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Incidental Environmental Anchors

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ABSTRACT

Three studies examined whether potential anchor values that are incidentally present in the environment can affect a person's numerical estimates. In Study 1, estimates of an athlete's performance were influenced by the number on his jersey. In Study 2, estimates of the proportion of sales in the domestic market were influenced by a product's model number. In Study 3, participants' estimates of how much they would spend at a restaurant were influenced by whether the restaurant was named ''Studio 17'' or ''Studio 97.'' These effects were not qualified by participants' expertise in the relevant domain (Study 1) or by their ability to subsequently recall the anchor value (Study 3). These findings document the existence of a new form of ''basic anchoring'' and suggest that not all basic anchoring effects are as fragile as the existing anchoring literature suggests. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS basic anchoring; numeric priming; incidental anchoring; accessibility

INTRODUCTION

What score might a judge assign Miss Alaska for her performance of a Bach minuet? What price might a restaurant owner be willing to pay for a crate of ketchup? How much might a non-profit agency expect to receive from a fund-raising campaign? Would it matter whether Miss Alaska's participant number is ''2'' or ''79,'' whether the order is for ''Heinz'' or ''Heinz 57,'' or whether the campaign is launched under the banner of ''Challenge 99'' or ''Challenge 2000''? It should not, of course, but we propose that it just may. In each of these cases, a potentially biasing number is present in the environment at the time of judgment, one that is not informative in any meaningful way with respect to the judgment at hand. Nevertheless, we propose that for a variety of judgments that require people to pull a numerical answer ''out of thin air,'' these *incidental environmental anchors* will exert an assimilative influence on judgment.

What we are proposing, of course, is a type of anchoring effect. But it is a type of anchoring effect that has yet to be examined in the anchoring literature. Virtually all existing demonstrations of anchoring involve paradigms in which a person's attention is called to the anchor value and the context or procedure ensures that the person devotes some thought to it. In the classic demonstration by Tversky and Kahneman (1974), for

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example, participants were asked whether the percentage of African countries in the UN was more or less than 10% (low anchor) or 65% (high anchor), guaranteeing that they would both note the anchor value and think about it while contemplating the actual percentage of African countries in the United Nations.[1] Participants' attention is likewise explicitly directed to the anchor value when they are asked whether the height of Berlin's Brandenburg Gate is more or less than 150 m (Strack & Mussweiler, 1997), and when they are asked whether the likelihood of U.S. military intervention in the Balkans was more or less than 70% (Chapman & Johnson, 1999). In Epley and Gilovich's investigations of ''self-generated'' anchors (Epley & Gilovich, 2001, 2004, 2005, 2006), participants' attention was not directed to particular values introduced by the experimenters, but they were asked questions (e.g., ''When was George Washington first elected President?'') that led most of them to retrieve the same anchor value (e.g., 1776, the year of the Declaration of Independence)—and those self-generated anchor values were very explicitly considered as helpful guides toward the sought-after target values.

The closest documented effect to what we are proposing is what Wilson and colleagues call *basic anchoring* (Wilson, Houston, Etling, & Brekke, 1996). Basic anchoring involves instances in which ''. . .people's judgments of a target are influenced by an anchor that is completely uninformative and people are not asked to consider the anchor as a possible target value'' (p. 389). For example, Wilson et al. (1996) found that participants' estimates of the number of physicians in their city were assimilated toward their recently highlighted participant ID number.

But note that even in these demonstrations, the participants' attention is explicitly called to the anchor value. Participants in one study, for example, had to copy down their ID numbers and render one of a number of different judgments about it, such as whether it was written in blue or red ink, whether it had four digits, or whether it was greater than 1920. The importance of directing a person's attention to the anchor value can be seen in that Wilson and colleagues did not observe an anchoring effect when their participants simply had to note whether the anchor was four digits (which did not require attention to the numeric value), but they did observe such an effect when their participants had to say whether the anchor value was greater than 1920 (which required more careful consideration of the value). As Wilson and colleagues both predicted and observed, ''people must pay sufficient attention to a numerical value in order for basic anchoring effects to occur. If a number is considered only briefly, anchoring will not occur'' (p. 390). Subsequent research has confirmed that basic anchoring occurs only under highly specific conditions that elicit a great deal of processing of the anchor value (Brewer & Chapman, 2002).

In the research reported in this paper, we sought to examine whether the limits of anchoring might extend beyond what the current literature suggests. With incidental environmental anchors, a person's attention is not explicitly directed to the anchor value and the value is completely irrelevant to the judgment at hand. Nonetheless, we predicted that its presence in the environment at the very moment of judgment might compensate for the fact that it is not highlighted in any notable fashion and thus give rise to a basic anchoring effect even in the absence of any extensive processing of the anchor value. In this respect, the anchoring effects we are proposing are similar to recent demonstrations of the impact of subliminal anchors. In one demonstration, Mussweiler and Englich (2005) subliminally flashed either high or low numbers to participants while they were thinking about how much the average German car cost. Participants' answers were drawn toward the anchor. In more recent work, Reitsma-van Rooijen and Daamen (2006) found that subliminal anchoring only affected judgments when participants were forced to respond quickly. This could either be because the subliminal anchoring effects were short-lived, or because the absence of time pressure allowed participants to consider information that overrode the weak influence of the subliminal anchor. Either way, subliminal anchoring appears to be a rather fragile phenomenon. We expect incidental environmental

[1]In many anchoring studies, steps are taken to ensure that the presented anchor value cannot be taken as informative about the to-be-estimated value. In this study, it was made clear to participants that the anchor values were chosen randomly by the spin of a wheel.

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anchors to have a more robust effect because of their continued, supraliminal presence during deliberation and judgment.

It is unclear which of the various models put forward to explain anchoring can most readily account for the impact of subliminal anchors, and as we discuss in the General Discussion, the impact of incidental environmental anchors likewise presents a challenge to some of the most prominent accounts of anchoring. But it is not our purpose in this paper to distinguish between the different theoretical accounts in the anchoring literature. Our goal instead was to document the existence—and examine the impact—of a new type of ''basic'' anchoring effect (Wilson et al., 1996), one that is likely to be more robust than those reported in the existing literature. As Wilson and colleagues noted, we are constantly exposed to potentially biasing anchor values. In the course of a few seconds, we might look at our watch, hear a phone number, and note the page number of the book we are reading. But the impact of such anchors is likely to be weak, uncertain, and fleeting given that they can so easily be ''washed out'' or replaced by the steady stream of new stimuli. This may explain why past research has found that special attention must be paid to these numbers for them to exert their effects. We sought to document a more robust type of basic anchoring effect by looking at the impact of incidental numbers that are an enduring part of the judgment context.

STUDY 1

When participants in fantasy football leagues the past few years have tried to predict who might earn them the most points, two popular choices have been Randy Moss, who wore number 18 for the Oakland Raiders before being traded to the New England Patriots, and Terrell Owens, who wore number 81 for the San Francisco 49ers and Philadelphia Eagles and currently wears that number for the Dallas Cowboys.[2] In trying to choose between these two players, is it possible that something as arbitrary as their transposed jersey numbers could color fans' assessments of the value they are likely to derive from ''owning'' each player? To determine whether an uninformative jersey number can indeed affect judgments of an athlete, we had participants make judgments about a linebacker whose jersey number had been digitally altered to read 54 or 94.

Method

Participants and design

Two hundred sixty-five undergraduates at Cornell University completed the study as part of a session for which they received extra course credit. Three participants, one in the #54 condition and two in the #94 condition, gave incomplete responses and thus were excluded from the analyses reported below.

Procedure

Participants read about Stan Fischer, a fictitious college linebacker, who went into his conference playoff game having sacked the opposing quarterback in 13 straight games. The description of Fischer and his past performance was accompanied by a photo (see Figure 1). Participants saw one of two possible photos, with Fischer wearing either jersey number 54 or jersey number 94. Participants were then asked ''how likely do you think it is that Stan Fischer will register a sack in the conference playoff game?'', which they answered by providing a percentage estimate in a blank space on the page.

[2]If you are wondering why two players considered the best at their position were allowed by their original teams to move elsewhere, just ask any football fan about the antics of these two players.

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Figure 1. The two linebacker photos presented between subjects in Study 1

Consistent with nearly all research on anchoring, we did not include a no-anchor control condition (Mussweiler & Englich, 2005; Mussweiler, Englich, & Strack, 2004). Although this does not permit us to ascertain whether any observed effect is due to the effect of the high anchor, the low anchor, or both, our purpose was simply to examine whether incidental environmental anchors, of any sort, might influence participants' judgments.

Because Wilson et al. (1996) found that basic anchoring effects were muted or eliminated for participants who were experts in the domain under investigation, we also asked participants about their level of football expertise. In particular, they reported on six-point scales how much they knew about and how frequently they watched football.

Results and discussion

As expected, participants' ratings of their football knowledge and frequency of watching football correlated very strongly, $r(260) = .83$, $p < .001$. To create a composite measure of football expertise, each variable was standardized and the two were added together.

To test the main hypothesis, participants' probability estimates were regressed on uniform number, participants' expertise, and the uniform-number × expertise interaction. As predicted, those who saw Stan Fischer wearing jersey number 94 estimated that his probability of sacking the quarterback in his next game was higher ($M = 61.6\%$, $SD = 22.1\%$) than did those who saw him wearing number 54 ($M = 55.6\%$, $SD = 24.9\%$), $t(258) = 2.07$, $p = .04$, $d = .26$. Neither the main effect of expertise nor the uniform number × expertise interaction approached significance, $ts < 1.11$, $ps > .26$.

Thus, although there is no normative reason why a jersey number should have any impact on a player's likelihood of sacking the quarterback, participants' assessments of ''Stan Fischer's'' future performance were nevertheless influenced by the number displayed on his uniform. Unlike the results reported by Wilson et al. (1996), this effect was not qualified by participants' expertise. Perhaps this is because expertise ''bought'' participants more in Wilson et al.'s studies than in this one—some of their experts may have known the correct answer or known that the correct answer had to be confined to a narrower range. In the present study, no correct answer existed and even those participants with considerable expertise about the sport of football may have found it hard to estimate how likely it would be for a linebacker to sack a quarterback during a playoff game in an unnamed conference. Thus, there may have been more leeway in the present study for the

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incidental environmental anchor values to exert their effects, even among experts. Nonetheless, novices and experts likely differed in their familiarity with what goes into sacking the quarterback, so novices were more likely to have been in the position of having to pull their answer ''out of nowhere.'' Thus, greater familiarity with the content domain, even if not with the specific target of judgment, appears not to immunize people from the pull of incidental environmental anchors.

STUDY 2

In this study, we sought to further assess the impact of incidental environmental anchors by examining whether they can influence judgments relevant to the fields of marketing and management. Although a product's model number can sometimes convey information about its quality (''system 10,'' for example, is presumably an improvement over ''system 9''), we tested whether model numbers might also bias judgments about the product that are unrelated to the dimensions of quality or novelty. More specifically, participants were asked to make a sales forecast, but not of overall sales volume (which is, of course, often is related to product quality). Instead, participants were asked to estimate the percentage of sales of a new phone that would be made in the United States versus Europe. The phone was described either as model number ''P17'' or ''P97'', and we examined whether participants' sales forecasts would be influenced by the incidental anchor contained in the model number. By including the number as part of an alphanumeric code, the manner of presentation did not meet Wilson et al.'s (1996) stipulation that for basic anchoring to occur participants must devote a non-trivial amount of attention to the number *as a number*. Thus, an anchoring effect observed under these conditions would further support the idea that incidental environmental anchors can lead to more robust basic anchoring effects than those reported previously in the anchoring literature.

Method

Participants and design

Two hundred seven Cornell University undergraduates participated in exchange for either a piece of candy or as part of an experimental session for which they received extra credit in their psychology or human development classes. The data from six participants, three in the P17 condition and three in the P97 condition, were excluded because their responses fell outside of the allowable range of 0–100.

Procedure

Participants saw a picture of a Sony Ericsson smartphone with either the fictitious model number ''P17'' or ''P97'' superimposed on the phone's display. Participants read some background information about the features of the fictitious product before being told there were plans to introduce the P17 [P97] in the United States and Western Europe before being sold more widely in the entire global marketplace. Participants were asked to estimate the percentage of the smartphones that would be sold in the United States, as opposed to Western Europe, during the introductory trial period. More specifically, they were asked ''what percentage of the Sony Ericsson P17s [P97s] sold during the initial introduction period will be purchased in the United States, as opposed to Western Europe?'', which they answered by filling in a blank space followed by the percentage symbol.

Results and discussion

Consistent with our hypothesis, participants making judgments about the P97 estimated that a higher percentage of smartphones ($M = 58.1\%$, $SD = 19.6\%$) would be sold in the United States than did those

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making estimates about the P17 ($M = 51.9\%$, $SD = 21.7\%$), $t(197.5) = 2.12$, $p = .03$, $d = .30$. Thus, as in Study 1, participants' responses were influenced by numbers incidentally associated with the target—numbers that should have no bearing on the value being estimated.

Some may question the external validity of such results, noting that sales forecasts are typically made using more sophisticated (and less contaminable) methods than those employed by our participants. But even when more sophisticated forecasting methods are used, they are often rounded up or down on the basis of ''gut feelings'' before decisions are made and actions taken. When such subjective considerations intrude, incidental environmental anchoring may intrude as well.

STUDY 3

In this study, we wanted to move beyond the influence of incidental environmental anchors on percentage estimates and examine whether they also influence people's assessments of how much they would be willing to spend on a product. We had two additional aims. First, we investigated whether calling participants' attention to the incidental environmental anchor just before they made their judgments would eliminate the anchoring effect. Although research on semantic priming has often found that such manipulations dampen or eliminate the impact of semantic primes (Lombardi, Higgins, & Bargh, 1987; Newman & Uleman, 1990), we predicted no such effect in this study because of previous research in the anchoring literature showing that even explicit warnings about the biasing impact of anchors do not diminish their influence on participants' judgments (Tversky & Kahneman, 1974; Wilson et al., 1996). Second, we examined whether incidental environmental anchors exert their biggest effects on participants who paid the greatest attention to the anchor values. Unlike Wilson et al. (1996), who did not obtain basic anchoring effects when the anchor was ''considered only briefly'' (p. 390), we expected to observe, an impact of incidental environmental anchors even among those who did not process the anchor values very deeply. The reason for this predicted divergence with Wilson et al.'*s* (1996) results is the sequential versus simultaneous nature of the anchor's presentation. An anchor value no longer present in the environment has to have been processed in sufficient depth to leave a memory trace capable of influencing judgment. A concurrently presented anchor value does not. Its presence in the environment may be sufficient, with only the most superficial processing, to influence judgment. Thus, we predicted that even participants who did not process the anchor value sufficiently deeply to allow them to recall it right after rendering their judgment would be subject to incidental environmental anchoring effects.

Method

Participants and design

One hundred ninety-four Cornell University undergraduates completed the study as part of an experimental session for which they received extra course credit.

Procedure

All participants received the same picture of a moderately up-scale restaurant that had supposedly been copied from a magazine advertisement. To the side of the picture, the restaurant was either identified as Studio 17 or Studio 97. A Butler, PA address (without any numbers) appeared below the name.

Under the pretext that the bottom half of the page would be torn off, participants in the *highlight* condition were asked to circle which of two restaurants they were evaluating (either Studio 17/97 or ''Restaurant Mon Jardin''). This served to draw participants' attention to the anchor just before making the judgment—and which should have made it clear to them why that number may have been experienced as particularly accessible. At this point, participants were asked to estimate how much they would be willing to spend on

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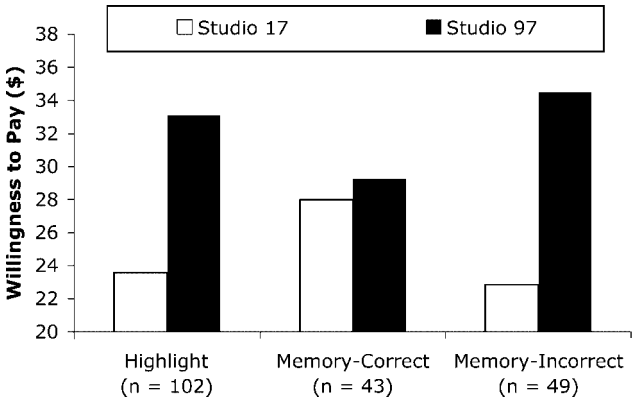

Figure 2. Willingness to pay in Study 3 as a function of number (17 or 97) and condition

their own meals if they were to eat at this restaurant. More specifically, they were asked to ''estimate how much you would be willing to pay for a dinner at this restaurant (not for your whole party, just for you),'' which they answered by filling in a blank space preceded by the dollar symbol. Participants in the *memory* condition made this judgment without first having their attention explicitly drawn toward the anchor. Immediately afterwards, they were handed a small piece of paper and were asked to write down, if they could, the name of the restaurant. Participants' recall was coded for accuracy using the criterion that at least the number (17 or 97) had to be accurately recalled. For example, responses such as ''Studio 97'' and ''Lounge 17'' were coded as accurate recall, whereas ''Studio something'' or ''Butler, PA'' were coded as inaccurate.

Results

Forty-three of the ninety-two participants in the *memory* condition (47%) correctly recalled the name of the restaurant. Our main analysis therefore consisted of a 2 (number: 17 or 97) $\times$ 3 (condition: Highlight, Memory—Correct Recall, Memory—Incorrect Recall) ANOVA on the log transformations of participants' reported willingness to pay values, which are depicted in Figure 2.[3] The main effect of number was significant, $F(1, 188) = 4.91$, $p = .03$, indicating that those who saw Studio 97 were willing to pay significantly more for their dinner ($M = \$32.84$) than were those who saw Studio 17 ($M = \$24.58$). There was no main effect of condition, $F < 1$, nor did condition interact with number, $F(1, 188) = 1.32$, $p > .26$.

Despite the non-significant interaction, we conducted simple effects tests to examine the presence of anchoring effects within each condition separately. There was a significant anchoring effect in the *highlight* condition (Ms = \$33.09 vs. \$23.56), $t(188) = 2.61$, $p = .01$, and among the 53% of the participants in the *memory* condition who were unable to recall the name of the restaurant (Ms = \$34.48 vs. \$22.83), $t(188) = 1.93$, $p = .05$. Unexpectedly, those who did recall the name of the restaurant showed only the smallest hint of an anchoring effect (Ms = \$29.25 vs. \$28.00), $t(188) = .12$, $p > .90$.

Discussion

Once again, participants' responses were assimilated toward an uninformative number associated with a target of judgment. All participants saw the same photograph of the restaurant but those who were asked about Studio 97 estimated they would spend more on their meal than those who were asked about Studio 17.

[3]Although all analyses were performed on the log-transformed means, the raw means are reported for ease of interpretation.

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Although the omnibus interaction between condition and number was not significant, the results of the simple effects tests point to a couple of potentially important ancillary issues.

First, participants whose attention was drawn to the anchor value just before making their willingness to pay judgments were every bit as susceptible to the anchor's influence as other participants. Doing so, it seems, did not prompt them to correct for the anchor's biasing influence because they did not recognize it as a source of bias (Wilson et al., 1996). Without a theory of how something might taint one's judgment, there is no reason for people to correct for even the most salient stimulus (Wegener & Petty, 1997; Wilson & Brekke, 1994).

Second, participants who could not recall the anchor moments after returning the questionnaire were nonetheless susceptible to the anchor's pull. This result diverges from previous research on basic anchoring that has found that such anchoring effects require careful attention to the anchor (Brewer & Chapman, 2002; Wilson et al., 1996). This discrepancy is most likely explained by the continued presence of the anchor value at the moment of judgment (in our paradigm), allowing it to exert an influence without particularly deep processing. It is also worth noting here that no anchoring effect was observed among participants in the *memory* condition who correctly recalled the anchor value to which they were exposed. Given the significant anchoring effect in the highlight condition, this effect cannot plausibly be attributed to a tendency among these participants to correct for the anchor's influence. Instead, memory for the anchor value may have differentiated those who were engaged in more effortful thinking about the task (resulting in correct recall) and those who were not. Those who engaged in more effortful processing may have generated and considered more information about the judgment they were asked to make—information that dampened the impact of the anchor. This possibility fits with Reitsma-van Rooijen and Daamen's (2006) finding that subliminal anchors only influenced judgment when participants were rushed, which presumably gave them less time to generate additional judgment-relevant information that might have dampened the impact of the subliminal anchor.

GENERAL DISCUSSION

Across three studies, incidental numbers present in the environment influenced participants' estimates of uncertain values. This effect was observed in domains as varied as athletics (Study 1), sales/management (Study 2), and dining (Study 3), and influenced both percentage estimates (Studies 1 and 2) and willingness to pay (Study 3). Experts were influenced just as much as novices (Study 1), and even those who could not recall the anchor moments after exposure were influenced by it (Study 3). In marked contrast to numerous experiments on semantic priming, highlighting the anchor just before the time of judgment did nothing to diminish the magnitude of the anchoring bias (Study 3).

Because participants in these studies were not asked to consider the anchor as a possible target value, the results can be considered a type of ''basic anchoring'' effect (Wilson et al., 1996). But note that the effect of incidental environmental anchors may be more robust than the typical basic anchoring effect (Brewer & Chapman, 2002; Epley, 2004). In Wilson et al.'s experiments, the anchors were introduced in the context of one task and participants made their estimates in the context of another task. The anchor values thus had to be processed in sufficient depth for them to remain sufficiently accessible to influence the subsequent estimates. Incidental environmental anchors, in contrast, are present in the environment at the moment of judgment and thus may not require the same level of processing to exert an influence. Consistent with this idea, an anchoring effect was observed in Study 3 even among those participants who did not attend to the anchor value sufficiently to allow them to recall it moments after they were exposed to it.

One set of findings that might seem, on the surface, to be similar to what we have shown is Wansink, Kent, and Hoch's (1998) demonstrations of the effectiveness of anchor values provided as part of ''end of the aisle'' sales advertisements. In one study, for example, Wansink et al. found that a sign stating ''Snickers Bars—buy 18 for your freezer'' led to sales that were 38 percent higher than one stating ''Snickers Bars—buy them for your freezer.'' This is a type of environmental anchor, to be sure, but it can hardly be said to be an *incidental* environmental anchor. The anchor value in this case (18) provides both an explicit purchase recommendation

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and implicit information about the norms regarding the appropriate quantity of candy bars to buy. The anchor values used in their research were part of highly specific persuasive appeals that directly prompted buyers to consider purchasing particular quantities. The same cannot be said about the anchor values presented to our participants. The anchor values were not presented as possible responses to the questions participants were asked, and whether or not a restaurant is named Studio 17 or Studio 97 should have no bearing on how much one should be inclined to spend on a meal there.

The impact of incidental environmental anchors is not readily explained by the most prominent accounts of why anchoring effects occur. According to the insufficient adjustment account, which seems to best explain the impact of self-generated anchors, anchoring effects occur because people adjust from the anchor value, but their adjustments tend to be insufficient (Epley & Gilovich, 2001, 2006). People use these self-generated anchor values despite knowing that they are off the mark because they provide a reasonably informative reference point from which to adjust. But it is not clear why anyone would start a process of adjustment from the kind of incidental, and thus uninformative, environmental anchors that were used in the studies reported here. Why would a diner, for example, try to discern the price of a meal by adjusting from the value of 97 incidentally contained in the restaurant's name?

The Selective Accessibility Model has something of the same difficulty. The model does a good job of accounting for anchoring effects in the standard anchoring paradigm, in which people are first asked whether an uncertain quantity is greater than or less than the anchor value, and then are asked to estimate the quantity of interest. According to that model, people address the first question by asking themselves whether the anchor value might be the sought-after target value (Englich, Mussweiler, & Strack, 2006; Mussweiler & Strack, 1999, 2000, 2001). Because people try to assess such propositions by searching for evidence consistent with them, semantic information consistent with the anchor value becomes highly accessible, with predictable effects on estimates of the target values in question. The model has also been used to explain the influence of subliminal anchors: Subliminal priming heightens the anchor's accessibility, making it more likely to be tested as possibly the correct response (Mussweiler & Englich, 2005). To the extent that participants assume that such values have come to mind because they represent initial intuitions as to the correct response, this may indeed be a plausible account of the influence of subliminal anchors.

But in the case of incidental environmental anchors, it is not clear why people would ask themselves, either implicitly or otherwise, why the target value might equal the kinds of anchors used in the studies reported here. The clearer the incidental source of the anchor, the less likely it is to be accepted as a reasonable test value. Participants in Study 3 who had the source of the anchor value highlighted for them would presumably be unlikely to misattribute the accessibility of the anchor value to any reasonable hunch or intuition on their part, and yet these participants were just as influenced by the anchor value as their counterparts for whom the source of the anchor value was not highlighted. Also, it is unclear, by this account, why the more knowledgeable participants in Study 1 did not exhibit a bigger anchoring effect. After all, their greater store of football knowledge should have made it easier for them to access information consistent with the anchor (cf. Chapman & Johnson, 1999). It is also unclear what information was differentially accessed by participants in Study 3 who estimated how much they would spend at Studio 97 that was not also available to those who estimated how much they would spend at Studio 17. The only information that participants in either group had about the restaurant was its location (Butler, Pennsylvania, USA) and a picture from a magazine advertisement.

Of all the existing accounts of anchoring, perhaps the most applicable to the type of anchoring effects documented in these studies is simple numeric priming (Wong & Kwong, 2000). The presence of a number in the environment, even one completely unrelated to the judgment at hand, may increase the accessibility of the anchor value, thereby exerting a direct influence on numeric responding. Such accessible values—both the anchor itself and near-by numbers—would be more likely to spring to mind as candidate responses. Even as people consider more pertinent sources of information, these primed values are likely to be given some weight, subtly drawing numeric responses toward the anchor.

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This raises at least two important questions about boundary conditions of the observed effects. First, does the anchor value have to be especially salient for an incidental environmental anchor to exert an effect on judgment? The existing evidence suggests that it does not. For one thing, previous research has established that even subliminally presented anchors can influence numerical estimates (Musssweiler & Englich, 2005; Reitsma-van Rooijen & Daamen, 2006). In addition, we increased the salience of the anchor values in Study 3 by highlighting it to some participants just before they made their judgment, and doing so did not increase the magnitude of the anchoring effect. Finally, the incidental environmental anchors we used were not especially salient—not any more salient, that is, than the sorts of incidental anchors one is likely to observe in representative, day-to-day environments. The model number P17 (or P97) presented on the screen of a cell phone is certainly no more salient than the model numbers displayed on many consumer products.

A second, related question is whether the effect of incidental environmental anchors is easily swamped by other target-relevant information or whether it is robust against such influences. The existing evidence is equivocal. On one hand, the impact of the incidental anchors used in the research reported here withstood the influence of other pertinent information that participants could bring to bear on the task at hand. In Study 2, for example, participants' knowledge of the relative populations and economies of Western Europe and the United States doubtless influenced their responses, but not so heavily that there was no room for an additional effect of the presented anchor values. In Study 3, furthermore, participants were exposed to a picture of the restaurant's decor, which should have allowed them to formulate a reasonable estimate of how much they would be willing to pay for a meal there. Thus, it seems that the influence of incidental environmental anchors is fairly robust and not limited to situations in which little or no information pertinent to the judgment is available. On the other hand, participants in Study 3 who correctly recalled the anchor value (and to the extent that this indicated greater task engagement, may have been drawing on more information in forming their judgments) did not show an anchoring effect, perhaps because the influence of the anchor was ''drowned out'' by other information. It thus remains for future research to establish more precisely the extent to which incidental environmental anchors can influence judgment when they must compete with other, more normatively defensible sources of information.

Conclusion

Incidental environmental anchors give rise to a type of basic anchoring effect that appears to be more robust than those documented in the existing literature. They may also be more common. Modern environments assault us with numbers. Jersey numbers, model numbers, and restaurant names to be sure, but also street addresses, product names, and contestant ID numbers, all of which have the potential to incidentally and inadvertently influence unrelated numerical judgments.

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REFERENCES

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

Chapman, G. B., & Johnson, E. J. (1999). Anchoring, activation, and the construction of values. *Organizational Behavior and Human Decision Processes*, *79*, 115–153.

Copyright © 2007 John Wiley & Sons, Ltd.

DOI: 10.1002/bdm

Englich, B., Mussweiler, T., & Strack, F. (2006). Playing dice with criminal sentences: The influence of irrelevant anchors on experts' judicial decision making. *Personality and Social Psychology Bulletin*, *32*, 188–200.
Epley, N. (2004). A tale of Tuned Decks? Anchoring as accessibility and anchoring as adjustment. In D. J. Koehler , & N. Harvey (Eds.), *The Backwell handbook of judgment and decision making* (pp. 240–256). Oxford, UK: Blackwell Publishers.
Epley, N., & Gilovich, T. (2001). Putting adjustment back in the anchoring and adjustment heuristic: Differential processing of self-generated and experimenter-provided anchors. *Psychological Science*, *12*, 391–396.
Epley, N., & Gilovich, T. (2004). Are adjustments insufficient? *Personality and Social Psychology Bulletin*, *30*, 447–460.
Epley, N., & Gilovich, T. (2005). When effortful thinking influences judgmental anchoring: Differential effects of forewarning and incentives on self-generated and externally provided anchors. *Journal of Behavioral Decision Making*, *18*, 199–212.
Epley, N., & Gilovich, T. (2006). The anchoring and adjustment heuristic: Why adjustments are insufficient. *Psychological Science*, *17*, 311–318.
Lombardi, W. J., Higgins, E. T., & Bargh, J. A. (1987). The role of consciousness in priming effects on categorization: Assimilation versus contrast as a function of awareness of the priming task. *Personality and Social Psychology Bulletin*, *13*, 411–429.
Mussweiler, T., & Englich, B. (2005). Subliminal anchoring: Judgmental consequences and underlying mechanisms. *Organizational Behavior and Human Decision Processes*, *98*, 133–143.
Mussweiler, T., Englich, B., & Strack, F. (2004). Anchoring effect. In R. Pohl (Ed.), *Cognitive illusions—A handbook on fallacies and biases in thinking, judgment, and memory* (pp. 183–200). London, UK: Psychology Press.
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. (2000). The use of category and exemplar knowledge in the solution of anchoring tasks. *Journal of Personality and Social Psychology*, *78*, 1038–1052.
Mussweiler, T., & Strack, F. (2001). The semantics of anchoring. *Organizational Behavior and Human Decision Processes*, *86*, 234–255.
Newman, L. S., & Uleman, J. S. (1990). Assimilation and contrast effects in spontaneous trait inference. *Personality and Social Psychology Bulletin*, *16*, 224–240.
Reitsma-van Rooijen, M., & Daamen, D. D. L. (2006). Subliminal anchoring: The effects of subliminally presented numbers on probability estimates. *Journal of Experimental Social Psychology*, *42*, 380–387.
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.
Wansink, B., Kent, R. J., & Hoch, S. J. (1998). An anchoring and adjustment model of purchase quantity decisions. *Journal of Marketing Research*, *35*, 71–81.
Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naive theories of bias in bias correction. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 141–208.). San Diego, CA: Academic Press.
Wilson, T., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin*, *116*, 117–142.
Wilson, T. D., Houston, C. E., Etling, K. M., & Brekke, N. (1996). A new look at anchoring effects: Basic anchoring and its antecedents. *Journal of Experimental Psychology: General*, *125*, 387–402.
Wong, K. F. E., & Kwong, J. Y. Y. (2000). Is 7300 m equal to 7.3 km? Same semantics but different anchoring effects. *Organizational Behavior and Human Decision Processes*, *82*, 314–333.

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