10 Anchoring effect

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Suppose you are the judge in a legal case of rape. The prosecutor and the defender have given their final speeches and you have just closed the court for a lunch break. The next session will start right after lunch, so that you have roughly an hour to make up your mind about the sentence. All the information that is necessary to make this important decision is right in front of you. The protocols of witnesses' statements, the opinions of a series of experts, and the relevant passages from the penal code are spread over your desk. You go through the most important facts once again: The victim's account of what happened that night, the expert's assessment of how likely it is that the defendant will commit rape again, the prosecutor's and the defender's plea. Upon close inspection, the evidence seems mixed and you are uncertain about what to do, what sentence to give. In thinking about the core facts, the final words of the prosecutor echo in your mind ". . . therefore, your honour, I demand a sentence of 34 months". You wonder, "34 months of prison confinement, is this an appropriate sentence?" Will the prosecutor's demand influence your sentencing decision?

If so, your decision may be biased by one of the most remarkable influences on human judgement, namely the anchoring effect (Tversky & Kahneman, 1974). Because the prosecutor's goal is to obtain a high sentence, being directly influenced by his demand may be against your intentions. At the same time, it would put you in good company. The results of a recent study of ours (Englich & Mussweiler, 2001) indicate that accomplished trial judges with an average of more than 15 years of experience were influenced by sentencing demands, even if the demands were made by non-experts. In fact, the magnitude of this influence proved to be dramatic. Judges who considered a high demand of 34 months gave final sentences that were almost 8 months longer than judges who considered a low demand of 12 months. A difference of 8 months in prison for the identical crime. Notably, this influence occurred although both demands were explicitly made by a non-expert: In our study they were given by a computer science student in the role of the prosecutor.

THE ANCHORING PHENOMENON

As is true in this legal setting, human judgement is often influenced by salient anchors (for a classroom demonstration, see Text box 10.1.). Judgemental

Text box 10.1 Anchoring experiment

Anchoring effects are among the most robust and easily replicated findings in psychology. The experimental design we outline as a basis for classroom demonstrations follows the classic anchoring paradigm (Tversky & Kahneman, 1974).

Method

Participants

Anchoring effects are exceptionally strong. Furthermore, simple studies can typically be run in a within-subjects design. For such designs a total of 20 participants is sufficient to produce reliable effects.

Materials

Four pairs of difficult general-knowledge questions pertaining to different content domains are used as materials (see Appendix). The anchors are typically set at one standard above and below the mean estimates of a calibration group that answered absolute questions (Mussweiler & Strack, 1999a).

Each question pair consists of a comparative and an absolute anchoring judgement. In the *comparative* judgements, participants indicate whether the target quantity is higher or lower than the anchor value (e.g., "Is the mean temperature in Antarctica in winter higher or lower than –17°C?"). In the subsequent *absolute* judgements, participants provide their best estimate of the target quantity (e.g., "How high is the mean temperature in Antarctica in winter?"). Two of the comparative judgements include a high anchor, the other two include a low anchor. Two different versions of the questionnaire are constructed to control for content and order effects. In both versions, questions are presented in the same order. In each version, however, the high and low anchor conditions are assigned to different questions, so that across both versions each of the two conditions is realized with each of four critical question pairs.

Procedure

Participants may complete the questionnaires in groups of up to 20. Upon arrival in the lab, they are given the questionnaire and are told to read the instructions carefully. They are informed that they are taking part in a pretest for the construction of a general-knowledge questionnaire. The purpose of the pretest is ostensibly to find the best wording for general-knowledge questions. Importantly, to reduce the perceived informativeness of the anchors and thus to discourage conversational inferences (Grice, 1975) the instructions emphasize that the anchor values were randomly selected. This is typically

done by explaining that the anchors were determined by a randomization device that works in a similar way to a wheel of fortune. It is further pointed out that this random selection is necessary to minimize the impact the anchors have on the answers and to thus identify the impact of different question formats. Finally, participants are instructed to answer all of the questions in the given order and to do so as accurately as possible.

Analysis

To pool answers across different content domains, absolute estimates are transformed into *z*-scores, separately for each question. These scores reflect participants' average deviation for the question mean in units of the pertinent standard deviation. For each participant, the mean *z*-score for the two questions in the high anchor condition and for the two questions in the low anchor conditions are calculated. These mean scores build the basis for the analysis which in this simple design consists of a *t*-test for repeated samples.

Results and discussion

Absolute estimates should be reliably assimilated towards the provided anchor values, so that higher mean estimates result for those targets that were compared to high anchors than for those that were compared to low anchors. As we have indicated before, this effect is extremely robust. Even if participants are deliberately trying to work against the anchoring influence, their estimates are typically assimilated towards the anchor values.

anchoring – the assimilation of a numeric judgement to a previously considered standard – may be one of the most remarkable influences on human judgement for at least two reasons. First, anchoring effects are strikingly pervasive and robust. Second, the mechanisms that produce anchoring have long remained an enigma.

Pervasiveness and robustness

Anchoring effects pervade a variety of judgements, from the trivial (i.e., estimates of the mean temperature in Antarctica; Mussweiler & Strack, 1999a) to the apocalyptic (i.e., estimates of the likelihood of nuclear war; Plous, 1989). In particular, they have been observed in a broad array of different judgemental domains, such as general-knowledge questions (Strack & Mussweiler, 1997), price estimates (Mussweiler, Strack, & Pfeiffer, 2000; Northcraft & Neale, 1987), estimates of self-efficacy (Cervone & Peake, 1986), probability assessments (Plous, 1989), evaluations of lotteries and gambles (Chapman & Johnson, 1994), legal judgement (Chapman & Bornstein, 1996; Englich & Mussweiler, 2001), and negotiation (Galinsky & Mussweiler, 2001).

Not only is the anchoring effect influential in a plethora of laboratory and

real-world settings, this influence is also remarkably robust. In particular, anchoring is independent of many potentially moderating variables. For one thing, anchoring occurs even if the anchor values are clearly uninformative for the critical estimate, for example because they were randomly selected (e.g., Mussweiler & Strack, 2000b; Tversky & Kahneman, 1974). Moreover, anchoring remains uninfluenced by the extremity of the anchor (e.g., Chapman & Johnson, 1994; Strack & Mussweiler, 1997) so that even implausibly extreme values yield an effect. For example, in one of our own studies (Strack & Mussweiler, 1997) estimates for Mahatma Gandhi's age were assimilated to an unreasonably high anchor value of 140 years. Furthermore, anchoring effects appear to be independent of participants' motivation (e.g., Wilson, Houston, Etling, & Brekke, 1996). Specifically, the attempt to improve accuracy by awarding a prize for the best estimate proved unsuccessful. In addition, it has been demonstrated that anchoring occurs independently of participants' expertise (Englich & Mussweiler, 2001; Northcraft & Neale, 1987). In the above-mentioned study in the legal domain (Englich & Mussweiler, 2001), for example, experienced judges and inexperienced law students were influenced by the anchor sentencing demand given by a computer science student to similar degrees.

Furthermore, anchoring effects are characterized by an exceptional temporal robustness and persist over fairly long periods of time. In one study, for example, anchoring effects were still apparent 1 week after the anchor value had been considered (Mussweiler, 2001). Probably the most striking demonstration of the robustness of the phenomenon, however, stems from research demonstrating that explicit instructions to correct for a potential influence of an anchor do not mitigate the effect (Wilson et al., 1996). Even explicitly forewarning judges about the potential distortion and informing them about its direction does not diminish the effect. This suggests that anchoring is an exceptionally robust phenomenon that is difficult to avoid.

Relevance

Judgemental anchoring is not only a particularly robust judgemental effect that has been demonstrated in a variety of domains, it also constitutes a basic explanatory concept that has been used to explain a wide array of judgemental phenomena. Anchoring has, for example, been used to explain attitudinal phenomena (Quattrone, 1982). More recently, the egocentricity of social judgement has also been attributed to an anchoring mechanism (Gilovich, Medvec, & Savitsky, 2000). Specifically, people may overestimate the extent to which their appearances are noted by others, because they anchor on their own rich experiences. Furthermore, anchoring has been used to explain another eminent cognitive illusion, namely hindsight bias (Fischhoff, 1975; see also Chapter 20, this volume), the assimilation of a recollected estimate towards a provided solution.

In the psychology of judgement and decision making, anchoring has been

primarily applied to probabilistic inferences. Thus, preference-reversal effects (Lichtenstein & Slovic, 1971), the distortion of estimates for the probability of disjunctive and conjunctive events (Tversky & Kahneman, 1974), and the assessment of subjective probability distributions (Tversky & Kahneman, 1974) have been attributed to judgemental anchoring.

Finally, applications of the anchoring concept are also found in applied contexts, such as negotiations in organizational psychology (Neale & Bazerman, 1991). First offers, for example, may influence the final negotiation outcome, because they serve as judgemental anchors to which the final outcome is assimilated (Galinsky & Mussweiler, 2001). In consumer behaviour, it has been suggested that price claims in advertisements influence consumer behaviour because they function as anchors in product evaluation (Biswas & Burton, 1993).

These accounts bear witness to the great diversity of phenomena that have been explained by the notion of judgemental anchoring. It is important to note, however, that these phenomena are not sufficiently explained by evoking an unspecific notion of anchoring. As such, the anchoring notion does not illuminate the underlying mechanisms, but only describes the direction of the observed influence (assimilation). In this respect, the term "anchoring" constitutes a descriptive rather than an explanatory concept which does not go beyond the terms assimilation and contrast (Strack, 1992). In order to be used as an explanatory concept, however, the psychological mechanisms that underlie anchoring first have to be sufficiently understood.

Paradigms

Anchoring effects are most typically examined in a classic paradigm introduced by Tversky and Kahneman (1974). In this paradigm, anchors are explicitly provided by inducing judges to compare the target to the anchor value. Typically, this is achieved by posing a comparative anchoring question and asking participants to indicate whether the target's extension on the judgemental dimension is larger or smaller than the anchor value. In order to reduce the perceived informativeness of the anchor values, they are ostensibly selected at random. This may be obtained by spinning a wheel of fortune (Tversky & Kahneman, 1974), emphasizing the random selection in the instructions (Strack & Mussweiler, 1997), or throwing dice (Mussweiler & Strack, 2000b). In what is probably the best-known demonstration of anchoring in this paradigm, Tversky and Kahneman (1974) asked their research participants two consecutive questions about the percentage of African nations in the UN. In a first comparative anchoring question, participants indicated whether the percentage of African nations in the UN is higher or lower than an arbitrary number (the anchor) that had ostensibly been determined by spinning a wheel of fortune (e.g., 65% or 10%). In the subsequent absolute anchoring question, participants then gave their best estimate of this percentage. Absolute judgements were assimilated to the

provided anchor value, so that the mean estimate of participants who received the high anchor was 45%, compared to 25% for participants who received the low anchor.

Alternatively, the anchor may be implicitly provided to the participants in cases in which it is clearly informative for the judgement at hand. For example, Northcraft and Neale (1987) demonstrated that real-estate pricing decisions depended on the listing price for the property. They had real-estate agents estimate the value of a property. Participants were given a 10-page booklet including all the information that is important for real-estate pricing. This booklet also contained the listing price of the house, which constituted the central independent variable. The price provided was either above or below the actual appraisal value of the property (e.g., $83,900 vs $65,900). Replicating the typical anchoring finding, participants' estimates for the value of the property were assimilated towards the provided anchors.

In a third paradigm, anchors are self-generated rather than explicitly or implicitly provided by the experimenter (Tversky & Kahneman, 1974). In one such study, participants were given 5 seconds to estimate the result of a product that was either presented in ascending sequence ($1 \times 2 \times \ldots \times 8$) or in descending sequence ($8 \times 7 \times \ldots \times 1$). Participants' estimates for the ascending sequence proved to be lower than for the descending sequence, presumably because participants use the result of calculating the product for the first few numbers (which is lower for the ascending than for the descending sequence) as a self-generated anchor, to which their final estimate was then assimilated. Similarly, judges may assimilate their estimates to self-generated anchors that are closely associated with the target quantity. Participants who are asked to give their best estimate for the freezing point of vodka, for example, may generate 0°C as the freezing point of water as an anchor, and then adjust downwards, because they know that the freezing point of alcohol is lower (Epley & Gilovich, 2001).

Finally, anchoring effects may be obtained by increasing the accessibility of the anchor value in a preceding unrelated task (Wilson et al., 1996). In one experiment (Wilson et al, 1996) demonstrating such *basic* anchoring effects, participants were first induced to copy either five pages of numbers ranging from 4421 to 4579 or five pages of words, and subsequently estimated the number of students at the University of Virginia who will contract cancer within the next 40 years. Those participants who had copied five pages of high numbers estimated this number to be higher than those who had copied five pages of words. Thus, the arbitrary high anchor presented in the preceding task influenced the judgement.

In sum, anchoring effects have been demonstrated using four different experimental paradigms, in which the anchor values are either explicitly or implicitly provided by the experimenter, self-generated, or provided in an unrelated task. Most of the anchoring research, however, uses the standard paradigm that was introduced by Tversky and Kahneman (1974) by first asking participants a comparative and then an absolute anchoring question.

THEORETICAL ACCOUNTS

To date, four theoretical accounts of anchoring effects have been proposed. In particular, it has been suggested that anchoring effects result from (1) insufficient adjustment from a starting point, (2) conversational inferences, (3) numerical priming, and (4) mechanisms of selective accessibility.

Insufficient adjustment

In their initial description of the phenomenon, Tversky and Kahneman (1974) describe anchoring in terms of insufficient adjustment from a starting point. They argue that "[. . .] people make estimates by starting from an initial value that is adjusted to yield the final answer [. . .]. Adjustments are typically insufficient. That is, different starting points yield different estimates, which are biased toward the initial value" (Tversky & Kahneman, 1974, p. 1129). Adjustment may be insufficient because it terminates at the boundary of a region of acceptable values for the estimate (Quattrone et al., 1984). For example, participants who are asked whether the percentage of African nations in the UN is higher or lower than 65% may use this anchor value as a starting point, determine whether it is too high or too low, and then adjust in the appropriate direction until the first acceptable value is found. However, such insufficient adjustment to the boundary of a distribution of acceptable values is only possible if the anchor value falls outside this distribution, in that it constitutes an unacceptable value itself. This may be the case because the anchor value is absurdly extreme, or because it is known to be wrong. Participants who, in order to estimate the freezing point of vodka, self-generate the freezing point of water as an anchor, for example, are likely to know that 0°C constitutes an unacceptable value because the freezing point of alcohol is below that of water (Epley & Gilovich, 2001). As a consequence, they may adjust from this unacceptable value until the first acceptable value is reached.

Anchoring effects, however, are not only obtained for clearly implausible and unacceptable anchor values (e.g., Strack & Mussweiler, 1997). It seems difficult to explain effects of plausible and acceptable anchors by an "insufficient adjustment" because for such anchors, there is no reason to adjust in the first place. The scope of the insufficient adjustment account thus appears to be limited to implausible anchors that are clearly unacceptable (for a more extensive discussion, see Mussweiler & Strack, 2001). Consistent with this assumption, it has been demonstrated that insufficient adjustment only appears to contribute to anchoring effects if the critical anchors are unacceptable self-generated, rather than acceptable provided, values (Epley & Gilovich, 2001).

Conversational inferences

A second account attributes anchoring to conversational inferences. According to this reasoning, applying implicit rules of natural conversations (Grice, 1975) to standardized situations (e.g., Schwarz, 1994) allows participants to use the anchor value to infer the actual range of possible answers. Participants who expect the experimenter to be maximally informative (Grice, 1975) in asking his or her questions, may assume that the provided anchor value is close to the actual value and consequently position their estimate in its vicinity. Such conversational inferences may well underlie the effects of considering anchor values that are of clear relevance for the estimate to be made (e.g., Northcraft & Neale, 1987). It is important to note that this account presupposes that the anchor value is indeed seen as informative for the judgement. Anchoring effects, however, also occur if the anchor values are clearly uninformative because they were randomly selected (Tversky & Kahneman, 1974), are implausibly extreme (Strack & Mussweiler, 1997), or are not related to the question at all (Wilson et al., 1996). Thus, although conversational inferences are potential determinants of anchoring in natural situations, they are not a necessary precondition.

Numeric priming

A third theoretical account assumes that anchoring effects are rather superficial and purely numeric in nature (Jacowitz & Kahneman, 1995; Wilson et al., 1996; Wong & Kwong, 2000). In particular, solving a comparative anchoring task may simply render the anchor value itself more accessible, so that this value is likely to influence the subsequent absolute judgement. From this numeric-priming perspective, the sole determinant of anchoring effects is the anchor value itself, regardless of its context, the target with which it is compared, and the judgemental operations in which it is involved. One recent account even goes so far as to claim that anchoring effects may be so superficial that not the anchor itself, but only its absolute value (e.g., "50" for an anchor of "−50°C") is represented in memory and exerts the primary anchoring influence (Wong & Kwong, 2000).

However compelling such a simple numeric account may appear, a careful analysis of anchoring research reveals that focusing exclusively on the numeric anchoring value is insufficient to allow for a complete understanding of judgemental anchoring. In particular, abundant evidence demonstrates that the semantic content that is associated with the anchor necessarily has to be taken into account to understand the complete pattern of findings in the standard paradigm. A purely numeric account cannot, for example, explain that anchoring effects depend on changes in the judgemental dimension (Strack & Mussweiler, 1997). Were anchoring effects indeed evoked by the anchor value itself, then identical effects should result irrespective of the semantic content with which the anchor is associated. For example,

comparing the *height* of the Brandenburg Gate to a given anchor value should have identical effects on subsequent judgements of the *height* and the *width* of the Gate, because the numeric properties of the anchor value are left unchanged by changing the judgemental dimension. This, however, is not the case. Rather, the magnitude of the anchoring effect is reduced if the comparative anchoring question pertains to another dimension than the absolute anchoring question (Strack & Mussweiler, 1997).

The temporal robustness of anchoring effects is also at odds with a purely numeric account which implies that anchoring effects are fairly transitive and short-lived. Because we are constantly exposed to arbitrary numbers, our daily routines (e.g., calling a friend, paying a bill) should immediately wipe out the effects of solving a comparative anchoring task. The fact that anchoring effects can prevail for a week (Mussweiler, 2001) is clearly in conflict with this implication and further renders a purely numeric conceptualization of the standard anchoring paradigm unconvincing.

Selective accessibility

As a fourth theoretical account, we have proposed a selective accessibility (SA) model of anchoring (Mussweiler, 1997; Mussweiler & Strack, 1999a, 1999b; Strack & Mussweiler, 1997; for a related account, see Chapman & Johnson, 1994, 1999). The starting point of this model is the observation that anchoring occurs in situations in which the consequences of comparing a given target to a numeric standard are assessed with a subsequent absolute judgement of this target (for a more complete discussion of the informational underpinnings of comparison processes, see Mussweiler, 2003). Because – as in any judgement – absolute target judgements reflect the implications of accessible target knowledge, one has to examine the informational consequences of the comparison to understand the mechanisms that lead to the assimilation of absolute estimates towards the anchor. Absolute judgements are likely to be based on the knowledge that is accessible at the time the judgement is made, so that analyzing the accessibility of target knowledge promises to provide a more complete understanding of the anchoring enigma.

The basic assumption of the SA model is that anchoring is in essence a knowledge accessibility effect, and is thus semantic in nature (for more detailed accounts, see Mussweiler & Strack, 1999a, 1999b). The model attempts to explain anchoring by linking it to two principles that are fundamental to social cognition research: (1) *hypothesis-consistent testing* and (2) *semantic priming*. More specifically, the model postulates that comparing the judgemental target to the anchor value changes the accessibility of knowledge about the target. In particular, the accessibility of an anchor-consistent subset of target knowledge is selectively increased. We assume that judges compare the target with the anchor by testing the possibility that the target's value is equal to the anchor value. For example, judges who are asked

whether the percentage of African nations in the UN is higher or lower than a high anchor of 65% are assumed to test the possibility that this value actually is 65%. To do so, they selectively retrieve knowledge from memory that is consistent with this assumption (e.g., "Africa is a huge continent", "There are more African nations than I can keep in mind", etc.).

This kind of hypothesis-consistent testing is a general tendency that contributes to a variety of judgemental processes (Klayman & Ha, 1987). As a consequence, the accessibility of anchor-consistent knowledge is increased. In order to generate the final numeric estimate, judges then rely primarily on easily accessible knowledge (Higgins, 1996), so that their estimate is heavily influenced by the anchor-consistent knowledge generated before. In our example, absolute estimates about the percentage of African nations in the UN would thus be based on the specific subset of target knowledge that was deliberately retrieved to be consistent with the assumption that this percentage is fairly high. Conceivably, using this knowledge leads to high estimates, so that the final estimate is assimilated to the anchor value.

Similarities between anchoring and knowledge accessibility effects

This conceptualization of anchoring as a knowledge accessibility effect is consistent with a large body of evidence, which demonstrates that anchoring effects share many of the qualities that are characteristic of knowledge accessibility effects in general (for a review, see Higgins, 1996). For one, anchoring effects critically depend on the applicability of the knowledge that was rendered accessible during the comparative task. It has been demonstrated that the extent to which increasing the accessibility of a concept in a priming task influences a subsequent judgement, is determined by how applicable the activated concept is to this judgement (Higgins, Rholes, & Jones, 1977). In much the same way, the magnitude of anchoring depends on how applicable the knowledge that was rendered accessible during the comparative task is to the critical absolute judgement. As described before, comparing the height of the Brandenburg Gate to a given anchor yields stronger effects on absolute estimates of the height of the Gate than on estimates of its width (Strack & Mussweiler, 1997; see also Chapman & Johnson, 1994). This may be the case because the knowledge generated during the comparative task has more direct implications for estimates of height than for estimates of width (i.e., it is more applicable to judgements of height) so that estimates of height are influenced more strongly. Thus, anchoring effects appear to depend on the applicability criterion (Higgins et al., 1977) in much the same way as is characteristic of knowledge accessibility effects in general.

An additional characteristic that is shared by anchoring and knowledge accessibility effects is that the time that is needed to make a given judgement depends on the degree of accessibility of judgement-relevant knowledge. In a classic priming study, for example, Neely (1977) demonstrated that

participants were faster in judging whether a given letter string constitutes a word, if a semantically related word had been presented beforehand. For example, participants were faster in judging the word "robin" if "bird" had been presented before. Paralleling this dependency, response latencies for the absolute anchoring task have been demonstrated to depend on the extent to which the accessibility of judgement-relevant knowledge had been increased during the comparative task (Mussweiler & Strack, 1999a, 2000a, 2000b; Strack & Mussweiler, 1997). For example, judges were faster in giving absolute judgements if they had ample time to generate knowledge during the preceding comparison than when they had made the comparison under time pressure – a condition that is likely to limit the accessibility increase (Mussweiler & Strack, 1999a).

However, different levels of accessibility influence not only response latencies for absolute judgements, but also the content of these judgements. In particular, larger anchoring effects occur under conditions that promote the extensive generation of anchor-consistent target knowledge and thus lead to a more substantial accessibility increase. For example, judges who have more target information available during the comparative task show more anchoring than those who have little information available (Chapman & Johnson, 1999). Furthermore, judges who generate more anchor-consistent knowledge during the comparative task, because they are in a sad mood – a condition that is typically associated with more elaborate processing – show larger anchoring effects than judges in a neutral mood (Bodenhausen, Gabriel, & Lineberger, 2000).

Temporal robustness constitutes yet another characteristic of knowledge accessibility effects that is shared by anchoring. Knowledge accessibility effects often have long lasting effects on judgement. For example, it has been demonstrated that increasing the accessibility of a specific trait concept influences person judgements that are made 1 week after the priming episode (Srull & Wyer, 1980). The same temporal robustness also characterizes judgemental anchoring. In particular, it has been demonstrated that anchoring effects still occur, if the comparative and the absolute question are separated by a 1-week delay (Mussweiler, 2001).

These parallels between anchoring and knowledge accessibility effects in general provide converging evidence in support of the assumption that anchoring effects are indeed knowledge accessibility effects in essence.

Direct support for selective accessibility

The most direct support for this notion, however, stems from a series of studies that directly assessed the accessibility of target knowledge subsequent to the critical comparative judgement (Mussweiler & Strack, 2000a, 2000b). In one of these studies (Mussweiler & Strack, 2000a), participants were asked to compare the average price for a German car to either a high or a low anchor value (40,000 vs 20,000 German Marks). Subsequent to this

comparative judgement, we assessed the accessibility of target knowledge with a lexical decision task. In particular, participants made a series of lexical decisions including target words that are closely associated with expensive cars (e.g., Mercedes, BMW) and words associated with inexpensive cars (e.g., VW).

Response latencies for these two types of target words clearly depended on the anchoring condition, as is apparent from Figure 10.1. In particular, judges were faster in recognizing words associated with expensive cars after a comparison with the high anchor than after a comparison with the low anchor. In contrast, words associated with inexpensive cars were recognized faster after a comparison with the low anchor. These findings demonstrate that the accessibility of anchor-consistent semantic knowledge about the target (e.g., knowledge indicating high prices after a comparison with a high anchor) is increased as a consequence of the comparative judgement.

Additional evidence further suggests that this accessibility increase is specific to the judgemental target itself. That is, the knowledge that is rendered accessible specifically pertains to the judgemental target. In one study demonstrating this specificity, for example, comparing the self as a judgemental target to a high anchor of general knowledge only increased the accessibility of knowledge indicating that the self is knowledgeable, whereas the accessibility of knowledge about a close other remained unchanged (Mussweiler & Strack, 2000a). These findings provide direct support for the core assumption of the SA model. Comparing the target to the anchor value does indeed appear to increase the accessibility of anchor-consistent semantic knowledge about the target. Using this knowledge as a basis for the absolute estimate produces the assimilation effect that is known as the typical consequence of anchoring.

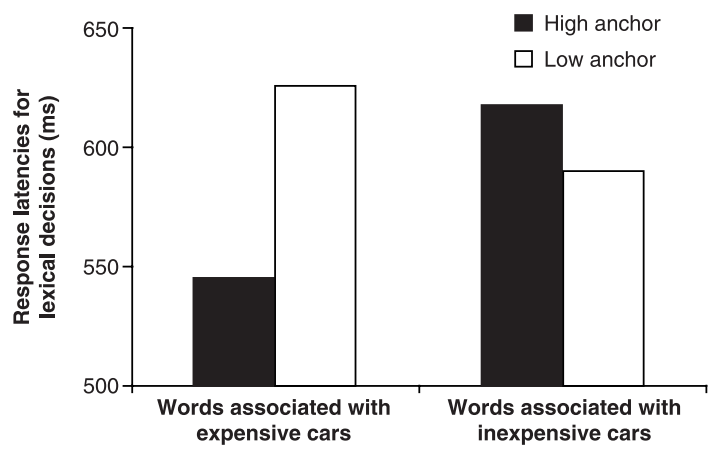

Figure 10.1 Response latencies for lexical decisions as a function of word type and anchor (Mussweiler & Strack, 2000a).

Integration: Anchoring as a two-stage process

The preceding discussion suggests that anchoring effects are in essence knowledge accessibility effects. The critical comparison of the judgemental target with the anchor value appears to involve a selective search for anchor-consistent target knowledge. Although this target–anchor comparison appears to be a core stage in all of the described anchoring paradigms, at least some of these paradigms involve a preceding stage. In those paradigms in which the anchor value is not explicitly provided to the judges, they first have to select a potential anchor, which can then be compared to the target. That is, at least in some of the anchoring paradigms, judges first have to engage in selection processes before they can carry out the comparison process that is likely to involve mechanisms of selective accessibility. This suggests that to obtain a complete understanding of the anchoring phenomenon, one has to differentiate between two stages which appear to be clearly distinguishable with respect to the processes they involve: the *selection* of a judgemental anchor, and its subsequent *comparison* with the target (for a related view, see Wilson et al., 1996).

Although selection processes do not play much of a role in the standard anchoring paradigm (Tversky & Kahneman, 1974) because here the standard is explicitly provided to the judges, they may constitute an important aspect of many judgements in everyday life. Theorizing in different areas of psychology has pointed out that human judgement is essentially relative or comparative in nature, even if a comparison is not explicitly asked for (e.g., Festinger, 1954; Helson, 1964; Kahneman & Miller, 1986; Mussweiler, 2003). Such a tendency towards comparative evaluation is likely to be especially pronounced in situations in which judges have little target knowledge available, as is typically the case in anchoring studies. Judges who desperately search for information that may help them to estimate a quantity they have never thought about, are likely to consider the target quantity in comparison to a standard it appears to be bringing to mind. Participants who estimate the number of African nations in the UN (Tversky & Kahneman, 1974), for example, may compare this target quantity to a number that comes to their mind because they have previously compared it to the unrelated quantity of the number of physicians listed in the local phone book (Wilson et al., 1996). Thus, an unrelated anchor value may be selected as a comparison standard for the generation of the target estimate, so that this stage of standard selection is open to numeric influences.

At least three mechanisms may influence the initial stage of standard selection. First, a particular value may be selected as an anchor because conversational inferences suggest it as relevant. If a particular anchor is explicitly mentioned by the experimenter, then judges may well use it to subsequently compare it to the target. Second, a value may be selected as an anchor because it is easily accessible and comes to mind during the evaluation of the target. Finally, an anchor may be self-generated via an insufficient adjustment

process. Judges who are provided with an implausible anchor, for example, may use this value as a starting point to generate a more plausible value, which is then compared to the target. This suggests that the alternative mechanisms of conversational inference, numeric priming, and insufficient adjustment may contribute to the selection of an anchor value.

The outcome of this process of standard selection is likely to influence the subsequent process of target evaluation. At the same time, selecting a standard by itself is not sufficient to influence how the target is judged. Rather, these effects result from the process of comparing the selected standard to the judgemental target. In order for a selected standard to be helpful for target evaluation, it has to be related to the characteristics of the judgemental target. This process requires the activation of semantic target knowledge and is – in light of the accumulated evidence (see Mussweiler & Strack, 1999b) – likely to involve the process of selective accessibility.

From this perspective, there appear to exist at least two distinguishable types of anchoring effects: a relatively shallow anchoring influence that operates at the stage of standard selection and a deeper anchoring effect that has its roots in the comparison stage. Notably, it is the latter effect that is typically seen as the classic case of anchoring. The actual comparison appears to involve a relatively elaborate process of testing the hypothesis that the target quantity may be similar to the comparison standard by selectively generating target knowledge that supports this assumption. This hypothesis-testing process increases the accessibility of standard-consistent knowledge about the target, which influences subsequent target judgements.

CONCLUSION

Anchoring effects are among the most robust and ubiquitous psychological phenomena in judgement and decision making. Given the diversity of paradigms that have been used to produce "anchoring effects", it seems unsurprising that a careful differentiation of different processes that operate in paradigms which involve clearly different judgemental tasks is called for. Despite this variety of judgemental paradigms and contributing mechanisms, however, the accumulated evidence suggests that the selective accessibility mechanism of generating anchor-consistent target knowledge lies at the core of the anchoring phenomenon. The various paradigms that have been used to examine anchoring effects, however, appear to differ with respect to the additional mechanisms they may involve. With a perspective on psychological processes rather than judgemental effects, we may well find that what has previously been considered as instantiations of one judgemental heuristic called "anchoring" is actually a conglomeration of fairly diverse phenomena whose similarity rests solely on the net outcome they produce.

SUMMARY

- An assimilation of a numeric estimate towards a previously considered standard is defined as judgemental anchoring.
- The core mechanism underlying anchoring appears to be a selective increase in the accessibility of knowledge indicating that the target's extension is similar to the anchor value.
- Anchoring constitutes a ubiquitous phenomenon that occurs in a variety of laboratory and real-world settings.
- Anchoring effects are remarkably robust. They occur even if the anchor values are clearly uninformative or implausibly extreme, are independent of participants' motivation and expertise, persist over long periods of time, and are not reduced by explicit instructions to correct.

FURTHER READING

Recent reviews of anchoring research are given by Chapman and Johnson (2002) as well as Mussweiler and Strack (1999b). Bazerman (2002) provides an interesting discussion of how anchoring effects may influence managerial decision making.

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APPENDIX

Comparative anchoring questions and anchor values:

1 Is the mean temperature in Antarctica higher or lower than –17 (–43) °C?
2 Was Leonardo da Vinci born before or after 1698 (1391) AD?
3 Was Albert Einstein's first visit to the US before or after 1939 (1905)?
4 Was Mahatma Gandhi older or younger than 79 (64) years when he died?