

Unconscious Influences of Memory for a Prior Event

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We interpret the difference between aware and unaware forms of memory in terms of Polanyi's distinction between tool and object. Aware memory, such as recognition and recall, occurs when memory serves as an object of attention. Unaware memory occurs when memory serves as a tool to accomplish a present task. Both memory-as-tool and memory-as-object can rely on memory for specific prior experiences. Memory used as a tool is a pervasive form of unconscious influence. We present experiments in which memory used as a tool enhances perception, lowers the subjective experience of background noise, increases the fame of nonfamous names, and lowers estimates of the difficulty of anagrams. To escape the pervasive effects of unconscious memory, one must consciously remember the past experience, understand its influence in the present task, and possess a good theory to serve as an alternative basis for behavior. These three criteria may seldom be met.

The ordinary person relates the concept of "the unconscious" to the psychoanalytic tradition and reacts with some skepticism when told that many of the factors influencing behavior are not open to consciousness. By that tradition, memory for a past event can influence behavior although the memory is so anxiety provoking that it cannot be admitted to consciousness. We agree that people are often unconsciously influenced by memory. However, we will show that those unconscious influences can originate from mundane as well as from traumatic experiences. A particular prior experience often influences perception and interpretation of later events, although a person cannot recall or recognize the relevant prior experience. We will describe procedures that we have found useful for revealing unconscious influences of the past on performance of a variety of tasks. Effects of this sort have been so easy to uncover that we are now convinced that unconscious influences are common rather than remarkable.

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Before describing the experiments, let us illustrate what we mean by unconscious influences of memory. The most dramatic examples are shown by amnesics, who can be influenced by memory for a prior event despite their inability to consciously recall or recognize the event. One example of this sort involved a Korsakoff patient with very dense amnesia who was encountered by Bruce Whittlesea, a former graduate student at McMaster. Bruce saw this encounter as an ideal opportunity for a man with a limited repertoire of jokes. He reasoned that it should be possible to tell the same joke repeatedly to the patient and get a laugh every time. The first time he told his joke, the patient laughed. When told the same joke a day later, the patient predictably claimed that he did not remember the joke. However, rather than laughing, the patient told Bruce that the joke was "dumb," not funny. The patient had unconsciously used his memory for the prior telling of the joke to anticipate its punch line, spoiling the joke, although he was unable to recall or recognize the joke. That is, the patient misattributed the unconscious influence of memory to a property of the joke, its not being funny. Such misattributions of the effects of unconscious memories are common in the experiments we will describe.

Unconscious influences of memory for a prior experience are not confined to amnesics, but may be found in the most prosaic behaviors of normal people. For example, our choice of words during a conversation often seems to be influenced by others. A word used by a person with whom we are conversing "creeps" into our own comments. We do not notice the word as a repetition, rather, the word simply comes to mind more readily. People also unconsciously use memory for prior parts of a conversation when interpreting what is said later. When used in this fashion, memory for the prior conversation is not focal in attention. The focus of attention is on understanding the conversation, and memory for the prior conversation serves to unconsciously influence comprehension.

These illustrations of how memories are used unconsciously can be interpreted in terms of Polanyi's (1958) distinction between tool and object. Polanyi illustrated his distinction between tool and object in an anecdote about reading his morning correspondence. He is multilingual. If he wanted to pass a letter he had just read to his son, who read only English, he often had to look back at the language of the letter. When first reading the letter, the language had served as a tool to convey meaning. Serving as a tool, the language was transparent, used without awareness of the particular words being read. To specify the language, he had to make the language itself the object of attention. The distinction between tool and object is also used by Polanyi to describe the focus of attention during skilled performance. When riding a bicycle, one's focus is on traveling down the road, rather than on the specifics of keeping one's balance. Indeed, cyclists may be unable to specify the particulars of keeping their balance. Treating the skill as an object in an attempt to specify particulars often results in destruction of the skilled performance.

Polanyi's distinction between tool and object can be used to describe different functions of memory. Memory is most obviously used for conscious

recall or recognition. In recall or recognition, memory is treated as an object that can be inspected and described to others. The focus of attention is on the past. However, memory can also serve as a tool for the perception and interpretation of later events. When memory is used as a tool, the focus is not on the past, but on the present. Also, the two uses of memory may be antagonistic because of the difference in focus of attention. The description of memory as a tool is similar to the stage setting metaphor of Bransford, McCarrel, Franks, and Nitsch (1977). They suggest that memory for the past serves the function of setting the stage for perception and the interpretation of later events. The notion of memory as object is similar to Johnson's (1983) description of "reflection."

We will show that memory for a single experience can serve as a tool to unconsciously influence the perception and interpretation of later events. The memory-as-tool, memory-as-object notion leads us to emphasize the similarities of memories used unconsciously versus consciously. Both uses can rely on memory for a specific prior experience. As is the case for conscious memories, unconscious use of memories will occur to a greater degree when there is a good match between specific details of the memory and details of the current situation. This means that the use of memory as a tool will vary depending on whether the specific details of the prior event are reinstated in the task being influenced. As will be discussed later, this emphasis on the situationality of effects marks an important difference between our view and views that reserve unconscious influences for the performance of skills or habits (Cohen & Squire, 1980) or the priming of abstract representations (Srull & Wyer, 1979). By the latter views, unconscious influences of memory reflect general skills or abstract concepts so that effects should be very general, not constrained by the details of memory for a particular prior event.

Treating memory as an object for recall and recognition requires a different focus of attention and different type of processing than does using memory as a tool. When used as a tool, the influence of memory is unconscious. Sometimes memories that can serve as tools cannot be brought into consciousness. That is, memory for a prior experience can be used as a tool even when one is unable to treat it as an object by recalling or recognizing the relevant prior experience. Amnesics are able to use memory as a tool, but are deficient in their ability to treat memory as an object. We will show that normal people also often show effects of memory for a prior experience in their perception and interpretation of later events even when they are unable to recall or recognize the relevant prior experience.

It is sometimes possible to bring a memory used as a tool into consciousness, treating it as an object, so as to escape its unconscious influences. However, attempts to recognize or recall a particular experience may be difficult to do concurrently with a task that uses the same memory as a tool. For memory to be used as a tool, attention must be on the task, whereas for memory to be treated as an object, attention must be on the past. A division or switching of attention may

be detrimental to both functions of memory. This means that memory might have its greatest effects on performance when it works unconsciously, when the source of those effects are not specified. Uncovering the effects of memory so as to avoid unconscious influences can be accomplished only by suffering the cost of continually changing the focus of attention. To appreciate this point, again consider the example of memory influencing our choice of words in a conversation. We could avoid our choice of words being unconsciously influenced by the person with whom we are conversing. However, to do so would require changing the focus of attention to the words as objects and would disrupt the conversation.

The use of memory as a tool can influence subjective experience. The earlier example of an amnesic's memory for a joke influencing his later reaction to the joke illustrates this point. Memory produces effects in the interpretation and subjective experience of events that are then attributed to some source. The amnesic misattributed the effects of memory to a characteristic of the joke, claiming the joke was not funny. We will provide evidence to show that normal people also sometimes misattribute effects of memory on subjective experience to other sources. For example, the effects of memory on later perception and interpretation are sometimes experienced as a change in the physical stimulus.

Effects on subjective experience are important because subjective experience is often used as a basis for judgments. To illustrate this argument, suppose our amnesic was installed as an editor of a joke book. A common way of judging whether or not others will find a joke to be funny is to assess one's own reaction to the joke. Our amnesic, acting as an editor, would reject jokes that he had heard earlier because of his misattribution of the effects of memory. Now, suppose we attempted to be helpful by identifying for the amnesic the jokes that he had heard earlier. Would this "repair" the amnesic's ability as an editor? Probably not. To restore the validity of subjective experience as a basis for judgment, he would have to answer the question: How funny would this joke be if I had not already heard it? The amnesic could presumably not remember his earlier reaction to the joke, and it may be impossible to "correct" current subjective experience for the effects of memory. Such a correction would require understanding the nature and exact size of the effects of memory. Escaping these unconscious influences of memory may depend on replacing subjective experience with a more objective basis for judgments. We will contrast subjective experience with the use of a more objective theory as a basis for judgments.

RETRIEVING THE PAST IN PERCEPTION OF THE PRESENT

Memory for a particular prior event can influence later perception, and those effects in perception can occur even in the absence of conscious memory for the event. For example, reading a word can enhance its later identification in situations in which perception is difficult, although the person does not

recognize the word as having been previously read. Reading is thought to be a general skill, so commonly performed that memory for a particular prior encounter with a word should have little effect on its later identification. Finding effects in a mundane task such as word identification suggests that unconscious influences are not confined to psychodynamic events, but are pervasive effects of memory for particular prior events. We will describe a few studies in detail to illustrate unconscious effects of memory on perception. For more extensive reviews, see Jacoby (in press), Jacoby and Brooks (1984), and Roediger and Blaxton (1987).

Typically, subjects in our experiments (e.g., Jacoby & Dallas, 1981) were presented with words under various study conditions and were then given two types of test. One test was a standard yes/no recognition memory test in which words previously presented in the study phase, old words, were mixed with new words, and the task was to recognize the old words. The second type of test was a perceptual identification test. Old and new words were mixed and each word was flashed for a very brief duration (e.g., 35 msec), followed by a visual mask. The task was to identify words aloud, and the dependent variable was the probability of identification. Old words have an advantage in perceptual identification, which is evidence of an influence of memory for the prior presentation of a word on its later perception. However, it is not logically necessary that the old words be recognized for there to be an old-word advantage in perceptual identification. For the perceptual identification task, subjects are only asked to report the word that was presented, without reference to whether it is an old word or a new one.

In those experiments, a single prior presentation of a word sometimes doubled the probability of its later perceptual identification. The effect is not only large, it is long lasting, persisting for at least 5 days (Jacoby, 1983a). These effects on perception are relatively specific to the details of the prior presentation of the word. For example, the effects are modality specific. Although reading a word greatly enhances its later identification, hearing a word or producing the word as a name for a picture has little influence on its later visual perceptual identification. These effects can be independent of recognition memory. Some manipulations that influence recognition have no effect or even an opposite effect on perceptual identification of a repeated word (Jacoby, 1983b; Jacoby & Dallas, 1981). For example, generating a word as an antonym to a presented word improves later recognition performance relative to reading the word, whereas later perceptual identification is less probable for the generated word compared with the read word (Jacoby, 1983b). Also, words that are not recognized as old can gain as much in identification performance from their prior presentation as do words that are recognized as old, indicating that effects in perceptual identification can be stochastically independent of recognition in memory performance (Jacoby & Witherspoon, 1982). That is, memory used as a tool to aid perceptual identification can be independent of a person's ability to treat memory as an object for a test of recognition memory.

The effects of prior experience on performance of a variety of other tasks can also be independent of recall or recognition memory. Prior presentation of a word can facilitate completion of a fragmented version of the word (e.g., Tulving, Schacter, & Stark, 1982), increase the speed of identifying the word in a lexical decision task (e.g., Scarborough, Cortese, & Scarborough, 1977), and increase the speed of reading an inverted version of the word (e.g., Kollers, 1976), even when the person does not recognize the word as having been previously presented.

Priming versus rapid context-specific learning. The effects of a prior presentation of a word on its later identification could be described as due to the priming of an abstract representation such as a logogen (Morton, 1979). In contrast, we (e.g., Jacoby & Brooks, 1984) have argued that the effects are better described as reflecting very rapid, context-specific learning. That is, the use of memory as a tool can rely on retrieval of memory for a particular prior experience. One argument is based on the specificity and longevity of the effects of presenting a word on its later identification. The effects last for at least 5 days and are specific to the reinstatement at test of details such as the modality and the context of the studied word (Jacoby, 1983b). The longevity of the effects is problematic for a priming view. If priming were sufficiently long lasting, all logogens would be primed so that priming would confer no relative advantage to any particular logogen. Consequently, a claim that priming is long lasting results in the notion of priming losing its explanatory power. Also, by a priming view, effects should be general, not restricted by the details of memory for a prior presentation of an item. An abstract representation does not preserve information about any particular encounter with a word; so its priming could not be specific to the details of a particular prior presentation of a word.

The longevity and specificity of the effects of a prior presentation are understandable if those effects rely on retrieval of memory for a prior experience rather than on the priming of some abstract representation. If retrieval is important, the use of memory as a tool will vary depending on whether the specific details of the prior event are reinstated in the task being influenced. Similarly, Kahneman and Miller (1986) claim that norms for relative judgments do not exist as stable abstractions, but are constructed by the retrieval of similar experiences from memory. Our view also shares assumptions with the "exemplar" or "instances" account of concept learning advanced by Brooks (1978, 1986), Medin (Medin & Schaffer, 1978), and Hintzman (1986). By those accounts, variability in performance across situations reflects the differential contribution of memories for particular instances of a concept or type of event and is greater than could be produced by consistent reliance on some general skill or abstract representation.

Let us further illustrate the arguments against an abstract representation reinterpretation of the effects of prior presentation on perception in the domain of a similar effect on impression formation. Srull and Wyer (1979) observed that unscrambling sentences that had hostile content led subjects to later judge

ambiguous descriptions of people as more hostile. This effect on impression formation remained even when the test was delayed for 24 hours. Srull and Wyer interpreted these effects as due to the sentence task priming a "hostility" trait concept or node. Consider the implications of the priming interpretation. A trait concept is an abstract representation of knowledge that can be applied very generally. If the trait concept of hostility were primed, there should have been an increase in the probability of its being applied outside the context of the experiment as well as in the experiment. Also, it must be assumed that priming lasts at least 24 hours.

To us, it seems unlikely that reading sentences with hostile content could have such general effects. Indeed, in a later model, Wyer and Srull (1986) restrict the priming effect to occasions when the trait is applicable to a behavior and the subject has the goal of forming an impression. We would restrict the effects even further. In our view, the effects cannot be described as due to priming an abstract trait concept, but must involve a memory that can be accessed when the specifics of the experimental setting are reinstated. Effects of prior experience can appear to be either long lasting or short-lived, depending on the cues for retrieval provided by the test. If retrieval cues are critical to gain access to a memory for its use in a task, there should be less stability in the effects of prior experience across manipulations of context than is predicted by a priming account. For an experiment of the sort done by Srull and Wyer, reinstating details of the experimental context might be important for the use of memory as a tool to influence judgments, even if a person does not notice the influence of the prior experience on performance of the impression formation task.

The types of processing that are necessary to allow the use of memory as a tool differ from the processing required to treat memory as an object in conscious recollection. Consequently, performance on the two types of test can be independent. However, both the use of memory as a tool and its use as an object can reflect memory for a particular prior event. Effects on later performance can be specific to reinstating the details of a prior event, although the person is unable to report those details. Effects in perceptual identification are specific to the details of the prior presentation of a word even when the word cannot be recognized as previously presented. Similar specific effects of prior experience might serve to unconsciously influence performance in social tasks.

Memory influences subjective experience. The possibility that memory can unconsciously influence subjective experience arose in our investigations of the effects of a prior presentation of a word on its later perceptual identification. Several subjects in those studies told us that some words were presented for a longer duration than were others and so were easily identified. The words thought to have been presented for a longer duration were words that had been previously read in the experiment. Witherspoon and Allan (1985) followed this lead by varying the duration of presentations and requiring subjects to judge

LIMITATIONS ON THE ABILITY TO TREAT MEMORY AS AN OBJECT: SUBLIMINAL ADVERTISING AND SOURCE AMNESIA

The effects of memory on perception described in the last section qualify as unconscious influences of memory, because those effects occurred even when subjects were unable to recognize a tested item as having been previously presented. That is, effects on perceptions remained even when people were unable to specify the source of those effects. Although not as dramatic, these effects of memory on perception are akin to unconscious effects said to be produced by subliminal perception. An inability to identify the source of effects on performance makes it impossible to avoid those effects.

The existence of subliminal perception continues to be hotly debated. Bowers (1984) provides a discussion of some of the logical pitfalls in that debate. Cheesman and Merikle (1986) distinguish between an objective and a subjective threshold in their discussion of conscious and unconscious perceptual processing. Subjective threshold refers to the visual duration of an item that is necessary for subjects to claim that they "saw" it, whereas objective threshold refers to the duration that is necessary for presentation of an item to influence performance on some task. An item would have to exceed the subjective threshold before people could be aware of the source of effects on their performance.

A common experience reported by subjects in our perceptual identification experiments is the feeling that an item simply "came to mind," without the accompanying experience of having actually "seen" the item. This amounts to a confusion about the source of an item, confusing what is actually an external source with one's own thoughts. A confusion of this sort would be sufficient to produce unconscious influences on performance. Consider sensationalistic claims about the effectiveness of subliminal advertising. It has been claimed that flashing the phrase "hot buttered popcorn" during a movie could subliminally influence behavior and result in a stampede to buy popcorn. The data never supported such effects, but the logic behind it is interesting. For people to be unconsciously influenced, it may only be necessary for them to be confused about the source of the message. Attributing a thought of hot buttered popcorn to oneself has a very different implication for behavior than does attributing it to an external source. Perhaps conditions that result in a thought coming to mind along with a misattribution of source could produce "subliminal advertising" sorts of effects.

Becoming famous without being recognized: differential effects of attention. We have not tried to promote the sale of popcorn. However, we have used manipulations of attention during the presentation of a name to bestow fame on nonfamous names. The rationale for those experiments is that the attention to a name that is necessary for its later use as a tool in a fame judgment task differs

duration. They found that words that had been previously read were judged as staying on the screen longer than new words. The single prior reading of the word was sufficient to later produce a difference in subjective experience of duration of the words.

More recently, we (Jacoby, Allan, Collins, & Larwill, in press) have examined the effects of prior experience on subjective experience of noise. In one experiment, previously heard sentences and new sentences were presented against a background of white noise of varying loudness. Subjects judged the background noise as less loud when the foreground sentences were old, rather than new. Subjects perceived the old sentences more easily than the new sentences, in a manner similar to the advantage of old words in the perceptual identification experiments. The difference in ease of perception of the old versus new sentences seems to have been unconsciously misattributed to a lower background noise level. Subjects were unable to separate out the contribution of memory to perception when judging noise level and so experienced a change in their subjective experience of the noise.

Changes in subjective experience can provide an indirect measure of the unconscious effects of prior experience. Variations in perception have been used by others as an indirect measure of subjects' motivations and attitudes, as in Bruner's discussion of perceptual readiness (1957) and work on perceptual defense (e.g., Eriksen, 1966). That work measured accuracy of perceptions and so, for example, required subjects to report taboo words. The work was open to the interpretation that the effects operated at the level of reports of experience, rather than changes in experience per se. The noise judgment paradigm measures the background noise of messages, and does not require subjects to report the actual message. Because the change in subjective experience involves subjects' misattribution of an unconscious memory effect to changes in the physical noise level, it is unlikely that subjects could strategically change their reports of noise.

The effects of memory for a prior event on later subjective experience may be seen as a perceptual hindsight effect. In his investigations of hindsight, Fischhoff (1975) demonstrated that people are largely unaware of the effect that outcome knowledge has on their postdiction of the likelihood of an event. Consequently, they overestimate what they would have known without outcome knowledge. This hindsight effect is difficult to eliminate either through instructions or practice. Similarly, people are generally unaware of the effects of memory for a prior event on the subjective experience of later events and so are unable to discount those effects. Even if one is aware that memory influences subjective experience, it may be impossible to correct subjective experience for that influence. Once experience that is relevant to a task has been gained, it may be impossible to regain the subjective experience of the naive observer. We will later further discuss this possibility, along with its importance for judgments.

from the attention necessary for its later treatment as an object for recognition memory.

Is Sebastian Weisdorf famous? Most people will respond no, because the name is not familiar to them. Suppose that before being asked to judge whether or not Sebastian Weisdorf is famous you had read the name as one of a list of names that you were told were all nonfamous. Reading the name would increase its familiarity, but recognition of the name as previously read would allow you to be certain that Sebastian Weisdorf is not famous. However, what if the nonfamous names had been read under conditions of divided rather than full attention? That is, suppose you engaged in a demanding listening task while reading the names. Dividing attention might have differential effects on gaining familiarity and recognition memory performance. If Sebastian Weisdorf's name had been read under conditions of divided attention, would its familiarity have been increased, but without sufficient awareness of the source to allow recognition memory? If so, then the name might later be mistakenly judged as famous because of its familiarity. Never having previously encountered the name could no longer be used as a basis for rejecting it as famous. At the same time, recognition memory of the name as a previously read nonfamous name could not be used to discount its familiarity.

The results of an experiment in our lab (Jacoby & Woloshyn, 1987), that followed this outline, are presented in Table 1. Full attention to nonfamous names during their reading did result in those old nonfamous names being recognized and more readily rejected as nonfamous than were new nonfamous names. That is, full attention allowed subjects to later remember the source of a name's familiarity and so correctly judge it nonfamous. However, in the divided-attention condition, subjects were unable to recognize names they had read and mistakenly attributed the familiarity of those names to more general knowledge, the names being famous. In the divided attention condition, old nonfamous names were more likely to be called famous than were new nonfamous names. Also, note that subjects in the divided-attention condition were generally less willing to call any name famous than were subjects in the full-attention condition. This greater conservatism was probably a reaction to confusion among sources of familiarity. People noticed that names sometimes seemed familiar for the wrong reason and consequently required greater familiarity of a name for it to be called famous.

The attention to an event that is necessary to recognize that event later and so specify the source of its effects can differ from the attention that is necessary for the event to have its effects. A failure to specify source amounts to an unconscious influence of memory on later performance. Similarly, Eich (1984) uses the paradigm in which spelling of homophones can be biased by recent experience with the less common meaning of the homophone (see also Jacoby & Witherspoon, 1982), and found that divided attention can produce a chance

TABLE 1 Probability of Judging a Name Famous

Study condition	Type of Name	
	Famous	Nonfamous
NEW	OLD	NEW
Full attention	.62	.19
Divided attention	.49	.27
		.17

level of recognition memory but still leave effects of prior experience on later spelling. Also, Gabrielleik and Fazio (1984) demonstrated that subliminal presentation of words containing a particular letter, such as *t* or *s*, led to an increase in subjects' estimation of the frequency of those letters in the language, in the absence of recognition memory for the words. Zajonc (1980) found that presenting an item for a brief duration can influence its later judged affect, although the item cannot be recognized as previously presented. This dissociation is arguably due to a difference in processing demanded for later recognition memory as compared with the later use of memory in interpreting events (Jacoby, 1984; Seamon, Brody, & Kauff, 1983).

Other limitations on the ability to specify source. Forgetting can produce much the same effect as does divided attention during the occurrence of an event. The influence of dividing attention on the probability of judging an old nonfamous name as famous is similar to the sleeper effect in persuasion (e.g., Cook, Gruder, Hennigan, & Flay, 1979; Hovland, Lumsdaine, & Sheffield, 1949). In those experiments, a message from a low-reliability source had little impact on attitude change when the test was delayed. Hovland et al. suggested that an immediate test, the content of the message is discounted due to its low-reliability source being readily retrieved. Across time, however, the content of the message continued to be remembered, but discounting becomes less likely because the source is forgotten. Greenwald, Pratkanis, Leippe, and Baumgardner (1986) recently questioned the generality of the sleeper effect. However, a sleeper effect of sorts can be obtained under certain conditions. We have done experiments (Jacoby & Jasechko, in preparation) that show that manipulating the retention interval between reading a name and judging its fame can produce effects on fame judgments that are similar to those produced by manipulating attention. As the experimental source of the name's familiarity is forgotten, the name becomes famous.

Dramatic cases of source amnesia have been observed in amnesics. Schacter, Harbluk, and McLachlan (1984) found that amnesics frequently failed to recognize that they had learned new facts in the experimental setting, and instead assumed that they learned the facts from some external source, such as newspapers or television. The memory deficits produced by amnesia or by aging

have sometimes been interpreted as a particular deficit in memory for the source or context (e.g., Hirst, 1982; Winour & Kinsbourne, 1978). However, failures to specify the source of familiarity or other effects of a prior experience are also commonplace among normal people. Brown, Deffenbacher, and Sturgill (1977) provide examples of forgetting of source that are relevant to eyewitness testimony, such as being unable to specify the source of familiarity of a particular face.

The effects of misleading postevent information on eyewitness testimony (Loftus, Miller, & Burns, 1978) may be similar to effects in our fame paradigm in that they reflect differences in attention-demanding processing. For nonfamous names to become famous in our paradigm, they must receive enough attention to gain familiarity, but not enough attention to support later recognition as a name from the nonfamous list. Similarly, for maximal effects of misleading postevent information, enough attention must be directed to the postevent information to encode it, but not so much that it can be detected as discrepant and so resisted. In this vein, Tournant, Hall, and Loftus (1986) found that subjects who paid more attention to a potentially misleading text by reading it more slowly were later less likely to be misled. These subjects may have compared the postevent information provided by the text to their memory for the original event and rejected discrepant information. Tournant et al. speculate that the relationship between attention to postevent information and the effects of that information would be curvilinear.

Monitoring the source of unconscious influence. We have described unconscious effects of memory on perception, subjective experience, and fame judgments. Can people escape unconscious influences of memory? Can they correct their judgments for such memory effects? The effects of memory used as a tool may be eliminated by conscious memory of the source of those effects.

Subjects in the fame experiments could monitor the source of a name's familiarity by attempting to remember whether names appeared earlier in the experiment. Once a name was recognized, it was easy to correct judgments for unconscious memory effects, because there was a simple rule that could be used. All old items were nonfamous, so if a name was recognized it could be judged nonfamous. But such monitoring may have a cost. Monitoring imposes an additional task, that of recognizing, on the subject. The subject now is basically in a dual-task situation and must switch focus between making fame and recognition decisions. The influence of memory as a tool when making fame judgments requires a different focus of attention than does its use as an object to allow recognition memory.

Because monitoring requires resources and time, it should be possible to reduce monitoring by requiring people to engage in some irrelevant task while performing the task that is susceptible to unconscious influences of past experience. That is, we may be most open to unconscious influences when we are so heavily engaged in extra tasks that monitoring is not possible. We have some

preliminary data that are in line with this possibility. When attention is divided during fame judgments, subjects are unable to monitor the source of familiarity and so misattribute the familiarity of old nonfamous names to fame. Here, it seems likely that we are only discovering principles that are already well known to salesmen and other experts in persuasion. To be maximally effective in producing unconscious influences, one should not give people time to think, time to monitor their performance so as to uncover unconscious influences and alter their performance accordingly.

In the fame experiments, monitoring can pay off because once the source of a name's familiarity is specified as due to the experiment, one has a simple rule for judgment, call it nonfamous. Similarly, avoiding the unconscious influence of messages from a perfectly misleading source would only require that the source of a message be recognized. If the source were recognized, we could conclude that the message was false. However, it is seldom the case that conscious memory for a source reliably specifies a judgment. Sources are more likely to be unreliable, so that messages from a source are sometimes true and sometimes false. Recognition of the source, then, does not allow us to be sure whether the message was true or false. In that case, we need to shift to more complex theory-based judgments to avoid unconscious memory effects. We will take up the differences between theory-based and subjective experience-based judgments in the next section.

SUBJECTIVE EXPERIENCE VERSUS THEORY AS A BASIS FOR JUDGMENTS

We can attempt to escape the unconscious influence of prior experiences by consciously remembering those experiences. Once we become aware of a prior event and understand that it influences our current perceptions and judgments, we can deliberately attempt to change the basis for our judgments. Sometimes, as discussed in the last section, we can easily correct our judgments with a simple rule. However, such easy corrections may be rare. In many cases, unconscious influences may be complex, prior events may influence current experience in ways too complicated to comprehend. In those cases, we would be tempted to somehow remove or ignore the prior experience. But once an event has been experienced, memory for that experience cannot be simply erased.

Memory for a prior event is likely to influence our subjective experience unintentionally and be beyond any attempt at control. This is important, because subjective experience is often used as a basis for judgments and can be spoiled for that purpose. To illustrate, one often relies on subjective experience when judging whether a paper is well written. We judge the flow of an argument in terms of how easily we are able to follow it. Unfortunately, the quality of the writing often seems to improve with each rereading. Arguments that were originally very difficult to follow later seem clear. Indeed, when we reread a paper during the editing process, it often seems that the paper could be

experience. The paradigm is best illustrated with an example. How difficult would it be for people to solve the anagram *fscar*? If you are like most of our subjects, you would answer that question by first solving the anagram yourself and answering on the basis of whether you found it easy or difficult to solve. What if we asked you to judge the difficulty of an anagram with the answer present, for example, *scar/fscar*? The solution word very effectively blocks the tactic of first trying to solve the anagram. Presenting the solution obviously spoils the subjective experience of solving the anagram and deprives one of using that subjective experience as a basis for predicting the performance of others. With the solution present, you are forced to judge the difficulty of the anagram on the basis of some theory about anagrams, rules such as "low frequency words are harder to solve."

The use of a theory is an analytic basis for judgments, whereas judgments based on subjective experience are more nonanalytic and global (Jacoby & Brooks, 1984). When one uses a theory to judge anagram difficulty, particular factors can be given more or less weight in the judgment or can even be considered irrelevant and ignored entirely. Such analytic judgments give people control over the information that will enter into their decision. In contrast, subjective experience as a basis for judgment is essentially nonanalytic. A number of factors act en masse to determine the experienced difficulty of a particular anagram, without the subjects' awareness or understanding of the influence of the separate factors. Such nonanalytic judgments are global or comprehensive. Nonanalytic judgments incorporate factors of which subjects are not aware, and which would be overlooked by theories. The down side of nonanalytic judgments is that they are overinclusive, incorporating irrelevant as well as relevant factors. A factor such as recently reading the solution word to an anagram reduces the difficulty of that anagram for a person, but is irrelevant to judging the difficulty of the anagram for others. However, the irrelevant factor cannot be separated out or ignored in a nonanalytic judgment.

One purpose of our experiment was to document that subjective experience and theory serve as qualitatively different bases for predicting the performance of others. We expected that using the subjective experience of difficulty (anagram-alone items) would lead to a different pattern of judgments for others than would theory-based judgments (anagram-with-solution items). If subjective experience is a different basis for judging difficulty than is a theory, then particular anagrams should yield different judgments under the two conditions (Rubin, 1985). That is, predicted item difficulty should be reordered between the conditions. The two bases for judgments would produce the same ordering of anagrams in their predicted difficulty only if people had a theory that made predictions equivalent to those based on subjective experience. To do this, the theory would have to specify the factors influencing the difficulty of anagrams and would also have to specify how those factors interact. We also expected predictions based on subjective experience to be made more rapidly than were

shortened considerably and still make its points. In this vein, we suspect that the improvement in a paper that results from the editorial process has as much to do with changes in the editor's memory as a tool for interpreting the paper as it does with changes in the paper. After the first reading, our comprehension has been pervasively altered, and no attempt to "ignore" our previous reading of the paper can let us recapture our status as a naive reader.

In the example above, we can easily remember prior readings of the paper, and realize that our current ease of comprehension may reflect some influence of those prior readings. But even if we are aware of those effects, it is not clear how our current subjective experience should be "corrected." One cannot simply subtract a constant from our current level of comprehension. There may well be interactive effects, so that memory used as a tool in reading contributes more to the comprehensibility of some sections of a paper than to others. We can no longer rely on subjective experience to judge the quality of writing, and so we must resort to some theory to predict difficulties in comprehension that will be encountered by the naive reader. When revising a paper, one becomes aware that those theories are neither simple nor exact.

This phenomenon of spoiled subjective experience may be relevant to the hindsight effect. The striking thing about the hindsight bias is that people are so unable to escape it. Once given the outcome of an uncertain event, people find it nearly impossible to ignore that outcome and make predictions that are equivalent to those of the naive subject. By our view, giving people the outcome of an uncertain event robs them of a fundamental basis for assessing uncertainty—their subjective experience of that uncertainty. Once heard, the influence of outcome information is inescapable; subjects cannot return to a state of ignorance. Similarly, an illegal piece of evidence heard by a jury may be stricken from the record, but will likely continue to influence jurors' judgments. In both cases, people's experience and interpretation of later events is influenced even when they are told to disregard the earlier event.

The only way that people can escape a hindsight bias is to shift to an alternative means of making judgments. If people have well-developed theories of assessing probabilities in all domains, such as a theory of assessing guilt or innocence that fits all cases, they can use those theories when subjective experience is rendered suspect. We think judgments based on subjective experience are more open to unconscious influences of memory than are judgments that are based on a theory. One might take this as an indictment of subjective experience as the basis for judgments. However, we will later argue that subjective experience is still often the best basis for judgments. There are many important domains in which we lack good theories that can substitute for subjective experience as a basis for judgments. Use of a poor theory can be more detrimental than is the use of spoiled subjective experience.

Predicting the performance of others. We explored the differences between predicting for others on the basis of theories versus on the basis of subjective

relatively low correlation of difficulty ratings between the conditions ($r = .30$) is consistent with the claim of qualitatively different bases for judgment.

The third question we asked was what subjects would use as a basis for judgment when their subjective experience was spoiled by previous reading of solutions. Would they continue to use subjective experience, or would they switch to theory-based judgments? As predicted, presenting solutions to anagrams in the first phase of the experiment led to substantially faster solution times for those anagrams, so subjective experience was likely spoiled. However, judgments for the old-anagram-alone items led to a pattern of results that suggested that subjects continued to base their judgments on subjective experience, rather than shifting to a theory. Item-difficulty ratings for the old-anagram-alone items were substantially correlated with ratings for the anagram-alone items ($r = .71$) and less correlated with ratings for the anagram-with-solution items ($r = .30$). As expected if old anagrams were rated on the basis of subjective experience, the ratings correlated substantially ($r = .80$) with speed of solution. Difficulty ratings for the old-anagram-alone items were made more quickly than for the anagram-with-solution items, which again fits with an interpretation that those ratings were made on the basis of subjective experience, rather than a theory.

When subjects received the solutions to the anagrams in an earlier phase of the experiment, they continued to use their flawed subjective experience of anagram difficulty when rating the difficulty of anagrams for others. Their predictions for others suffered from this use of flawed subjective experience. Reading the solution words in the first phase of the experiment resulted in these old-anagram-alone items being rated as much easier for others to solve ($\bar{X} = 2.99$) than were new-anagram-alone items ($\bar{X} = 3.70$). That is, subjects acted as if reading the solution word made that anagram easier to solve for another person who had not read the solution word. The predicted difficulty of old-anagram-alone items was even lower than anagrams with solution ($\bar{X} = 3.20$). Flawed subjective experience resulted in a greater underestimate of difficulty than did use of a theory.

Subjects' failure to discount their subjective experience may have occurred because they did not successfully monitor the overlap between the first-phase words and the solutions to anagrams in the second phase. However, we required a few people in a preliminary experiment to report when they recognized a solution word as having been presented in the first phase of the experiment and found that recognition memory performance for those people was very high. Despite their high level of recognition memory performance, those subjects still appeared to use their spoiled subjective experience as a basis for judging anagram difficulty. People were generally unwilling to abandon subjective experience as a basis for judgments. As an indication of this unwillingness, in the preliminary experiment, we caught a few people covering the solution word with their hands when anagram-with-solution items were presented. Covering the

those based on a theory. Basing predictions on a theory is effortful and time consuming, whereas predictions based on subjective experience often seem almost immediate.

We arranged a third condition to investigate possible unconscious effects of prior experience on subjective experience of anagram difficulty. In that condition, the solution words appeared in an earlier phase of the experiment. In the earlier phase, subjects simply read a list of words, half of which appeared later in the experiment as anagrams to be solved. We predicted that prior reading of the solution words would lead to faster solution times for the anagrams (Dominowski & Ekstrand, 1967). But would subjects be aware of that influence on their performance and so discount their subjective experience when judging for others? If so, they might shift to theory-based predictions, and produce a pattern of results similar to the anagram-with-solution condition. However, subjects could be unconsciously influenced by prior experience, either because they failed to remember the experience of reading a solution word or failed to understand its influence on their later solving of an anagram. If subjects were influenced unconsciously by the prior presentation, they would rely on their subjective experience and produce a pattern of judgments similar to that of anagrams in the anagram-alone condition.

When an anagram was presented alone during the test phase of the experiment, subjects were required to first solve the anagram, saying the solution word aloud. Next, the anagram was presented with a 7-point scale that was to be used for judging the difficulty of the anagrams for others. A rating of 1 meant *maximally easy*, whereas a rating of 7 meant *maximally difficult*. Times both for solving the anagram and for rating the difficulty of the anagram were recorded. When an anagram was presented with its solution word, subjects read the solution word aloud and then rated the difficulty of the anagram.

First, did subjects base their judgments of anagram-alone items on their subjective experience? For anagram-alone items, the average correlation between subjects' time to solve an anagram and their rating of anagram difficulty was quite high, ($r = .84$), which is consistent with the claim that subjects did base their judgments on subjective experience of item difficulty. Second, did subjects use a different basis for judging the anagram-with-solution items? The data for the two conditions differ in a number of ways. Anagrams were judged as easier for others to solve when presented with their solution word ($\bar{X} = 3.20$) than when presented alone ($\bar{X} = 3.70$). More important is evidence of a qualitative difference in the way subjects judged the two types of items. Subjects took longer to make their difficulty ratings for the anagram-with-solution items than for the anagram-alone items, as would be expected if judgments for anagrams-with-solution items were based on a theory, whereas those for anagram-alone items were based on subjective experience. To gain further evidence of a qualitative difference in the basis for judgments, we collapsed ratings across subjects and compared the patterns of relative difficulty ratings for the two conditions. The

appropriateness of our normal style of interaction with others, our attempt to be analytic may make our behavior even more awkward. There seems to be no set of rules for social interactions that can be widely applied. Removing faith in our ability to act according to what "feels right" can lead to a loss of confidence and inaction.

However, basing judgments for others on subjective experience does, in part, deserve its bad reputation. Reliance on subjective experience when judging for others can lead to egocentric errors of the extreme sort made by children (Piaget & Inhelder, 1956). Olson (1986) argues that children fail to distinguish between what they see, and therefore what others could see, and what they know. For example, he showed young children pictures of various animals, such as a red cat and a green dog, and then hid the cat behind a barn such that only a patch of red was exposed. When the children were asked to predict what someone who had not been shown the animals would see, they responded "a cat, because it is red." Olson suggests that children have not yet developed the ability to treat a stimulus objectively so as to distinguish between what is given in the stimulus and what is simply their interpretation of it. They later develop that distinction and no longer make egocentric errors in predicting what others will see.

We would argue that people do not develop a general ability to distinguish what is given in a stimulus and what is an interpretation. Instead, even adults continue to rely on their interpretations—their subjective experience—to judge the qualities of a stimulus, although those interpretations are susceptible to unconscious influences. People do realize that in certain situations they must give up subjective experience as a basis for judgment and rely on more analytic, theory-based judgments. However, the ability to know that subjective experience is a bad basis for predicting for others may be situation specific. For example, when writing, even adults have difficulty separating their interpretation of what they have written from what is actually given in a text. Also, to avoid egocentrism, one must have a good theory that can replace subjective experience as a basis for judgments.

People may be biased toward relying on subjective experience rather than theories. Such experience-based judgments require less work, as evidenced by the time required to make ratings in our anagram study. Subjective experience might also be a preferred basis for judgment because it has such a compelling quality of veridicality. That is what gives perceptual illusions their power to amaze us. We are used to the many cases in which experience is a valid reflection of the world and cannot appreciate variables that act unconsciously to invalidate experience. If we have used subjective experience to predict for others, and seen it fail, we are tempted to attribute our failed prediction to qualities of the others, rather than to our own experience. The failure of subjective experience must be clear before we are willing to abandon it and, even then, abandoning subjective experience should depend on the availability of a good theory. An extremely good theory may be necessary to achieve the same accuracy of predictions that

solution word was apparently an attempt to keep subjective experience from being spoiled as a basis for judgments.

There was good reason to be hesitant to abandon subjective experience, because it provided a quick and relatively accurate basis for predictions. More important, subjects' theories of anagram difficulty were not particularly good. We used the average reaction time on each item in the anagram-alone condition as the criterion measure for prediction. That measure indicates the actual difficulty of items, which subjects attempted to predict. Subjective experience-based predictions (anagram-alone ratings) correlated highly with the actual difficulty of the items ($r = .93$). In contrast, theory-based predictions (anagram-with-solution items) did not serve as well in predicting anagram difficulty. Ratings for the anagram-with-solution items correlated only .31 with the criterion reaction time.

When subjective experience was flawed, subjects made better predictions when they continued to rely on subjective experience than they could have by switching to a theory. Ratings in the old-anagram-alone condition correlated .79 with the actual difficulty of items, which was substantially better than the .31 correlation achieved by theory-based predictions. Although flawed subjective experience was disadvantaged, as compared with theory-based judgments, in that it more greatly underestimated item difficulty on the average, it better captured the relative difficulty of items.

Knowing when to analyze, and when analysis fails. Predicting for others on the basis of subjective experience when that experience has been spoiled by unconscious influence can lead to serious errors. Equally serious errors can arise from predicting on the basis of a bad theory. In the anagram study, people did not have a theory that was sufficiently good that its use could profitably replace spoiled subjective experience as a basis for judgments. We have observed similar cases of the failure of analysis in detecting misspelled words. Many people judge whether a word is spelled correctly by an unanalyzed feeling that it looks right. If that feeling is invalidated, one is in trouble because there is no well-specified theory of spelling. A dramatic example of this occurred when Ann Hollingshead, a research technician in our laboratory, ran a series of experiments involving misspelled words. Seeing the misspelled words unfortunately increased their familiarity, and now misspellings such as *amoung* no longer look wrong to her. The few rules of spelling such as "i before e except after c" are neither widely applicable nor reliable enough to serve as an analytic basis for her judgments. The result is that she has now generally lost confidence in the accuracy of her spelling, although prior to working in our lab, she was an executive secretary and very proud of the accuracy of her spelling.

Particularly in social domains, there may be no theory to use when the validity of subjective experience is called into question. In those domains, reducing a person's faith in subjective experience can be crippling. Consider the self-consciousness that one sometimes feels in social situations. If we suspect the

can be produced on the basis of subjective experience. The theory would have to specify the important variables that influence performance and interactions among those variables. Subjective experience as a basis for predicting for others, in contrast, takes interactions into account in a nonanalytic fashion, by predicting that those effects on the performance of others will be the same as for oneself.

Theory-based judgments do have the advantage of being more likely to avoid unconscious influences of memory. However, academicians sometimes hold analysis in too high regard. Our theories often oversimplify and, in so doing, fail to capture the richness of number of factors and interactions among factors that is reflected by nonanalytic judgments. In line with the claim of the humanists, we probably would sometimes be better advised to rely on intuition, subjective experience, rather than on a poor theory. The trick is to avoid being egocentric while avoiding being "blinded by theory."

SUMMARY AND CONCLUDING COMMENTS

Unconscious influences are even more pervasive than the psychoanalytic tradition would have it. By that tradition, memory for traumatic events has far-reaching unconscious influences. We argue that the source of unconscious influences is memory for an incredibly large number of mundane events. The influence of memory for a particular event is local, limited by conditions of retrieval.

We have argued that memory used as a tool commonly results in unconscious influences of memory for a prior event. The use of memory as a tool is of great advantage in enhancing perception and aiding the interpretation of the events. However, its use can also have effects such as changing the subjective experience of a background noise, making nonfamous names be judged famous, and producing underestimates of the difficulty of anagrams. These unconscious influences of memory can be avoided by treating memory as an object so as to monitor performance for effects of a particular prior event. As in the famous judgment experiments, recognizing that memory for an irrelevant event can potentially influence our judgments is sometimes sufficient to allow us to escape those unconscious influences. However, the use of memory as an object requires a different focus of attention than does the use of memory as a tool and can also require different types of prior processing and different cues for retrieval. The reduction in processing of an event produced by dividing attention can result in unconscious influences of memory that cannot be escaped by monitoring judgments for those effects. Even when the influence of memory for a prior event is recognized, people are often unable to specify the details of those effects. To fully escape unconscious influences requires a theory that is sufficiently exact to satisfactorily replace subjective experience as a basis for judgments.

Should we constantly engage in analysis so as to avoid unconscious influences? First, to do so is extremely costly, as monitoring performance to

uncover influences of memory is an extra burden that requires taking attention off the task at hand. Second, even if one tracks down such influences, one can often do little to fully compensate for them. Being aware that subjective experience has been spoiled by irrelevant factors may justify reducing one's confidence in a judgment based on subjective experience, but may not allow recourse to a better basis for judgments. Even spoiled subjective experience is a better basis for judgments than is a bad theory. Indeed, constantly questioning subjective experience and continually attempting to replace it with theory as a basis for judgments would be so disadvantageous as to allow survival in only a very special environment: academia.

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