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Anchors Aweigh: A Demonstration of Cross Modality Anchoring

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Abstract

Research has shown that judgments tend to assimilate to irrelevant "anchor" numbers. We extend anchoring effects to show that they can even operate across modalities. In the first two experiments, participants drawing long "anchor" lines made higher numerical estimates of target quantities than did those drawing shorter lines, even when the target estimates were not in the dimension of length. A third experiment showed that anchoring effects occur in the reverse direction as well: Individuals anchored on high numbers drew longer lines than those anchored on low numbers. A final study showed that an anchor's length relative to context, and not its absolute length, is the key to predicting the anchor's impact on judgments. Potential mechanisms underlying the current effects are discussed, and we conclude that the boundary conditions of anchoring effects may be much looser than previously thought, with anchors operating across modalities and dimensions to bias judgment.

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How long is the Mississippi River? An individual could use a number of cues to help answer such a question, and those cues vary in usefulness. Relevant information, such as the fact that the Mississippi is the longest river in North America or that it runs from Minnesota to the Gulf of Mexico, provides a useful cue for estimating length. However, irrelevant information, such as the fact that Samuel Clemens (a.k.a. Mark Twain) was born in 1835, is not useful in judging the length of the Mississippi. An individual making a judgment may be exposed to a mix of such relevant and irrelevant cues. Someone attempting to estimate the Mississippi's length, for example, might come across a variety of information, such as information about geography (relevant) or information about the most famous author to write about the Mississippi, including the year he was born (irrelevant). Ideally, the individual would not be biased by such irrelevant information, and intuitively, the individual might not expect such bias to arise. Unfortunately, mounting evidence suggests that such irrelevant and arbitrary cues can indeed bias judgments.

In particular, a phenomenon described in the literature as *anchoring* (Chapman & Johnson, 1994; Strack & Mussweiler, 1997; Tversky & Kahneman, 1974) illustrates how estimations can be biased by the consideration of irrelevant information. In a classic study, Tversky and Kahneman (1974) asked participants whether the number of African countries in the United Nations exceeded the results of a spin on a number-generating "wheel of fortune." Subsequent estimations of the actual number of African countries in the U.N. were biased by the results of the spin; high spins led to higher estimates, and low spins led to lower estimates. This pattern of effects has been documented in numerous contexts, and anchoring is agreed to be a quite robust phenomenon (see Chapman & Johnson, 2002, for review).

There is less consensus as to what the boundary conditions for anchoring might be. That is, at what point will a piece of information no longer influence an individual's judgments? Some researchers argue that anchors will have greater influence on judgments to the extent that the anchors might be informative about the to-be-estimated quantity (e.g. Moore & Brown, 2004). This view is supported by evidence that anchoring effects are greatly reduced, and often disappear, if the anchor and target do not refer to the same dimension (Chapman & Johnson, 1994). Similarly, Strack and Mussweiler (1997) found that while an anchor expressed in terms of height influenced participants' estimates of the height of the Brandenburg Gate, it had a markedly reduced influence on estimates of the gate's width.

In contrast, other research suggests that anchoring may be more prevalent. There is ample evidence that implausible (hence, clearly uninformative) anchors can still bias estimates (Chapman & Johnson, 1994); for example, participants estimating the average temperature of San Francisco were influenced by an anchor of 558 degrees (Quattrone et al., 1981). Furthermore, researchers have demonstrated "basic anchoring": merely exposing an individual to a number can bias estimates in the number's direction, even if the number is never explicitly linked to the judgment being made (e.g. Wilson et al., 1996). While such basic anchoring effects are fragile, they have been effectively replicated several times (Brewer & Chapman, 2002), further casting doubt on the requirement that anchors must be informative. Further evidence attests to anchoring's pervasiveness: Incentives for accuracy do not seem to reduce anchoring effects (Tversky

& Kahneman, 1974; Wilson et al., 1996) nor do explicit warnings about the possibility of being biased by anchors (Quattrone et al., 1981; Wilson et al., 1996).

Anchors can come in many, not necessarily numerical, forms (see, e.g., Kruger, 1999). Indeed, even physical quantities can serve as anchors for physical judgments: Participants attempting to draw a previously seen line produced a shorter line when they extended a short “anchor” line than when they reduced a long line, even when no numbers were attached to the line lengths (LeBoeuf & Shafir, 2004b). This evidence, in combination with reports of basic anchoring effects, suggests that anchoring may be much more widespread than previously believed.

Given that merely being exposed to an anchor can bias unrelated judgments, and that physical quantities such as lines can serve as anchors, we hypothesize that physical anchors might function cross-modally to bias numerical judgments. In particular, we propose that large or small anchors may prime the notion of their general magnitudes (e.g., “largeness” or “smallness”) and that the activated sense of magnitude may be influential when judges next form an estimate, leading to an anchoring effect. That is, merely activating a sense of size, unattached even to a rating scale, can bias subsequent judgments to be consistent with that activated size, regardless of the modality of judgment. Hence, cross-modal effects of anchors may arise, with a large anchor in any one modality leading to a large judgment in any other (or the same) modality.

Other previously documented processes leading to anchoring would not predict such cross modal effects on judgments. Numerical priming (Wilson et al., 1996) requires the presence of a numerical anchor. The priming of the anchor number makes similar numbers (irrespective of their “largeness” or “smallness”) more accessible and results in anchoring, whereas we predict that cross-modal anchoring would arise even without numerical anchors. Likewise, insufficient adjustment (Epley & Gilovich, 2001; Tversky & Kahneman, 1974) requires that one generates an estimate by starting at, and adjusting from, an anchor that is a potential estimate of the target. However, this explanation requires the anchor and target to be on the same rating dimension (otherwise adjusting would not, strictly speaking, be possible). Selective knowledge accessibility (Chapman & Johnson, 1994, 1997; Strack & Mussweiler, 1997) is a tenable explanation only to the extent that the anchor can be credibly argued to selectively activate knowledge about the target. That is, considering a low or high magnitude anchor could selectively activate ideas related to the target being small or large; this information's increased likelihood of being incorporated into the final judgment can lead to anchoring. Such activation seems unlikely if the anchor is evaluated in one modality and the target in another because the former is *target-specifc*. If, however, anchors can exert effects by merely activating the notion of "largeness" or "smallness" (in the absence of the target altogether), one would expect judgments to be biased by anchors, even cross-modally when the anchor cannot activate knowledge about the target. To explore the hypothesized existence of cross-modal anchoring effects, Experiment 1 investigated whether participants give larger numerical estimates of a target quantity after exposure to an unnumbered long line than after exposure to a short line.

Experiment 1

Method

Participants. Seventy-one Stanford University undergraduates participated to fulfill part of a course requirement. The experiment consisted of two questionnaires in a packet of approximately 20 unrelated one-page questionnaires. Packets were randomly ordered and then distributed in class, and participants were given a week to complete the entire packet.

Design, stimuli, and procedure. Participants were presented with a set of three horizontal lines and were asked to replicate the lines as best as they could without using a ruler. The three lines were a straight line, a wavy line, and an inverted-u. Participants in the short-anchor condition viewed 1-inch long lines, while participants in the long-anchor condition viewed 3.5-inch lines. The stimuli are reproduced in Figure 1.

On the next page, participants were presented with an ostensibly unrelated judgment task in which they were asked to estimate various quantities. The target quantity, the length of the Mississippi River, was always presented first; several decoy questions followed to prevent participants from guessing the hypothesis.

Results and Discussion

Six participants who gave estimates falling more than 3.5 standard deviations from the mean were excluded as outliers. Participants who drew long lines gave an average estimate of 1223.9 miles whereas participants who drew short lines gave an average estimate of 719.9 miles. This difference was statistically reliable, $t(63) = 2.61$, $p < .05$.

Participants who had been anchored by copying long lines reliably estimated the river to be longer than those anchored with short lines. In other words, not only can anchoring occur when no explicit comparison is made between an anchor and a target, it can even do so across modalities. This suggests that modality can not be counted among the boundary conditions of the anchoring phenomenon, and that anchoring effects may be more prevalent than previously thought.

Although Experiment 1 demonstrated cross-modality anchoring effects, it did so within a single dimension: length. Participants were anchored on lines of varying lengths and then made estimates of length. This finding does not address whether anchoring effects persist when anchors and targets are not in compatible dimensions (e.g. Strack & Mussweiler, 1997). After all, Chapman and Johnson (1994) found that anchors expressed in terms of dollar amounts did not influence life-expectancy estimates. Similarly, Kahneman and Knetsch (1993) found that dollar anchors did not influence subsequent judgments reported in percentages.

Given such literature on anchor-target compatibility, it is plausible that cross-modality anchoring effects may not extend across physical dimensions. Experiment 2 investigated this possibility by presenting physical anchors that varied in length and then asking for numerical estimates in a different dimension, in this case, temperature. If cross-modality anchoring operates across dimensions, with anchors priming general notions of largeness and smallness (and not just specific ideas about length), temperature estimates should increase as participants are exposed to longer lines.

Experiment 2

Method

Participants. Ninety-eight individuals recruited from arbitrarily chosen intersections in San Francisco participated in exchange for a candy bar.

Design, stimuli, and procedure. The anchoring procedure and stimuli were identical to Experiment 1. However, instead of estimating the length of the Mississippi

River, participants were asked to estimate the average temperature in Honolulu in July in degrees Fahrenheit. As in Experiment 1, participants were also asked several decoy estimation questions to disguise the experiment's true aim.

Results and Discussion

Two participants were excluded as outliers, as their estimates fell more than 3.5 standard deviations from the mean. Participants who drew long lines gave an average estimate of 87.5 degrees. Participants who drew short lines gave a reliably lower average estimate of 84.0 degrees, $t(94) = 2.05$, $p < .05$.

Participants who had initially drawn long lines reliably gave warmer temperature estimates than those who had drawn short lines, indicating that anchoring occurs both cross-modally and across dimensions. This is somewhat surprising in light of previous studies that found reduced anchoring effects when targets and anchors were from incompatible domains or dimensions (Chapman & Johnson, 1994; Kahneman & Knetsch, 1993; Strack & Mussweiler, 1997). It is certainly possible that the anchor had less of a biasing effect for temperature (average difference of 3.5 degrees, Cohen's $d = .42$) in Experiment 2 than it did for length in Experiment 1 (average difference of 504 miles, Cohen's $d = .66$), but because the dimensions are so disparate it is difficult to make such comparisons.

Regardless, these data suggest that anchoring is not necessarily bounded by dimension or modality, and that anchors may prime general ideas of largeness or smallness (and not just ideas restricted to a specific dimension, such as length). However, these demonstrations of cross-modality anchoring have all been in one direction – from physical quantity to numerical estimates. A much stronger claim against modality as a boundary condition for anchoring could be made if effects were observed in the other direction as well – that is, if people's physical estimates of physical quantities could be biased by exposure to numerical anchors. Experiment 3 examines this by anchoring participants on numbers and then asking them to draw lines the length of a standard toothpick. If cross-modality anchoring operates bidirectionally, one would expect that participants would draw longer lines after having been exposed to larger numbers.

Additionally, Experiment 3 investigates whether the findings from the first two studies could be due to response-scale distortion; that is, due to a distortion of participants' internal representations of response-scale units. Some studies have suggested that an anchor may change how people perceive the response scale itself (e.g. Brewer, Chapman, Schwartz, & Bergus, 2004; Parducci, 1995). Participants in Experiment 1 may have had a stable representation of the river's length but may have had flexible, anchor-affected, descriptors of that length. Having participants draw lines helps dissociate the effect of response-scale distortion from other possibilities. Line drawing seems to be a more direct way of eliciting responses than is asking participants to provide a numeric descriptor, as line drawing does not require one to map one's mental representation onto a separate response scale. Thus, if participants are still influenced by anchors when drawing, then the anchors are unlikely to merely be distorting participants' response-scale units.

Experiment 3

Method

Participants. Eighty-six Stanford University undergraduates participated to fulfill part of a course requirement. The experiment was a two-page survey included in a packet of approximately 20 unrelated one-page questionnaires. The contents of the packets were randomly ordered and then distributed in class, and participants were given a week to complete the entire packet.

Design, stimuli, and procedure. The first (anchoring) page presented participants with a series of trivia questions. While most of the questions were decoys that were identical between conditions, the final question (about the length of the Mississippi River) served as the anchor. Participants in the short-anchor condition were asked if the Mississippi River was longer than 15 miles, while those in the long-anchor condition were asked if the Mississippi River was longer than 4800 miles. We adopted the "longer than" phrasing for the sake of simplicity and because past research has shown that the direction of a comparison (i.e., greater than, less than, or equal to) does not affect the magnitude of anchoring (Mussweiler & Strack, 1999).

On the next page, in an ostensibly unrelated task, participants were asked first to draw a line the length of a standard toothpick and then to draw several other shapes (included to make the hypothesis less obvious).

Results and Discussion

Six participants were excluded for incorrectly answering the trivia question regarding the length of the Mississippi River. A researcher blind to condition measured the "toothpicks." Participants who had seen the large anchor drew toothpicks that averaged 2.19 inches. Participants who had seen the small anchor drew toothpicks that averaged 2.08 inches. This difference was reliable, $t(78) = 1.7$, $p < .05$ one-tailed, Cohen's $d = .39$.

Participants anchored on larger numbers drew longer toothpicks than participants anchored on smaller numbers. Cross-modality anchoring can thus work bidirectionally: Physical anchors can influence numerical estimates, and numerical anchors can influence physical estimates. This finding suggests that all manner of anchors (physical or numerical) can prime ideas of largeness or smallness and can, in so doing, influence unrelated estimates. Additionally, these results suggest that anchors do more than influence people's response-scale units. That is, it seems highly unlikely that an individual would imagine a toothpick of one length, but would simultaneously produce a line of a different length in the drawing task.

Experiment 4

At this point, the data suggest that cross-modality anchoring has the potential to be fairly prevalent. The first three experiments suggest that anchors from any dimension or modality could influence estimates of targets in any other dimension or modality. Even so, such effects must have boundaries.

One such boundary might be found in how people conceive of "large" and "small." Size is a relative concept, which varies based on context (Birnbaum, 1999; Cruse, 1986; Denes-Raj & Epstein 1994). A pencil is long in comparison with a toothpick, but short when compared to the Golden Gate Bridge. In these studies, a 3.5-inch line is long relative to the width of a page, and a 1-inch line is short relative to the width of a page. The number 15 is small and the number 4800 is large in comparison to the number of miles in the Mississippi.[1] However, if the context were altered, one might be able to make lines of the same absolute length have different relative meanings (and, conversely, to make lines of different absolute lengths have the same relative meaning). This in turn could influence the effectiveness of these lines as anchors.

Experiment 4 investigates whether manipulating contextual cues can influence the ability of physical anchors to operate cross-modally. Consider two irregular lines, one that is approximately 4.5 inches long and another that is approximately 1.5 inches long. Since one line is larger relative to the size of a standard page than is the other, if each line is presented in isolation on a sheet of paper, the lines will evoke notions of largeness and smallness, respectively. Under such conditions, the lines should effectively anchor judgments. However, next imagine that the lines appear inside of a large or small (respectively) map of the United States. Given that the impression of size is indeed heavily influenced by context, the lines will appear to be approximately the same *relative* size (that is, relative to the appropriately-scaled map). Under *these* conditions, one line should not evoke a greater sense of "largeness" than should the other, and anchoring effects should be greatly reduced.

Method

Participants. One hundred and sixty two Princeton University undergraduates participated in exchange for a small monetary compensation.[2] The survey was included in a packet of approximately 30 unrelated one-page questionnaires. Participants completed the entire packet in approximately one hour.

Design, stimuli, and procedure. Four types of anchors were used: Anchor length (long or short) was crossed with context (map or no map). For the "map" conditions, a map of the United States that displayed state borders but contained no text or labels was digitally adjusted to create two sizes. The small map was 2.875 inches wide by 1.875 inches tall, whereas the large map was 8.875 inches wide by 6.125 inches tall. Regardless of map size, participants were instructed to trace the path of the Mississippi River on the map; "start" and "end" points were marked so that participants would know where on the map to look for the Mississippi.

To create "no map" conditions, we digitally isolated the path of the Mississippi from the maps, so that participants were presented with either a small or a large Mississippi-shaped line that was the exact size of the river in the small- and large-map conditions, respectively. Participants were told that the line was copied from a map and that it illustrated the shape of the Mississippi; they were asked to copy the line to recreate the river's path.

Thus, in two conditions participants copied a small river and in two they copied a large one, with the key manipulation being whether the river was shown in the context of a map. All participants were then asked to estimate the length of the Mississippi River (on the same page on which the line had been drawn).

Results and Discussion

Two participants in the map condition were excluded for ignoring the start and end points and drawing the wrong river. Four additional participants were excluded as outliers for giving estimates more than 3.5 standard deviations from the mean.

In the no-map condition, the average estimate of the Mississippi River was 899.9 miles after drawing the short line, and a reliably greater 1367.8 miles after drawing the long line, $t(79) = 2.94$, $p < .01$, Cohen's $d = .66$. This pattern of effects replicates the findings from Experiment 1. In the map condition, participants' average estimate of the

Mississippi River was 1537.6 in the short-line condition, and 1458.7 in the long-line condition, a difference which was not statistically reliable, $t(73) = .556$, $p > .10$, Cohen's $d = .13$. The interaction between the presence of a map and the effectiveness of the anchors was statistically significant, $F(1,152) = 6.56$, $p < .05$. The results are summarized in Figure 2.

As expected, in the absence of a map, participants who had drawn long lines gave longer estimates of the Mississippi than did participants who had drawn shorter lines, consistent with the idea that long lines prime the general idea of largeness, whereas short lines prime smallness. However, when the same lines were placed on a map such that they were the same length relative to the context, no differences were observed. Thus, it seems that anchors only exert effects to the extent that they are perceived as differentially small and large relative to the context. When contexts equalize the anchors' relative size, the anchors cease to have a differential impact on judgments, presumably because they no longer differentially provoke perceptions of largeness and smallness.

General Discussion

In four experiments, anchors in one modality influenced estimates made in another modality. Drawing long lines made distances seem longer and temperatures seem higher than did drawing short lines, and considering large numbers led people to draw longer lines than did considering small numbers. Far from anchors needing to be relevant to the estimate at hand, it seems that anchors can have subtle yet pervasive influences on judgments that are quite disparate in topic and form.

That said, one boundary condition that can be placed on cross-modality anchoring is that context is an important determinant of whether an anchor will influence judgments. It is not the absolute size of an anchor that drives the effect, but rather people's perception of its relative size (Wong & Kwong, 2001). To that end, one would expect long lines to exert less of an upward bias in contexts where many things in the environment are large.

Undoubtedly, contextual understanding of size is not the only boundary condition on cross-modality anchoring. For example, Chapman and Johnson (2002) proposed that individuals need to focus attention on the anchor in order for the anchor to have an effect. In the present experiments, participants had their attention drawn to the anchors by being asked to draw lines or to evaluate numbers. If the anchors had merely been one part of an unattended-to background, it is unclear whether the anchors would have been interpreted as large and small (as required by our model). It seems unlikely that merely being exposed to a line without attending to it would bias estimates, but the possibility remains open to empirical testing.

Additionally, anchoring effects likely only exist when people are estimating quantities not readily available or calculable. Most people do not know the exact length of the Mississippi nor the precise dimensions of a toothpick, hence, such estimates are susceptible to anchors. However, anchors would presumably not bias a person's ability to solve a simple arithmetic problem or report a known fact such as the current year (Wilson et al., 1996) or the distance until a prominent holiday (LeBoeuf & Shafir, 2004a). One would similarly presume that cross-modal anchoring would not impact estimations of known quantities.

The experiments reported here bear more than a passing resemblance to those Wilson et al. (1996) used to obtain *basic anchoring*. In their studies, anchor numbers were presented in a variety of innocuous ways, and those numbers biased later answers about wholly unrelated topics. Our line-copying task is analogous to their repetitive number copying exercise (e.g., copying a series of 35 four-digit numbers biased later estimates of cancer incidence).

An important difference is that in our studies, the anchor or target was a physical quantity. The difference has theoretical implications for explaining basic anchoring. The extension of the findings to the physical domain suggests that basic anchoring may not be due to numerical priming as Wilson et al. (1996) hypothesize (see also, Wong & Kwong, 2000). Instead, our findings suggest that anchors may prime some notion of “largeness” or “smallness” that is independent of any target but is itself highly context dependent.

Furthermore, our effect is unlikely to be driven by other theoretical mechanisms proposed for anchoring. Comparison of an irrelevant anchor number to a target is thought to trigger selective activation of anchor-congruent knowledge about the target (Chapman & Johnson, 1994, 1997; Strack & Mussweiler, 1997). Such biased activation then distorts later judgments about the target. This explanation is not applicable to the present findings because drawing an abstracted line is highly unlikely to activate knowledge of the length of the Mississippi (as Wilson et al, 1996 have argued).

Insufficient adjustment from a (possibly informative) anchor (Epley & Gilovich, 2001; Tversky & Kahneman, 1974) is not a likely theoretical explanation for similar reasons; the anchors in our studies cannot be considered a starting point for target estimation. It is difficult to determine what number people would anchor on (and subsequently adjust away from) when estimating, for example, temperature after exposure to an abstracted line.

The experiments we present call for a novel theoretical explanation other than those presently in the anchoring literature. The studies support the notion of a free-standing representation of magnitude that is activated by an anchor. Thinking about a relatively short line (or a small number) primes smallness while thinking about a relatively long line (or a large number) primes largeness. A key word in that conclusion, though, is “relatively:” when the two lines are placed onto a metric that equates them (e.g., a rescaled map of the US), they no longer cue different notions of magnitude.

The account we offer should not be construed as a rival hypothesis to the other major theories of anchoring in the literature; the present model can not account for many of the findings associated with insufficient adjustment and selective knowledge accessibility. At the same time, we do not rule out the possibility that the phenomenon we document may operate simultaneously with other previously reported anchoring mechanisms. It seems plausible that the phenomenon of anchoring has several underlying processes and that priming notions of magnitude is just one part of a bigger picture.

In sum, the present findings suggest that the boundaries of anchoring effects may be much wider than previously thought. Not only do irrelevant numbers influence judgments, but so might irrelevant shapes, sounds, temperatures, and weights. This has implications across a wide variety of domains. Students filling out class evaluation forms might have lower evaluations of the class if the forms are completed with golf pencils rather than regular pencils. The fact that the taller candidate won 80 percent of the presidential election contests between 1904 and 1984 (Gillis, 1982) could conceivably be due partly to the fact that their heights biased people’s estimates of their positive qualities. Waiting in a long line to get tickets at the theater may bias people to then think that the cost of theater popcorn is not exorbitant. This is hardly an exhaustive list; clearly, there are many far-reaching applications and implications of these findings.

Judgments are not made in a vacuum. People making judgments have access to a tremendous number of potentially influential internally-generated and externally-provided cues. Research on anchoring has demonstrated that it is very hard to ignore such cues, even when they are completely irrelevant to the judgment at hand. Understanding how people incorporate or exclude irrelevant information when making judgments plays an essential role in understanding cognition and is a necessary step towards helping people make better judgments. Finally, although we do believe that cross-modal anchoring effects are fairly wide-ranging, we hope the brevity of this paper does not bias perceptions of the import of our findings!

References

Birnbaum, M. (1999). How to show that 9 > 221: Collect judgments in a between-subjects design. Psychological Methods, 4, 243-249.

Brewer, N. T. & Chapman, G. B. (2002). The fragile basic anchoring effect. *Journal of Behavioral Decision Making, 15,* 65-77.

Brewer, N. T., Chapman, G. B., Schwartz, J., & Bergus, G. R. (2004). The influence of irrelevant anchors on the judgments and choices of doctors and patients. Manuscript submitted for publication.

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. (2002). Incorporating the irrelevant: Anchors in judgments of belief and value. In T. Gilovich, D. W. Griffin, & D. Kahneman (Eds.), *The Psychology of Judgment: Heuristics and Biases*. New York: Cambridge University Press.

Cruse, D. A. (1986). *Lexical semantics*. Cambridge: Cambridge University Press.

Denes-Raj & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. Journal of Personality and Social Psychology, 66, 819-829.

Epley, N., & Gilovich, T. (2001). Putting adjustment back in the anchoring and adjustment heuristic: Divergent processing of self-generated and experimenter provided anchors. *Psychological Science, 12,* 391-396.

Gillis, J. (1982). *Too small, too tall*. Champaign, IL: Institute for Personality and Ability Testing, Inc.

Kahneman, D. & Knetsch, J. (1993). *Strong influences and shallow influences: An analysis of some anchoring effects.* Unpublished manuscript, University of California, Berkeley.

Kruger, J. (1999). Lake Wobegon be gone! The "below average effect" and the egocentric nature of comparative ability judgments. *Journal of Personality and Social Psychology, 77*, 221-232.

LeBoeuf, R. A., & Shafir, E. (2004a). *Anchoring on the here and now: Anchoring and insufficient adjustment in time and distance estimation tasks*. Manuscript submitted for publication.

LeBoeuf, R. A., & Shafir, E. (2004b). *The long and short of it: Anchoring and adjustment with physical quantities.* Manuscript submitted for publication.

Moore, S. E. & Brown, N. R. (2004) *Examining the influence of disclaimers on adoption of numerical anchors: Evidence supporting a Gricean interpretation of anchoring effects*. Manuscript submitted for publication.

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.

Parducci, A. (1995). *Happiness, Pleasure, and Judgment: The Contextual Theory and its Applications.* Mahwah, NJ: Erlbaum

Quattrone, G. A., Lawrence, C. P., Warren, D. L., Souza-Silva, K., Finkel, S. E., & Andrus, D. E. (1984). Explorations in anchoring: The effects of prior range, anchor extremity, and suggestive hints. Unpublished manuscript, Stanford University, Stanford, CA.

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,* 1124-1131

Wilson, T. D., Houston, C. E., Brekke, N., & Etling, K. M. (1996). A new look at anchoring effects: Basic anchoring and its antecedents. *Journal of Experimental Psychology: General, 125,* 387-402.

Wong, K., & Kwong, J. (2000). Is 7300 m equal to 7.3 km? Same semantics but different anchoring effects. *Organizational Behavior and Human Decision Processes, 82,* 314-333.

Author Note

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Figure 1

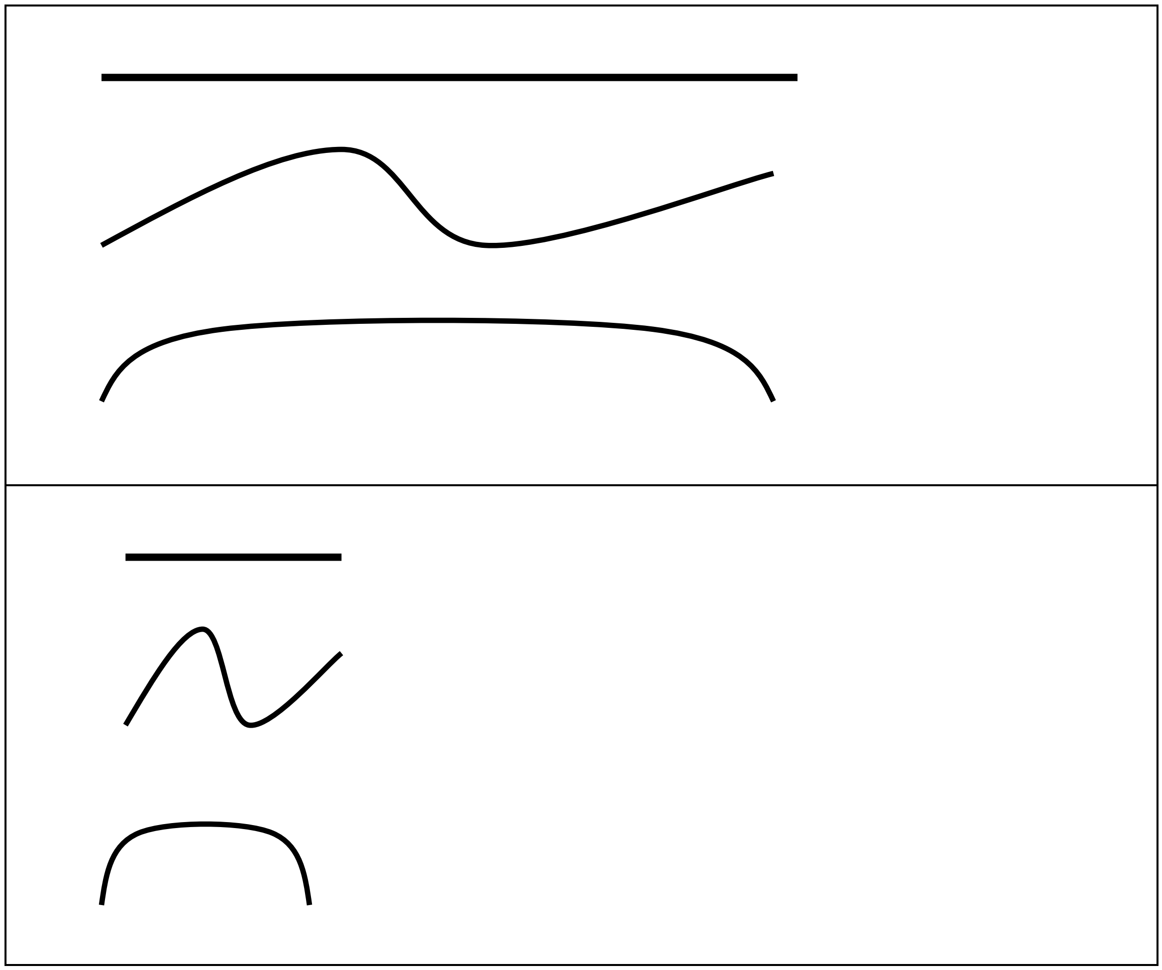

Figure 1: The short and long lines used as anchors in Experiments 1 and 2.

Figure 2

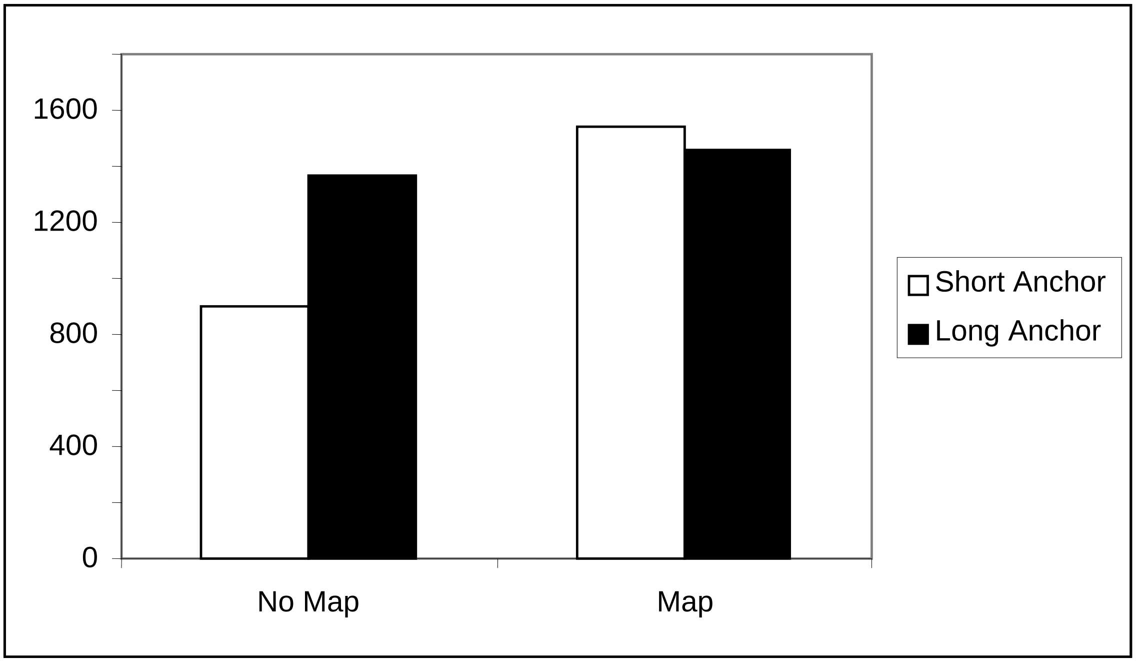

Figure 2: Results from Experiment 4. Lines of different lengths only serve as differential anchors in the absence of context.

[1] The actual length of the Mississippi varies yearly, and is contingent upon what tributaries one considers, but is generally accepted to be close to 2500 miles.

[2] This study was replicated in Central Park in New York City and in a questionnaire packet at University of Florida, and the trends were consistent.