12

A Tale of Tuned Decks? Anchoring as Accessibility and Anchoring as Adjustment

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Introduction

Ralph Hull made a reasonable living as a magician milking a card trick he called "The Tuned Deck" (Hilliard, 1938). The trick itself was unremarkable – subjects removed a card (yes, any card), identified it, and returned it anonymously to the deck. Hull claimed he could hear the chosen card ring a tune when he struck the deck with his finger and, after the requisite deck-flicking, would (*voilà!*) remove the chosen card. This trick became famous not for its ability to stump the gullible public – nearly all can do that – but for its ability to stump fellow magicians. Hull enjoyed subjecting himself to the scrutiny of colleagues who attempted to eliminate, one by one, various explanations by depriving him of the ability to perform a particular slight of hand. But the real trick was over before it had even begun, for the magic was not in clever fingers but in a clever name. The blatantly singular referent cried out for a blatantly singular explanation, when in reality The Tuned Deck was not one trick but many. The search for a single explanation is what kept this multiply determined illusion so long a mystery.

The mind, of course, has its fair share of tuned decks – singular referents that actually describe multiple mental tricks. "Consciousness," for example, is exactly the kind of thing that *should* reside in a single seat, but appears to spread its real-estate around the brain and is actually the product of multiple regions operating in unity (Zeki, 2003). So too with attention (Nakayama & Joseph, 1998), intelligence (Duncan et al., 2000), language (Pinker, 1994), and memory (Schacter, 1996) – all singular referents describing multiply determined phenomena. Searching for a single explanation in these cases is likely to leave interested psychologists, like Hull's audiences, with little to say.

This chapter is intended to add one of the most widely studied biases in human judgment to this list of psychological tuned decks – judgmental anchoring. Across ever-expanding domains, people's estimates of uncertain qualities are biased in the direction of a salient comparison value or "anchor." Although easy to demonstrate, such anchoring biases have not been so easy to explain (Strack & Mussweiler, 1997). One reason for this difficulty, it appears, is that psychologists have been seeking a single solution. In fact, judgmental anchoring is not a single mental trick but a set of tricks. How many tricks? At least two.

Anchors Aweigh

People's judgments are often inordinately influenced by the first information that comes to mind. Assessments of others' perceptions are unduly tied to one's own (Kenny & DePaulo, 1993; Keysar & Barr, 2002), impressions of others' personalities overly influenced by automatic dispositional inferences (Gilbert, 2002), inferences about pairs of attributes based heavily on the first attribute evaluated (Rottenstreich & Tversky, 1997), and answers to general knowledge questions biased in the direction of irrelevant values considered early in the processing stream (Chapman & Johnson, 2002).

These effects, and many like them, have traditionally been called an "anchoring effect" – an umbrella description that includes almost any judgment that is assimilated to an anchor value. Anchors come in numerous varieties, are presented or activated in very different paradigms, and bias judgments in widely dispersed domains. For example, some anchors are generated by participants themselves whereas others are provided by an experimenter or external source. Most anchoring effects are observed in an experimental paradigm involving a two-step process involving an explicit consideration of the anchor value whereas others are produced in the absence of any explicit comparison. Anchoring effects have been observed in probability estimates (Plous, 1989), legal decisions (Englich & Mussweiler, 2001), general knowledge questions (Tversky & Kahneman, 1974), consumer purchases (Wansink, Kent, & Hoch, 1998), and population frequencies (Rottenstreich & Tversky, 1997), just to name a few. Although "anchoring" may provide a nice description of the behavioral effects observed in these varied contexts, it may not be especially helpful for understanding the psychological processes that produce them.

The proliferation of these anchoring effects began after Tversky and Kahneman (1974) included the anchoring and adjustment heuristic in their seminal paper describing three basic heuristics that guide intuitive judgment (the other two being availability and representativeness). Tversky and Kahneman argued that people sometimes simplify complicated assessments by "starting from an initial value that is adjusted to yield the final answer" (p. 1128). Presumably this adjustment process would involve some kind of iterative consideration of estimates ever further from the initial anchor until a plausible estimate is reached (Quattrone, 1982). Thus, a person might estimate the cost of a new Toyota Camry by inflating the cost of last year's model, or estimate the height of the

second tallest mountain in the world (K-2) by adjusting down from the first (Mt. Everest). This heuristic simplifies judgment by substituting an easily accessible value that can be serially adjusted for a more complicated search that might involve a trip to the library. Although clearly helpful, Tversky & Kahneman (1974) suggested that "adjustments are typically insufficient" (p. 1128), leaving final estimates biased in the direction of the original anchor value.

To demonstrate the operation of this heuristic, Tversky & Kahneman (1974) developed a research paradigm that quickly acquired a research life of its own. This paradigm utilizes a two-stage process in which participants are initially asked to make a comparative assessment (e.g., Was Aristotle born before or after AD 1825?), followed by an absolute estimate (e.g., In what year was Aristotle actually born?). Countless experiments have demonstrated that people's absolute estimates are biased in the direction of the anchor value considered in the comparative assessment (for a review see Chapman & Johnson, 2002). People estimate, for example, that Aristotle was born in 140 BC if they first estimated whether he was born before or after AD 1825, but that he was born more than 1,000 years earlier if they first estimated whether he was born before or after 25,000 BC (Strack & Mussweiler, 1997).

The most obvious interpretation of these results is that participants take the anchor value as a hint to the answer, based on conversational logic that speakers mention only relevant information (Grice, 1975). However, the most interesting experiments utilizing this standard anchoring paradigm take great pains to inform participants that the anchor value was chosen randomly, or is completely uninformative. For example, anchoring effects are observed even when anchors are obtained by spinning a roulette wheel (Tversky & Kahneman, 1974), by using the participant's experiment number (Switzer & Sniezek, 1991), by adding a constant to the participant's phone number (Russo & Schoemaker, 1989), or by drawing a number from a hat (Cervone & Peake, 1986). Conversational logic may contribute to a great many anchoring effects in daily discourse, but it cannot explain the overwhelming number of demonstrations involving patently accidental anchors.

Instead, the results from this experimental paradigm have traditionally been interpreted as the product of insufficient adjustment from the anchor value considered in the comparative assessment. People start, the explanation goes, by rejecting the anchor value mentioned in the comparative assessment and then adjust in a serial, deliberate, and conscious fashion until they reach a plausible estimate. Because adjustments terminate at the outer range of plausible estimates, they tend to be insufficient (Quattrone, Lawrence, Finkel, & Andrus, 1981).

But while the race was on to demonstrate near and far that people incorporate irrelevant anchors into numeric estimates, nobody seemed to notice an experimental sleight of hand. In fact, recent research has demonstrated that the similarities between the anchoring and adjustment "heuristic" and the paradigm used to elucidate it are only skin deep. Ironically, the paradigm long used to reveal the anchoring and adjustment heuristic does not involve adjustment away from an anchor value at all. Instead, it appears that the anchoring and adjustment heuristic operates in an entirely different context, and the two-step procedure used to demonstrate it involves an entirely different process.

Heuristics versus Biases

Heuristics are short-cut rules used to simplify otherwise exceedingly difficult problems. One may not know, for example, whether another person is an athlete or not but can confidently guess by assessing the extent to which the person is similar to the prototypical athlete. And a perfectly calibrated assessment of one's own assertiveness would require an elaborate memory search (or a review of one's diary), but an intuition can be generated by considering the ease with which instances of assertive behavior come to mind.

The anchoring and adjustment heuristic describes cases in which one automatically generates a value known to be close to the right answer but in need of adjustment. The automatic recruitment of an anchor value that is close but wrong is followed by a controlled process of serial adjustment away from that anchor to incorporate other relevant information. Quattrone (1982), for example, suggested that people explain others' behavior by initially anchoring on a dispositional attribution and subsequently adjusting to accommodate situational constraints. Griffin & Tversky (1992) suggested that people determine the weighting of information in judgment by initially anchoring on its strength or extremity and subsequently adjusting to accommodate its validity. And Keysar & Barr (2002) suggested people understand another's communication by anchoring on their own egocentric interpretation and only subsequently adjusting to accommodate the speaker's perspective. In all of these cases people begin with a readily accessible assessment – a dispositional inference, the extremity of information, one's own perspective – that is adjusted to arrive at an actual answer.

Notice, however, that the anchors provided in the standard anchoring paradigm are considerably different than these "self-generated" anchors. They are not values generated automatically by participants to simplify an otherwise difficult assessment, but rather ones provided by an experimenter or external source. These anchors are novel values that must be explicitly considered, no matter how irrelevant, to answer a comparative judgment. They are *not* instantly known without reflection to be wrong (even if they are completely implausible), nor are they automatically perceived to be close to the right answer and thus in need of only slight adjustment. Instead, they involve two deliberate attempts to answer two very different questions, one comparative and one absolute. This difference in the context in which anchors are generated, as well as the knowledge that comes attached to them, produces anchoring effects that look descriptively similar but that are psychologically distinct.

The remainder of this chapter will present evidence for multiple mechanisms in judgmental anchoring. It will focus on what is generally considered to be a single literature on anchoring effects in human judgment that actually comprises two distinct paths of research, one addressing the standard anchoring paradigm and another addressing the anchoring and adjustment heuristic.

Understanding the Paradigm: Anchoring as Accessibility

Many psychological findings depend upon a variety of situational factors, and it is therefore a refreshing truism that human judgment is guided by accessible information (Higgins, 1996). But *what* is accessible at any point in time, returning quickly to familiar territory, depends on a variety of situational factors. Patently irrelevant anchors can influence intuitive judgment when the situational factors are aligned in exactly the ways that heighten the accessibility of anchor-consistent information and diminish the accessibility of anchor-inconsistent information. As it happens, the standard anchoring paradigm – and the everyday contexts that mimic it – do just that.

Recall that the standard anchoring paradigm consists of two steps – an initial comparative assessment followed by an absolute judgment. In the comparative assessment, participants are asked to compare the (irrelevant) anchor value to a target, such as "Is the maximum speed of a house cat more or less than 35 mph?" (Jacowitz & Kahneman, 1995). Assuming that even the most ardent cat lover would not know their pet's maximum speed, participants must retrieve knowledge to generate an answer. Not all retrievable knowledge, however, is equally helpful. Knowledge related to the anchor value – e.g., knowledge about other fast-moving animals or objects – is more helpful than knowledge unrelated to it – e.g., knowledge about slow-moving animals – when assessing whether or not an anchor value is correct (Klayman & Ha, 1987). Consequently, participants' retrieval is guided by the hypothesis implied in the comparative assessment (Tversky, 1977). In particular, Mussweiler & Strack (1999) have suggested that people generate an answer to these comparative assessments by "testing the hypothesis that the target's value is equal to the anchor" (p. 138) – in other words, "Is the maximum speed of a house cat equal to 35 mph?" This is likely to increase the accessibility of anchor-consistent information and decrease the accessibility of anchor-inconsistent information. The subsequent absolute estimate – "What is the maximum speed of a house cat?" – is then biased in the direction of the anchor value because it is based upon the accessible information used to answer the comparative assessment. This "Selective Accessibility" account is also consistent with models that suggest anchors increase the consideration of common features between the target and anchor and decrease the consideration of unique features (Chapman & Johnson, 1994; Jacowitz & Kahneman, 1995).

At least four findings are consistent with this account and demonstrate that irrelevant anchors increase the accessibility of anchor-consistent information. First, people attend to shared features between the anchor and target more than to unique features. For example, participants in one experiment reported how much they would be willing to pay for an apartment after explicitly comparing it with the rent of an "anchor" apartment (Chapman & Johnson, 1999). Participants not only spent more time looking at attributes shared by the target and anchor value, but also spent more time looking at positive features when provided a high rent anchor than when provided a low rent anchor. Not surprisingly then, directing participants to attend to differences between the anchor and target substantially diminishes anchoring effects (Chapman & Johnson, 1999; Mussweiler, Strack, & Pfeiffer, 2000).

Second, participants who have just completed the standard anchoring paradigm are faster to identify words consistent with the implications of an anchor value than words inconsistent with it. Those who had just assessed, for instance, whether the annual mean temperature in Germany is more or less than 5°C subsequently recognized winter words (e.g., snow, ski) more quickly than summer words (e.g., beach, swim). The opposite occurred among participants who considered whether the annual mean temperature is more or less than 20°C (Mussweiler & Strack, 2000b).

Third, altering the hypothesis tested in the comparative assessment correspondingly influences the magnitude of anchoring effects. If the comparative assessment renders anchor-consistent evidence more accessible because people evaluate whether the anchor value is equal to the target, then asking them to first determine whether the anchor is *more* than the target value or not should increase absolute estimates and asking whether the anchor is *less* than the target value should decrease absolute estimates, exactly the effect reported by Mussweiler & Strack (1999). Participants in this experiment thought the Elbe River, for example, was longer after initially evaluating whether it was *longer* than 890 kilometers than after evaluating whether it was *shorter* than 890 kilometers.

Finally, participants who are knowledgeable in a particular domain and thus better able to generate evidence consistent with an extreme anchor value are less influenced by irrelevant anchor values than participants who are not knowledgeable (Mussweiler & Strack, 2000a; Wilson, Houston, Etling, & Brekke, 1996). In addition, people who are more confident in their estimates within the standard anchoring paradigm generally show weaker anchoring effects than people who are less confident, presumably because more confident participants found it easier to generate anchor-inconsistent information (Jacowitz & Kahneman, 1995; Wilson et al., 1996).

This evidence suggests that most of the action in producing anchoring effects within this paradigm comes in the first comparative assessment. Explicitly comparing a target with an anchor value – even an irrelevant one – facilitates the recruitment of information consistent with the anchor value, creating an accessible pool of systematically biased evidence. Altering the hypothesis considered in this comparative assessment alters the magnitude of anchoring effects considerably, and removing it altogether by simply priming participants with a numerical value before making an absolute estimate produces relatively weak and unreliable anchoring effects (Brewer & Chapman, 2002; Chapman & Bornstein, 1996; Wilson et al., 1996).

However, accessible information is not applied in *any* judgment, just when it is relevant to the judgment at hand (Higgins, 1996). The standard anchoring paradigm not only facilitates the recruitment of anchor-consistent information but also its applicability to an absolute estimate because the two steps in this procedure generally involve the same target. This close relation means that judges are likely to rely on the information generated during the comparative assessment to make an absolute estimate. Because that information is biased in the direction of the anchor value, so too are absolute estimates.

Two findings in particular highlight the importance of applicability in the standard anchoring paradigm. First, reducing the relevance of the information generated during the comparative assessment dramatically alters the magnitude of anchoring effects, sometimes eliminating them altogether. For example, participants in one experiment were

asked whether the height of the Cathedral in Cologne was more or less than a high or low anchor value, and then estimated either the actual height or length of the Cathedral (Strack & Mussweiler, 1997). Anchoring effects appeared only when the comparative and absolute assessments were on the same dimensions, and disappeared when they were on different dimensions (see also Chapman & Johnson, 1994; Mussweiler & Strack, 2001b; Wong & Kwong, 2000). This is important not only for understanding the underlying mechanisms of these anchoring effects, but also for identifying boundary conditions. Making a numeric estimate will not automatically influence any subsequent judgment – as a quick perusal of the anchoring literature might suggest – only judgments that are clearly relevant.

The second finding demonstrating the importance of applicability is that the speed with which judges answer the comparative and absolute assessments tend to be negatively correlated (Mussweiler & Strack, 1999). This suggests that the more applicable the information generated during the comparative assessment is to the absolute estimate, the easier the absolute assessment is to make.

Collectively, the findings in this section strongly suggest that anchoring effects in the standard anchoring paradigm are produced by the biased accessibility of anchor consistent information, rather than by insufficient adjustment from an irrelevant anchor. Although many of the findings reviewed in this section are consistent with an insufficient adjustment account, it is not clear that any of them would have been predicted by it. More troublesome for an adjustment account within this paradigm is that manipulations that ought to influence a deliberate, effortful, and serial adjustment process do not influence responses. Distracting participants' attention with a simultaneous task, for example, ought to hinder people's ability to engage in effortful adjustment but it does nothing to responses in the standard anchoring paradigm (Epley & Gilovich, 2004b; Mussweiler & Strack, 1999). So too with financial incentives for accuracy and forewarning of bias that ought to lengthen adjustment by increasing the tendency to engage in effortful thought, but do not influence responses in the standard anchoring paradigm (for a review see Chapman & Johnson, 2002). An accessibility-based account of anchoring, however, has little trouble with these findings as accessibility effects are the paradigmatic example of automatic psychological processes that do not require attentional resources and are generally immune to deliberate corrective procedures.

Extending the Paradigm: Accessibility in Everyday Life

The preceding research can sound like just the kind of academic hair-splitting that irritates one's relatives, as the research can seem like a series of experiments about experiments. Although the standard anchoring paradigm is indeed an experimental task with its own unique attributes, it is important to remember that it is a proxy for some judgments that normal people care about a great deal.

For example, the outcome of an uncertain event seems more obvious or likely once the outcome is actually known. Although likely produced by multiple mechanisms (Hawkins & Hastie, 1991), this "hindsight bias" at least partly involves an implicit

comparison of the target with a highly certain anchor value once the outcome is known (see Chapter 13, this volume). This outcome appears to bias the recruitment of evidence consistent with the occurrence of the outcome, increasing retrospective evaluations of likelihood (Koriat, Lichtenstein, & Fischhoff, 1980). Mimicking results in the standard anchoring paradigm, explicit warnings to avoid the hindsight bias do little to dampen its effect (Fischhoff, 1977), but explicitly considering the likelihood that the opposite outcome occurred diminishes the bias (Slovic & Fischhoff, 1977).

More generally, overconfidence seems partly produced by people's failure to consider the likelihood that one's response might be wrong, and biased by the recruitment of response-consistent evidence (Block & Harper, 1991). People are more confident, for example, in the accuracy of others' responses than in the accuracy of their own responses (Koehler, 1994). This presumably occurs because *evaluating* an answer, like evaluating an externally provided anchor, involves biased hypothesis testing and the recruitment of answer-consistent evidence whereas *generating* an answer requires an explicit consideration of alternative responses. As in the standard anchoring paradigm, explicitly asking participants to generate reasons inconsistent with their chosen answer substantially reduces overconfidence (Koriat et al., 1980).

Beyond confidence, social comparisons often involve an implicit or explicit evaluation of the extent to which one is similar or dissimilar to some selected target. Whether one is athletic, attentive, or attractive, for example, depends critically on the standard of comparison. People tend to assimilate their self-assessments toward targets quickly perceived to be similar to themselves (such as members of relevant in-groups) and contrast them away from targets perceived to be dissimilar (such as members of relevant out-groups). The recruitment of features shared with similar targets and unshared with dissimilar targets follows a pattern akin to those in the standard anchoring paradigm, and appears to influence self-assessments in relation to a standard through the same mechanisms (Mussweiler, 2003).

On a more applied level, some everyday contexts are structured in a fashion similar to the standard anchoring paradigm and therefore contain similar anchoring biases. Negotiations, for example, begin with an initial offer that must be explicitly considered. This offer acts as an anchor, as final estimates are consistently biased in the direction of the opening offer (Galinsky & Mussweiler, 2002). Similarly, sentencing decisions by court judges often begin with a suggested sentence by prosecution that acts as an anchor and biases subsequent decisions (Englich & Mussweiler, 2001), as do initial award requests in personal injury verdicts (Chapman & Bornstein, 1996), and listing prices in residential housing assessments (Northcraft & Neale, 1987). Finally, advertisers can make gluttons of us all by introducing anchors into consumer contexts to increase spending. Shoppers in one grocery store, for example, bought nearly twice the number of Snickers bars when the advertisement suggested buying "18 for your freezer" than when it suggested buying "some for your freezer" (Wansink et al., 1998). Each of these contexts naturally involves a salient comparison value whose relation to the target value is unknown and must be implicitly or explicitly assessed. Related contexts that share this feature are also likely to produce anchoring effects through accessibility-based mechanisms, and resulting biases likely reduced by strategies that increase the accessibility of anchor-inconsistent information.

Understanding the Heuristic: Anchoring as Adjustment

The preceding research makes it clear that serial adjustment cannot explain the influence of irrelevant anchor values on human judgment. It would be premature, however, to conclude that the anchoring and adjustment heuristic does not exist. Many anchor values encountered in daily life are quite different from those encountered in the standard anchoring paradigm. They are not values provided by an experimenter or some external source but rather values generated by people to simplify a complicated assessment – in other words, a heuristic. What, for example, is the boiling point of water on the top of Mt. Everest? Or when was George Washington elected President of the United States? Although virtually no one knows the answers to these questions, most can arrive at a reasonable estimate by adjusting from a value they do know. Most know that less heat is required to boil water at higher elevations and water must therefore boil on Everest at less than 212°F, or that the US declared its independence in 1776 and Washington must have been elected shortly thereafter. People make these judgments, it appears, by automatically generating a value that is clearly wrong but known to be close to the right answer and in need of some tinkering. These "self-generated" anchors differ from the "externally provided" anchors encountered in the standard anchoring paradigm because there is no need to consider whether the answer is equal to the anchor – one already knows it is not – and thus no spark to ignite mechanisms of selective accessibility. Instead, people must serially adjust from this anchor value until a plausible estimate is reached.

Several findings demonstrate not only that these self-generated anchors activate serial adjustment but also that this process differs considerably from accessibility-based mechanisms involved in the standard anchoring paradigm. For example, because the adjustment from a self-generated anchor value is conscious and deliberate, people can consciously report utilizing this heuristic when responding to self-generated anchor values as coded by independent raters, but not when responding to externally provided anchoring questions (Epley & Gilovich, 2001).

More compelling, however, are experiments that manipulate adjustment rather than simply measure it. If people adjust from self-generated anchor values that are known to be close to the right answer but in need of adjustment, then anything that influences people's willingness to accept or reject values that come to mind ought to influence the amount of adjustment as well. A person inclined to accept a value as a plausible estimate ought to adjust less than a person inclined to reject that value. Research on attitudes and persuasion suggests that such acceptance and rejection can be manipulated by altering participants' body movements while making judgments. In particular, people are more inclined to accept propositions as true when they listen to them while nodding their heads up and down than while shaking them from side to side (Wells & Petty, 1980). And indeed, participants provided estimates closer to a self-generated anchor when they were simultaneously nodding their heads up and down than when they were shaking them from side to side (Epley & Gilovich, 2001). In addition, participants provided their responses more quickly when nodding their heads than when shaking them, also consistent with a shortened process of serial adjustment. Participants' head movements, however, did not influence either estimates or response times within the standard

anchoring paradigm, suggesting two very different mechanisms operating in these two contexts.

A similar asymmetry is found with psychologically similar proprioceptive movements such as pulling up versus pushing down on a table. People tend to respond more favorably to stimuli when adopting an approach posture through arm flexion than when adopting an avoidance posture through arm extension (Cacciopo, Priester, & Berntson, 1993). When responding to self-generated anchors, the favorable evaluation induced by arm flexion (like head nodding) leads participants to provide estimates closer to a self-generated anchor value than does the unfavorable evaluation produced by arm extension (Epley & Gilovich, 2004c). Again, arm position did not influence responses in the standard anchoring paradigm, demonstrating that "self-generated" anchors activate a process of adjustment that "experimenter-provided" anchors do not.

Arguably the most important feature of the anchoring and adjustment heuristic, and the reason it is used to explain a host of judgmental phenomena, is that adjustments tend to be insufficient. The problem with the existing (apparent) evidence for insufficient adjustment is that virtually all of it comes from the standard anchoring paradigm that clearly does not involve adjustment at all. However, two recent findings demonstrate that insufficient adjustment is a hallmark of self-generated anchor values as well. First, people's estimated answers to these questions tend to fall consistently short of the correct answers (Epley & Gilovich, 2004c). People estimate, for example, that George Washington was elected President of the United States somewhere around 1779 when he was actually elected in 1789, suggesting insufficient adjustment from the country's Declaration of Independence in 1776. And participants estimate that Vodka freezes around 1°F when it actually freezes closer to −20°, demonstrating insufficient adjustment from the freezing point of water at 32°F. Notice that a similar comparison to the actual answer within the standard anchoring paradigm is not meaningful because the relationship between the anchor value and answer is arbitrary. Not so, however, with the use of the anchoring and adjustment heuristic because these anchors are activated precisely because they are known to be close to the right answer but in need of adjustment. Second, participants who naturally generate, or who are led to generate, different self-generated anchors provide systematically different answers (Epley & Gilovich, 2004c). These results look similar to those seen in the standard anchoring paradigm, but are in contexts involving serial adjustment rather than selective accessibility.

Although Tversky & Kahneman (1974) offered no explanation for *why* adjustments tend to be insufficient, two subsequent accounts have focused on the attention-demanding nature of adjustment. Fans of one account note that anchors are activated automatically but adjustment requires attention (Gilbert, 2002). Because attention is a limited resource, anything that hinders a person's ability to expend it should shorten adjustment. In a world as complicated and attention demanding as ours, few judgments are given one's full attention, meaning that most adjustments will be insufficient. Several experiments have shown that responses to "self-generated" anchors are uniquely influenced by attentional demands (Epley & Gilovich, 2004b). In one, participants adjusted less when responding to a series of self-generated anchoring questions when they were simultaneously distracted by memorizing an eight-letter string than when they were not distracted. In another, participants who had consumed alcohol at a campus-wide party adjusted less from a

series of self-generated anchors than participants who had not consumed alcohol. And finally, people who dislike effortful thinking – those low in Need for Cognition (Caccioppo & Petty, 1982) – adjust less from self-generated anchors than those who love effortful thinking. Neither busyness, drunkenness, nor cognitive laziness, however, influenced responses to externally provided anchors within the standard anchoring paradigm. Insufficient adjustment, it appears, is partly produced by insufficient thought.

A prescription for harder thinking, however, will cure insufficient adjustment only if people recognize the right answer when they reach it. This is obviously impossible, by definition, in any judgment under uncertainty. Fans of a second insufficient adjustment account have therefore suggested that anchoring and adjustment is likely to be characterized by a certain amount of "satisficing" as people adjust until they reach a value that appears plausible (Mussweiler & Strack, 2001a; Quattrone, 1982; Quattrone et al., 1981). Because this adjustment terminates at the outer range of plausible values, adjustments tend to be insufficient.

To test this account, participants received a series of 12 self-generated anchoring questions like those discussed earlier (Epley & Gilovich, 2004b). Participants in one condition simply answered each of these questions. Participants in the other condition provided a range of plausible answers to each question (e.g., What is the earliest Washington could plausibly have been elected President of the United States? What is the latest Washington could plausibly have been elected President of the United States?). Consistent with this satisficing account, the answers provided in the first condition were not centered within the ranges provided by the second. Instead, answers were strongly skewed towards the anchor value, on average falling at the fifteenth percentile of the plausible ranges provided by other participants. It appears that people adjust until they reach a plausible value, at which point adjustment stops.

Both of these mechanisms of insufficient adjustment suggest that a different strategy for debiasing must be adopted than the "consider the opposite" strategy effectively employed within the standard anchoring paradigm. In particular, both suggest that insufficient adjustments should be lengthened by inducing more careful and deliberate thought. Although experimental instantiations of these strategies – including forewarnings to avoid being biased by values that come quickly to mind and providing incentives for accuracy – do not influence responses to externally provided anchors in the standard anchoring paradigm (Chapman & Johnson, 2002; Wilson et al., 1996), *both* increase adjustment from self-generated anchors (Epley & Gilovich, 2004b). Accessibility effects are prime examples of automaticity and serial adjustment a prime example of controlled processing, meaning adjustment-based anchoring effects will be influenced by attention-dependent debiasing strategies but accessibility-based anchoring effects will not. Dissociations in the effectiveness of different debiasing strategies are therefore predictable. After all, not all anchors are alike.

Extending the Heuristic: Adjustment in Everyday Life

The anchoring and adjustment heuristic appears to be utilized when people automatically generate an anchor value known to be wrong but close to the right answer, and not

when a novel anchor is provided by an external source. These circumscribed preconditions might seem to substantially reduce the scope of the anchoring and adjustment heuristic, except that so many everyday inferences appear to involve exactly these preconditions. Human inference often begins with an automatic process that provides a rough approximation and ends with a controlled process that subsequently refines or adjusts it. Whether such a dual-process judgment *actually* involves the anchoring and adjustment heuristic depends on whether the automatic approximation is known to be wrong, and if so, whether it is known to be close to the right answer and in need of slight adjustment. This more tightly tuned version of the anchoring and adjustment heuristic is likely to describe fewer phenomena than the unencumbered metaphor, but the decrease in population should be more than offset by the increase in accuracy. As it happens, this restricted pool of adjustment phenomena is still quite crowded.

For example, people appear to adopt others' perspectives by serially adjusting from their own. Because adjustments tend to be insufficient, adult perspective taking is often egocentrically biased. People tend to overestimate the extent to which others will share their thoughts and feelings (Keysar, 1994; Nickerson, 1999; Ross, Greene, & House, 1977; Van Boven, Dunning, & Loewenstein, 2000), overestimate the extent to which others notice both their internal states and emotions (Gilovich, Savitsky, & Medvec, 1998), and overestimate the extent to which others are noticing their very existence (Gilovich, Medvec, & Savitsky, 2000), just to name a few. Over time, of course, people learn that their own perspective may be quite different than another's, and parents commit far fewer egocentric errors than their children. Nevertheless, monitoring the time course of social thought via eye-tracking technology has shown that children and their parents are equally quick to look at objects suggested by an egocentric interpretation and differ only in the speed with which they shift that attention to accommodate another's differing perspective (Epley, Morewedge, & Keysar, 2004). A lifetime of learning doesn't reduce the tendency to form an egocentric response so much as increase the tendency to adjust from it.

Consistent with an anchoring and adjustment account of perspective taking, diminishing attentional resources (Kruger, 1999) or the time available to engage in serial adjustment (Epley, Keysar, Van Boven, & Gilovich, in press) increases the magnitude of egocentric biases. Increasing attentional resources, in contrast, by providing incentives for accuracy diminishes them (Epley, Keysar et al., in press). And asking participants to adopt another's perspective while nodding their heads up and down increases egocentric biases compared to when they are shaking their heads from side to side (Epley, Keysar et al., in press), consistent with the adjustment phenomena discussed earlier.

Similar effects seem to guide inferences about the future that are based on adjustments from best- or worst-case scenarios. What one hopes or fears will happen in some future event is often readily accessible but clearly more extreme than what is *likely* to happen, setting the stage for serial adjustment. Consistent with this account, participants in one experiment predicted how long it would take them to complete a variety of upcoming academic tasks. Although they generally underestimated how long it would take to complete these tasks, this "planning fallacy" was larger when participants were nodding their heads up and down than when they were shaking their heads from side to side (Epley & Gilovich, 2004a). This suggests that participants estimated their completion dates by anchoring on the date they hoped to complete the project and serially adjusted to a later date to accommodate inevitable delays.

Although the evidence for anchoring and adjustment is strongest in perspective taking and temporal prediction, these effects seem to be part of a larger family of inferences that involve adjustment from a self-generated anchor that is known to be close to the right answer but wrong. This includes people's attempts to adjust their inferences to reduce situational distortions (Gilbert & Gill, 2000), to adjust the predicted emotional impact of distressing events to accommodate the dampening effects of time (Gilbert, Gill, & Wilson, 2002), to adjust their relative ability estimates to accommodate others' ability levels as well as their own (Kruger, 1999), and to adjust the impact of a given piece of information in judgment to incorporate the reliability of the information into an assessment of its extremity (Griffin & Tversky, 1992). Each of these cases is marked by what appears to be insufficient adjustment, producing predictable biases in the direction of the initial anchor value. More important, biases that arise in at least some of these contexts are increased by attentional load (Gilbert & Gill, 2000; Gilbert, Gill, & Wilson, 2002; Kruger, 1999). Although the results of such load manipulations are ambiguous, influencing serial adjustment along with *any* effortful process, these findings are at least consistent with an anchoring and adjustment account. More work is clearly needed.

But by far the best-known application of the anchoring and adjustment heuristic is within the family of "correction" models that seek to explain how people identify the causes of their own and others' actions. Jones (1979) argued, for example, that it is easier to draw a connection between a person and their behavior than between a situation and the behavior, and Quattrone (1982) suggested that a dispositional inference may therefore serve as an anchor that is subsequently adjusted to incorporate situational constraints. Gilbert (1989, 2002) expanded this model and dropped the anchoring and adjustment terminology by proposing that people first "categorize" a person's behavior in terms of a general behavioral category (e.g., "George behaved arrogantly"), then "characterize" the person in terms of the category by forming a dispositional inference (e.g., "George is arrogant"), and finally "correct" that dispositional inference to accommodate situational constraints (e.g. "George is mildly arrogant"). Because characterization of the person is relatively automatic but situational correction is effortful, person perception will be dispositionally biased – which it is (Gilbert & Malone, 1995). Most of the data amassed to support this model demonstrates that cognitive load increases the dispositional bias.

However, Trope & Gaunt (2000) point out that these and other resource-depletion findings are also consistent with a slightly different kind of dual process account involving the integration of competing explanations rather than the adjustment of one to incorporate another. They demonstrate that manipulating the accessibility of situational constraints moderates dispositional inferences, much in the same way that the accessibility of anchor-inconsistent evidence moderates anchoring effects in the standard paradigm. Attentional load, their experiments suggest, may influence people's ability to consider situational information at all, and cognitive load does not increase dispositional biases when the situational constraints are highly accessible. This integration, or accessibility-based, account suggests that person perception may not involve any serial adjustment or effortful correction.

Like most debates within psychology, this one will likely be resolved by delineating domains of applicability. In fact, the research on "self-generated" anchors suggests a

solution based on the apparent power of situational constraints. Recall that people are likely to utilize the anchoring and adjustment heuristic when an anchor value is perceived to be close to the right answer but wrong. This predicts that people are likely to serially adjust a dispositional inference when the situational constraints are relatively weak and the dispositional inference therefore appears close to the right answer but in need of slight adjustment. When the situational constraints are strong, however, the dispositional inference is unlikely to serve as a starting point in adjustment but rather as a data point in a process of integration. The moderating strength of situational constraints would provide a resolution similar to that between accessibility- and adjustment-based accounts of judgmental anchoring. This proposed truce, however, is currently awaiting empirical signatures.

Although additional experimentation is required to fully understand the impact of the anchoring and adjustment heuristic in daily life, this section should confirm that reports of its death were exaggerated. The anchoring and adjustment heuristic appears to be alive and well, as long as one looks in the right places.

The Future of an Illusion

Anchoring effects are ubiquitous in human judgment and from a distance can all look alike. This apparent unity is produced by the illusion that similar psychological outcomes are guided by a single psychological process. But scientific scrutiny reveals that this blurry forest is actually composed of different trees. Some anchoring effects, namely those that involve externally provided anchors whose relation to a target is unknown, influence judgments by increasing the accessibility of anchor-consistent information. Other anchoring effects, namely those involving "self-generated" anchors known to be close to the target but wrong, are produced by a process of insufficient adjustment. Both types are united by the general tendency for judgments to be assimilated to an anchor value, but differ dramatically in the mental tricks that produce them.

The microscopic dissection of these tricks would be a matter of intellectual triviality were it not that these details are critical for determining both the nature of inferential biases and also strategies for alleviating them. Accessibility-based anchoring effects will generally produce assimilation, but can occasionally produce contrast effects when the target and anchor are wildly different from one another and activate a search for features that differ between them (Strack & Mussweiler, 1997). Adjustment-based anchoring, in contrast, should only produce assimilation effects. Accessibility-based anchoring effects can be reduced by considering features of the anchor that differ from the target, whereas adjustment-based anchoring effects can be reduced by attentional effort and careful thought. The number of domains that involve one of these two kinds of anchoring effects is large and expanding, increasing the importance of attending to these underlying mechanisms even further.

As varied demonstrations of anchoring effects continue to increase, so may the family of mechanisms that produce them. Although accessibility and adjustment are two established mechanisms, others including conversational norms (Englich & Mussweiler, 2001),

numeric priming (Wong & Kwong, 2000), and persuasion (Wegener, Petty, Detweiler-Bedell, & Jarvis, 2001) may make important contributions as well. Whether these additional mechanisms alone are sufficient to produce anchoring effects or merely serve to moderate accessibility and adjustment-based mechanisms is currently unclear, but there seems little doubt that an attempt to reduce this family to a single member will ultimately prove unfruitful.

It might therefore appear that the singular "anchoring effect" is an unhelpful and misleading term that ought to be diced up into its constituent elements and replaced by a new language that captures the variety of anchoring experiences. However, proliferation of psychological jargon is costly and should be restrained so long as the current language is not entirely misleading. The tricks underlying this psychological Tuned Deck are well on their way to being revealed, and the various mental tricks that a singular referent might have concealed is therefore of less concern. To the extent that an "anchoring effect" provides an accurate description of a psychological outcome, it is worth keeping, so long as one remembers that there are at least two psychological processes lurking beneath it.

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