Mannheim was founded?

Sample Target Item
The average attendance at a Chicago Bears home football game.

Earlier in this session you estimated the average attendance of a Chicago Bears home football game. In previous studies of this type, 10% of respondents provided an estimate of fewer than 25,000 people.

To what extent do you believe that 25,000 people is a plausible answer to the judgment?

- Completely Implausible
- Completely Plausible

Based on this information, what do you think the real average attendance is?

Sample Attack (Study 3)
APPENDIX B

SAMPLE MATERIALS FROM STUDY 4
Evaluation and Reevaluation

Today you will participate in social evaluation of another person(s). We are interested in how people learn information about a person from different sources, as well as how they shift and reevaluate their perspective as they get to know them better. Sometimes people form an opinion that stays consistent, and sometimes they shift that opinion based on new information. We are interested in how this process works. Specifically, we are interested in updating opinions.

Previous participants were recruited and asked to provide information about shared acquaintances (e.g., someone they all knew) or unique acquaintances (e.g., someone that only that participant knew). The names of the participants will not be provided to you to preserve confidentiality. You will sometimes receive information about the same source from multiple perspectives.

You will be evaluating one or several people, based on a series of behaviors. Please click the arrow below to continue on the study.
To what extent is your impression of Alex positive or negative?

- Extremely negative
- 
- 
- 
- 
- 
- 
- 
- 
- 
- Extremely positive

To what extent is your impression of Alex favorable or unfavorable?

- Extremely unfavorable
- 
- 
- 
- 
- 
- 
- 
- 
- 
- Extremely favorable

Alex is...

- A bad person
- 
- 
- 
- 
- 
- 
- 
- 
- 
- A good person

How much do you agree that Alex is likable?

- Strongly disagree
- 
- 
- 
- 
- 
- 
- 
- 
- 
- Strongly agree

Sample Attitude Scale Items (Filler)
New Information: Bob

The following is provided from a different acquaintance of Bob's than you previously heard from.

This acquaintance had generally unfavorable things to say about Bob. When asked about what kind of person Bob was, and what sorts of behaviors they could see him taking, they wrote:

"Bob is the kind of person I could see doing the following things".

Bob would not show up for a prearranged tennis game.

Bob would knock a grocery bag from a woman's arms as he ran down the street.

Bob would butt to the front of a long line at a movie theater.

Bob would decide to ruin a surprise party for his friend.

Bob would find a lost wallet, keep the $76 in cash that was inside, and throw away everything else.

Bob would kick his dog for eating some cheese left near the end of the table.
Figure 1. A three-way interaction of Knowledge X Anchor X Extremity on anchoring estimates, $F(4, 133) = 4.47, p < .003$, for Study 2A. This demonstrates the predicted effect of an attitudinal approach, such both high- and low-knowledge items consistently show a curvilinear pattern over levels of extremity, but anchors are differentially impactful over moderate to extreme levels between low- and high-knowledge items.
Figure 1.

Study 2A: Anchoring Over Multiple Levels of Extremity
Figure 2. A three-way interaction of Knowledge X Anchor X Extremity on anchoring estimates, $F(4, 246) = 2.63, p < .035$, for Study 2B. This again demonstrates the predicted effect of an attitudinal approach, such both high- and low-knowledge items consistently show a curvilinear pattern over levels of extremity, but anchors are differentially impactful over moderate to extreme levels between low- and high-knowledge items. Standard error bars are presented.
Figure 2.

Study 2B: Anchoring Over Multiple Levels of Extremity
Figure 3. A three way Time X Knowledge X Valence interaction on attitudes towards a target (Bob), $F(1, 159) = 6.42, p < .012$, for Study 4. This figure demonstrates equal initial attitudes for low- and high-knowledge participants, attitude change to an equal degree between these items when presented with mildly discrepant, directionally-consistent information, followed by differential resistance between low- and high-knowledge participants when subsequently facing counterattitudinal information. Standard error bars are presented.
Figure 3.

Study 4: Mean attitude ratings towards target (Bob)

Time

Baseline
Mildly discrepant, directionally-consistent
Counterattitudinal

Attitude towards target (Bob)
APPENDIX D

TABLES
### Table 1.

<table>
<thead>
<tr>
<th>Extremity</th>
<th>Items</th>
<th>Low Anchors</th>
<th>High Anchors</th>
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<tr>
<td></td>
<td>(H) Avg. attendance: Chicago Bears football game</td>
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<td>160,000</td>
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<td></td>
<td>(L) Age of Gandhi when he died</td>
<td>32</td>
<td>118</td>
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<td></td>
<td>(H) Age of Richard Nixon when he died</td>
<td></td>
<td></td>
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<td></td>
<td>(L) Year University of Mannheim was founded</td>
<td>1772</td>
<td>1948</td>
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<td></td>
<td>(H) Year Purdue University was founded</td>
<td></td>
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<td></td>
<td>(L) Avg. attendance: basketball game at Arizona State University</td>
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<tr>
<td></td>
<td>(H) Avg. attendance: basketball game at Indiana University</td>
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Table 1. Anchoring items used in Study 1. Yoked items are paired together. Items associated with relative high knowledge are marked with (H), and items associated with relatively low knowledge are marked with (L).
<table>
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<th>Extremity</th>
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Table 2. Anchoring items used in Study 2A. Yoked items are paired together. Items associated with relative high knowledge are marked with (H), and items associated with relatively low knowledge are marked with (L). Anchoring values marked with a * next to them were items additionally used in Study 3.
Table 3. Anchoring items used in Study 2B. Yoked items are paired together. Items associated with relative high knowledge are marked with (H), and items associated with relatively low knowledge are marked with (L).
Bob Attitudes

Initial Belief (Time 1 – Positive)

Bob saw a cat in the grass.*
Bob found a pen.*
Bob helped his friend plant a large vegetable garden.*
Bob donated 200 dollars to a local high school.*
Bob eats lunch at noon.
Bob walks around the city.

Initial Belief (Time 1 – Negative)

Bob saw a cat in the grass.*
Bob found a pen.*
Bob insisted that he had tickets for a seat at a basketball game, knowing the seat was not really his.*
Bob destroyed a bookshelf that was a home-warming gift from his neighbor.*
Bob eats lunch at noon.
Bob walks around the city.

Belief-Consistent or Inconsistent Behaviors (Time 2 or 3 – Positive)

Bob would turn in a work assignment on time.
Bob would buy a neighborhood child a balloon at the fair.
Bob would become a volunteer basketball coach for a children’s home.
Bob would donate his time at a soup kitchen.
Bob would stop to assist a motorist whose car had stalled during a snow storm.
Bob would help a lost child find his way home.

Belief-Consistent or Inconsistent Behaviors (Time 2 or 3 – Negative)

Bob would not show up for a prearranged tennis game.
If Bob found a lost wallet, he would keep the $76 in cash that was inside, and threw away everything else.
Bob would kick his dog for eating some cheese left near the end of the table.
Bob would butt to the front of a long line at a movie theater.
Bob would decide to ruin a surprise party for his friend.
Bob would knock a grocery bag from a woman’s arms as he ran down the street.

Table 4. Bob attitude items used in Study 4. All items appeared for high-knowledge participants at baseline, and items marked with * appeared for low-knowledge participants at baseline. Participants who received positive information at Time 1 would receive the six (6) positive (belief-consistent) pieces of information at Time 2 and the six (6) negative (belief-inconsistent) information at Time 3, and vice versa for participants who initially received negative information.