Research Dialogue

Elaboration and numerical anchoring: Breadth, depth, and the role of (non-)thoughtful processes in anchoring theories

Duane T. Wegener [a,*], Richard E. Petty [b], Kevin L. Blankenship [c], Brian Detweiler-Bedell [d]

[a] Psychological Sciences, Purdue University, 703 Third Street, West Lafayette, IN 47907-2081, USA
[b] Ohio State University, USA
[c] Iowa State University, USA
[d] Lewis and Clark College, USA

Abstract

Noted Judgment and Decision Making (JDM) researchers differ in their opinions of whether and how an attitudes and persuasion (A&P) view of anchoring might add to the existing anchoring literature. Epley and Gilovich (2010) and Russo (2010) supported the breadth of variables that an attitudinal view of brings to bear on anchoring phenomena and the potential operation of different psychological processes across different contexts. They also suggest extensions to other types of anchors (along with Frederick et al. 2010), to alternative paradigms, and to other classes of moderators, such as goals. Authors of all three commentaries wondered if the evidence we presented speaks to traditional issues related to processes underlying anchoring. Frederick et al. (2010) also took a different approach in suggesting that anchoring is always due to non-thoughtful processes despite the fact that thoughtful processes can also influence judgments. This approach diverges from prominent reviews of the anchoring literature and implies that the presence of any simple, associative mechanism makes the overall process that involves that mechanism "non-thoughtful." We discuss how this approach differs from our own, and we discuss the implications of the other observations in each commentary.
© 2009 Society for Consumer Psychology. Published by Elsevier Inc. All rights reserved.

It is a privilege to receive comments on our work by researchers we hold in high esteem. We view many of the comments provided by this distinguished group as completely compatible with our elaboration-based, attitudes and persuasion approach to anchoring. For example, we are happy to see that Epley and Gilovich (2010) viewed an attitudinal approach to anchoring as potentially useful not only for anchors presented in the standard paradigm, but also for a variety of other types of anchors present in other kinds of situations. Frederick, Kahneman, and Mochon (2010) and Russo (2010) made similar comments, though Frederick et al. did not agree that our approach adds to understanding of anchoring in the standard paradigm. In our original article, we focused on the standard paradigm, but we certainly agree that many of the principles we discussed would be equally applicable, and in some cases even more applicable, to other types of anchors and paradigms. We are also happy to see that the commentators agreed with us that

an elaboration-based, attitudinal approach "brings into view sources of variability in anchoring effects that have so far been largely ignored" (Epley & Gilovich, 2010). This was certainly one of our goals in conducting this research, and both Epley and Gilovich (2010) and Russo (2010) drew out some interesting implications of taking this contextual approach to anchoring, including exploration of the potential impact of goals, self-affirmation, and even social facilitation. As we illustrated by discussing past persuasion research on communication discrepancy, we believe that many facets of the attitudes literature (e.g., motivation, goals, metacognition, and various forms of social influence) are relevant to anchoring outcomes. We welcome research efforts that expand the number of such factors brought to bear on anchoring and the consequences of anchored judgments.

As expected in any dialogue, there are also a number of points of contention. Although many of these appear in the commentary of Frederick et al. (2010), conceptually related points also appear in the other commentaries. We organize our discussion under four general issues: (1) whether anchoring is typically conceptualized as the result of non-thoughtful

* Corresponding author.
E-mail address: wegener@psych.purdue.edu (D.T. Wegener).

processes, (2) what defines whether a process is thoughtful, (3) how to account for the effects we discussed in our target article, and (4) the differing emphases of common attitudes and JDM models.

Is anchoring typically conceptualized as non-thoughtful?

Frederick et al. (2010) disagreed with our observation that prominent reviews of the anchoring literature attribute anchoring in the standard paradigm to relatively elaborative processes. They cited Chapman and Johnson (1999) and Mussweiler and Strack (1999) as suggesting that anchoring should be attributed to automatic associative processes. But, to us at least, prominent authors and reviewers of the anchoring literature seem clear on the point that "activation" or "selective accessibility" of anchor-consistent information in memory can result from confirmatory attempts at hypothesis testing, not simply from associations in memory between the anchor value and target-related knowledge that activate this knowledge automatically. For example, Mussweiler and Strack (2001b) noted that:

> the actual comparison appears to involve a relatively elaborate process of testing the hypothesis that the target quantity may be similar to the comparison standard by selectively generating target knowledge which supports this assumption. One implication of this differentiation is that anchoring processes may indeed be less heuristic than was originally assumed (Tversky & Kahneman, 1974). In fact, the processes that underlie standard anchoring effects appear to be fairly elaborate and systematic in nature. (p. 251)

Epley (2004) and others (see Bodenhausen, Gabriel, & Lineberger, 2000) have characterized Mussweiler and Strack (1999) similarly. Likewise, Chapman and Johnson (1994) suggested that "a mechanism underlying anchoring may be a confirmatory search for target features that are similar to the anchor" (p. 240). Chapman and Johnson (1999) also suggested that the size of anchoring effects can be influenced by prompts that lead individuals to consider different types of information, not just by direct activation of information by the anchor itself. Thus, in our reading, there is considerable reason to believe that anchoring theorists consider "activation" or "accessibility" of anchor-consistent information to involve more than direct, passive activation of material related to the anchor value.

We recognize that Chapman and Johnson (1999) also noted that activation of anchor-consistent knowledge should be considered relatively automatic, rather than intentional, because similar attention to anchor-consistent target features occurs when the anchor is clearly uninformative as to the target value. But, of course, people need not intentionally use the anchor as a basis for their judgment for the anchor to influence "thoughtful" consideration of the target's qualities. As we discuss in greater detail later, even subliminal anchors can influence which hypotheses are tested about the target, even if people do not realize that the hypothesis test is influenced by the anchor (e.g., Mussweiler & Englich, 2005). Thus, it is not surprising that Mussweiler and Strack (2001b) and others (see Blankenship, Wegener, Petty, Detweiler-Bedell, & Macy, 2008; Bodenhau-

sen et al., 2000; Epley, 2004) clearly attributed the judgmental effects of these anchors to relatively elaborative hypothesis testing even when research studies use anchors that are clearly uninformative (e.g., Mussweiler and Strack 1999, 2001a,b; Strack & Mussweiler, 1997).

What defines whether a process is thoughtful?

On some level, the different anchoring theorists, including Frederick et al., appear to share similar views of the processes at work in anchoring insofar as they describe anchoring as involving activation or accessibility of anchor-consistent information. Nevertheless, different theorists define the processes differently in terms of how thoughtful or non-thoughtful the processes are. It seems clear that Frederick et al. regarded activation per se as the source of anchoring, but does this mean that any process involving "activation of knowledge in memory" should be characterized as non-thoughtful? This is not how we label processes as relatively "thoughtful" or "non-thoughtful." The fact that the simple activation of knowledge in memory occurs at some point in the judgment process does not make the entire process non-thoughtful. If activation results from effortful thinking or if the activated content influences the outcomes of effortful thinking, then we regard the effects of that activation on judgment to be relatively thoughtful—at least more so than when the activation occurs automatically or when the activated mental content has no further impact on any additional thoughts that influence judgment. In other words, it is what people do in the process of activating the material or what further impact the activated material has (e.g., does it bias the generation or retrieval of other thoughts) that determines whether the anchor contributes to a judgmental process that is relatively effortful and elaborative rather than simple and non-elaborative.

For example, in the domain of impression formation, stereotypes can be automatically activated upon encountering a member of a stereotyped group. But to us, this simple activation of the knowledge structure of the stereotype does not determine whether the stereotype's influence on judgment is relatively thoughtful or non-thoughtful. Rather, it is whether the activated stereotype influences effortful thinking about the target. If the activated stereotype influences relatively effortful and comprehensive assessments of the target (e.g., activation of the stereotype makes it more likely that ambiguous information about the target will be interpreted in a manner consistent with the stereotype), then the activated stereotype has a relatively thoughtful, elaborative influence on judgment. If the stereotype affects judgments more directly (using the stereotype as a heuristic, Bodenhausen, 1990), then the activated stereotype has less thoughtful effects on judgments. Wegener, Clark, and Petty (2006) showed exactly these differences in the use of activated stereotypes. Effects of group membership on judgments were mediated by stereotype-consistent thoughts about the qualities of the target when cognitive load was low but were not mediated by the same measurement of thoughts when cognitive load was high, despite the same overall effect of stereotypes on judgments across high and low load conditions.

In the anchoring domain, we treat the issue of "thoughtfulness" in the same way. It is not whether activation of anchor-consistent knowledge occurs that determines whether a psychological process producing a judgment is thoughtful or non-thoughtful, but how the knowledge comes to be activated and whether people use this knowledge as part of more versus less elaborative processes that influence judgments. In relatively thoughtful cases, this activated knowledge influences target estimates by affecting relatively comprehensive assessments of target qualities, which in turn influences the target estimate. In persuasion and impression formation domains, this type of mediated process has been indexed through assessments of the differential favorability of thoughts about the target that are instigated under high- versus low-thinking conditions by some variable such as emotions (Petty, Schumann, Richman, & Strathman, 1993), source credibility (Chaiken & Maheswaran, 1994), or stereotypes (Wegener et al., 2006). That is, in high-thinking conditions, the variable affects both the nature (valence) of the thoughts that come to mind as well as the judgments. Furthermore these thoughts serve as the mediator of the effects of the independent variable on judgments (e.g., increased happiness increases the positivity of thoughts generated and this in turn enhances the positivity of judgments; Petty et al., 1993). In low-thinking conditions, however, the variable has a similar impact on judgments without affecting the valence of thoughts. That is, in these studies (Chaiken & Maheswaran, 1994; Petty et al., 1993; Wegener et al., 2006), what is observed is a pattern of moderated mediation (Muller, Judd, & Yzerbyt, 2005; Wegener & Fabrigar, 2000)—the independent variable produces the same effect on a judgment but does so with different mediational patterns under high versus low-thinking conditions.[1]

Russo (2010) also asked for greater specification of what "thoughtful" means (i.e., thought about the estimation task or conscious consideration of the validity and accuracy of the anchor itself), and he wondered how we would account for the effects of subliminal anchors on judgments, especially in "thoughtful" conditions (cf., Mussweiler & Englich, 2005). "Thoughtfulness" (elaboration) refers to effortful thinking about the target of judgment and assessing the target's qualities using as much available target-relevant information as possible. Sometimes this assessment might include explicit consideration of the validity of the anchor, but this need not be the case. If target-relevant information is activated by a subliminal anchor (or if an activated anchor influences which hypothesis comes to

mind to be tested when formulating an answer to the target question, Mussweiler & Strack, 1999, 2001b), then the subliminally activated anchor could certainly influence thoughts about the target. Just as a "prime" can bias thoughts about a target, whether activated subliminally or supraliminally (Bargh & Pietromonaco, 1982; Srull & Wyer, 1979), so too can an anchor.

We understand that evidence of this type in the anchoring domain is in its infancy. However, the evidence thus far is consistent and closely mirrors similar findings in the attitudes and persuasion literature. In our target paper, we briefly presented research on source credibility effects under relatively high- and low-thought anchoring conditions (Wegener, Blankenship, Petty, & Detweiler-Bedell, 2009). Anchoring effects were enhanced when the anchor came from a credible rather than non-credible source, and this source credibility × anchor interaction was mediated by thoughts about the target in high-thought (low cognitive load) but not low-thought (high cognitive load) conditions. When we examine the effects of anchors within each combination of cognitive load and source credibility, the high-thought conditions show significant effects of anchors on thoughts and effects of thoughts on target estimates (Sobel tests of mediation, $Zs = 4.22$, $p < .001$ and 3.27, $p < .001$, in high- and low-credibility conditions, respectively). Neither of these mediation tests were significant in low-thought (high cognitive load) conditions. This parallels the moderated mediation pattern found for persuasion variables such as emotion and credibility (see Petty & Wegener, 1998, 1999).

Epley and Gilovich (2010) pointed to "moderators" and "consequences" as potential benefits of an attitudes and persuasion approach. We agree but would add "mediation" in which many of the "moderation" hypotheses also imply differences in the mediational path from anchors to judgments (i.e., different mediation for each of the "multiple roles," Petty & Wegener, 1999).

Accounting for effects of anchors on judgments

In addition to arguing that anchoring is always non-thoughtful, Frederick et al. (2010) suggested that in high-thought conditions, effortful thinking about the target is independent and "added" to the relatively automatic effects of anchors on judgments. That is, they do not regard the thoughtful processes we describe as contributing to the anchoring effect itself, but rather as something that might follow the anchored judgment. In essence, they argue that relatively quick, automatic anchoring might influence initial perceptions of the target, and in high-thought conditions people continue to think about these already "anchored" perceptions, creating thoughts that reflect the anchor. Such additional thoughts that "justify" the anchor then render the anchored judgment more consequential (more persistent and resistant to change). This would imply mediation with anchors influencing judgments and judgments influencing thoughts. However, this reverse order of judgments and thoughts does not result in significant mediation in the high-thought conditions of Wegener et al. (2009; Sobel $Zs = 1.78$ and 1.64 in high- and low-credibility conditions, respectively). In

---

[1] The elaborative nature of psychological processes has also been shown by examining the extent to which target-relevant information (presented externally or available in memory) is incorporated into judgments (e.g., Petty & Cacioppo, 1986). This is the type of evidence presented in Experiment 1 of Blankenship et al. (2008). If anchor-consistent knowledge is activated by the active process of hypothesis testing, as suggested by Mussweiler and Strack (1999, 2001b), then greater availability of anchor-consistent knowledge should enhance anchoring effects on judgment, and greater availability of anchor-inconsistent knowledge should decrease anchoring effects on judgment when cognitive ability to elaborate is high but not when cognitive ability to elaborate is low. This knowledge need not be passively activated by the anchor, as asserted by Frederick et al. (2010).

each case, when controlling for the impact of anchors on thoughts, there is no additional impact of judgments on the thoughts ($ps > .2$). However, as presented earlier, thoughts do mediate effects of anchors on judgments in high-thought conditions. Therefore, the available data are not consistent with the idea that the impact of anchors on thoughts represents post-anchoring thinking about the target.

Frederick et al. (2010) suggested that their "simpler" view is a more parsimonious approach to anchoring. However, in order to account for the full pattern of effects, which include differential consequences of the judgments, they agree that an amount-of-thought (elaboration) dimension should be used. But this is no more parsimonious than saying that differences in elaboration are part of the process producing anchoring in the first place and that these differences in level of elaboration produce the predicted differences in persistence of the anchored judgments and in resistance to social influence. If anything, to us, it is more parsimonious to say that anchors can influence judgments through relatively thoughtful or non-thoughtful means, just as many other variables (such as emotion, source characteristics, and stereotypes) have been shown to do so. The evidence of thought mediation across these different variables would seem difficult to account for using only non-thoughtful processes to account for their judgmental impact and separate post-judgment thinking about the target as a way to produce consequences of those judgments.

Emphases of attitude theories and JDM theories

We can understand why Frederick et al. (2010) might want to restrict anchoring to simple association-based processes and to consider more effortful thinking as separate and "added" to "anchoring." This would be a traditional way to use the systems approach in which intuitive, System 1 processes provide output that can be at odds with and sometimes overridden by output from more thoughtful System 2 processes. This parallels situations in which previous dual- or multi-process persuasion theories predicted and found that peripheral cues or heuristics (e.g., associated with source characteristics) influence attitudes when processing is relatively low whereas the impact of clearly strong or weak message arguments can overwhelm the impact of such cues when processing is relatively high (e.g., Chaiken, 1980; Petty, Cacioppo, & Goldman, 1981).

But this is far from the entire picture. Persuasion theories have stressed that cues or heuristics can influence the nature and content of more effortful thinking when target-relevant information is more ambiguous (e.g., Chaiken & Maheswaran, 1994; Petty et al., 1993; Wegener et al., 2006). This "biased processing" may be consistent with a systems approach in that output from System 1 processes is thought to be capable of influencing System 2 processes (e.g., see Gilovich & Griffin, 1998). However, relatively little research from the systems view has directly examined this implication, and no systems-based work in the anchoring domain has directly compared relatively effortful versus non-effortful processes leading to the same anchoring effect on judgments or to differences in the consequences of the anchored judgments. In the abstract, one

might claim that any effect of amount of thinking is consistent with the systems approach, just as it is with the persuasion theories developed previously. However, this is different than the systems approach specifically making this prediction a priori. It is perhaps telling that no previous publications were cited in the commentaries as JDM theories predicting differential consequences of equal initial judgments. If previous systems theories have made these predictions, they have not formed a prominent part of the Zeitgeist of systems theories. But the multiple roles and differential consequences of similar judgments have played central roles in theories of attitudes and persuasion (Petty & Wegener, 1998) such as the Elaboration Likelihood Model (Petty & Cacioppo, 1986; Petty & Wegener, 1999) and the Heuristic-Systematic Model (Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999).

Whether relatively thoughtful or non-thoughtful processes involve qualitatively different processes is another question of interest. Each of the commentators seemed to focus on this qualitative dimension when they questioned whether our discussion served to resolve debates concerning which processes are responsible for anchoring. Elaboration Likelihood theorizing (Petty, 1997; Petty & Wegener, 1999) suggests that psychological processes vary along a number of dimensions including both qualitative and quantitative dimensions. Thus, the extent of elaboration (thoughtfulness) is an important dimension that differentiates psychological processes even if they are qualitatively similar (e.g., relatively thoughtful and non-thoughtful versions of selective accessibility). The commentators are correct that our demonstrated effects of cognitive load (e.g., Blankenship et al., 2008) did not directly inform readers about which thoughtful or non-thoughtful processes were at work, but this was not the primary purpose of that research. Instead, we set out to demonstrate that level of elaboration has important and previously unstudied consequences for the extent to which the anchored assessments last over time or resist future attempts at change.

Conclusion

We hope that our elaboration-based research and subsequent discussions are successful in "contextualizing" the question of which processes are at work in creating anchoring effects on judgments. We also hope that the dimension of amount of elaboration becomes a component of the larger discussion among anchoring theorists, even if that discussion focuses on the possible qualitative differences across hypothesized anchoring processes. We look forward to future anchoring research both within and beyond the standard paradigm, and we hope that our work helps to further the goal of greater integration of A&P and JDM theories. We believe that each literature will benefit from this potential integration.

References

Bargh, J. A., & Pietromonaco, P. (1982). Automatic information processing and social perception: The influence of trait information presented outside of

conscious awareness on impression formation. *Journal of Personality and Social Psychology*, *43*, 437−449.

Blankenship, K. L., Wegener, D. T., Petty, R. E., Detweiler-Bedell, B., & Macy, C. L. (2008). Elaboration and consequences of anchored estimates: An attitudinal perspective on numerical anchoring. *Journal of Experimental Social Psychology*, *44*, 1465−1476.

Bodenhausen, G. V. (1990). Stereotypes as judgmental heuristics: Evidence of circadian variations in discrimination. *Psychological Science*, *1*, 319−322.

Bodenhausen, G. V., Gabriel, S., & Lineberger, M. (2000). Sadness and susceptibility to judgmental bias: The case of anchoring. *Psychological Science*, *11*, 320−323.

Chaiken, S. (1980). Heuristic versus systematic information processing in the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, *39*, 752−766.

Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic processing within and beyond the persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 212−252). New York: Guilford Press.

Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: Effects of source credibility, argument ambiguity, and task importance on attitude judgment. *Journal of Personality and Social Psychology*, *66*, 460−473.

Chapman, G. B., & Johnson, E. J. (1994). The limits of anchoring. *Journal of Behavioral Decision Making*, *7*, 223−242.

Chapman, G. B., & Johnson, E. J. (1999). Anchoring, activation, and the construction of values. *Organizational Behavior and Human Decision Processes*, *79*, 1−39.

Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 73−96). New York: Guildford Press.

Epley, N. (2004). A tale of tuned decks? Anchoring as accessibility and anchoring as adjustment. In D. J. Koehler & N. Harvey (Eds.), *The Blackwell handbook of judgment and decision making* (pp. 240−256). Oxford, U.K.: Blackwell Publishers.

Epley, N., & Gilovich, T. (2010). Anchoring unbound. *Journal of Consumer Psychology*, *20*, 20−24.

Frederick, S., Kahneman, D., & Mochon, D. (2010). Elaborating a simpler theory of anchoring. *Journal of Consumer Psychology*, *20*, 17−19.

Gilovich, T., & Griffin, D. (1998). Judgment and decision making. In D. Gilbert & S. Fiske (Eds.), *The handbook of social psychology* (pp. 447−477)., (5th ed.) New York: McGraw Hill.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, *89*, 852−863.

Mussweiler, T., & Englich, B. (2005). Subliminal anchoring: Judgmental consequences and underlying mechanisms. *Organizational Behavior and Human Decision Processes*, *98*, 133−143.

Mussweiler, T., & Strack, F. (1999). Hypothesis-consistent testing and semantic priming in the anchoring paradigm: A selective accessibility model. *Journal of Experimental Social Psychology*, *35*, 136−164.

Mussweiler, T., & Strack, F. (2001a). Considering the impossible: Explaining the effects of implausible anchors. *Social Cognition*, *19*, 145−163.

Mussweiler, T., & Strack, F. (2001b). The semantics of anchoring. *Organizational Behavior and Human Decision Processes*, *86*, 234−255.

Petty, R. E. (1997). The evolution of theory and research in social psychology: From single to multiple effect and process models of persuasion. In C. McGarty & S. A. Haslam (Eds.), *The message of social psychology: Perspectives on mind in society* (pp. 268−290). Oxford: Blackwell.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change.* New York: Springer-Verlag.

Petty, R. E., Cacioppo, J. T., & Goldman, R. (1981). Personal involvement as a determinant of argument based persuasion. *Journal of Personality and Social Psychology*, *41*, 847−855.

Petty, R. E., Schumann, D. W., Richman, S. A., & Strathman, A. J. (1993). Positive mood and persuasion: Different roles for affect under high- and low-elaboration conditions. *Journal of Personality and Social Psychology*, *64*, 5−20.

Petty, R. E., & Wegener, D. T. (1998). Attitude change: Multiple roles for persuasion variables. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., pp. 323–390). New York: McGraw-Hill.

Petty, R. E., & Wegener, D. T. (1999). The elaboration likelihood model: Current status and controversies. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology.* New York: Guilford Press.

Russo, J. E. (2010). Understanding the effects of a numerical anchor. *Journal of Consumer Psychology*, *20*, 25−27.

Srull, T. K., & Wyer, R. S., Jr. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology*, *37*, 1660−1672.

Strack, F., & Mussweiler, T. (1997). Explaining the enigmatic anchoring effect: Mechanisms of selective accessibility. *Journal of Personality and Social Psychology*, *73*, 437−446.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*, 1124−1130.

Wegener, D. T., Blankenship, K. L., Petty, R. E., & Detweiler-Bedell, B. (2009). *Source credibility and numerical anchoring. Raw data.* West Lafayette, IN: Purdue University.

Wegener, D. T., Clark, J. K., & Petty, R. E. (2006). Not all stereotyping is created equal: Differential consequences of thoughtful versus non-thoughtful stereotyping. *Journal of Personality and Social Psychology*, *90*, 42−59.

Wegener, D. T., & Fabrigar, L. R. (2000). Analysis and design for nonexperimental data: Addressing causal and noncausal hypotheses. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 412–450). New York: Cambridge University Press.