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## AT A LOSS FROM WORDS: Verbal Overshadowing of Perceptual Memories

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There are two broad, and seemingly contrasting, themes that characterize many discussions of the relationship between language and thought. On one hand, many theorists have proposed that language represents the central scaffolding for cognition. In this vein, Wittgenstein (1922/1961) observed, "The limits of my language mean the limits of my world" (p. 115) and Sapir (1921, cited in Hardin & Banaji, 1993) proclaimed, "We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation" (p. 277). An equally acclaimed tradition, however, has argued that there are many thoughts that transcend words. So, for example, James (1891) noted, "Great thinkers have vast premonitory glimpses of schemes of relations between terms, which hardly even as verbal images enter the mind, so rapid is the whole process" (p. 255). Einstein (cited in Schlipp, 1949), in a striking fulfillment of James' characterization, reported, "These thoughts did not come in any verbal formulation. I very rarely think in words at all. A thought comes, and I may try to express it in words afterwards" (p. 228).

Although these two depictions of the relationship between language and thought might seem at odds, research in a number of domains of perceptual memory suggests that they may both be accurate. For example, individuals' ability to successfully recognize difficult-to-verbalize colors (Heider, 1972),

faces (Polanyi, 1966), and nonverbal forms (Atneave, 1957) reveals the substantial degree to which knowledge can often transcend linguistic skill. Yet these domains are not immune to the influence of language, as revealed by the recognition advantage of easily named colors (Luce & Schweder, 1979), the impact of postevent verbal information on memory for faces (Greene, Flynn, & Loftus, 1982), and the influence of verbal labels on memory for form (Carmichael, Hogan, & Walter, 1932). In short, cognitive representations can exceed, and yet still be influenced by, language. The confluence of these two premises raises an intriguing question: What happens when one attempts to articulate cognitions that cannot be fully captured in words? More specifically, what happens when one attempts to describe their memory for an indescribable perceptual experience? If perceptual memories exceed words, and yet can be constrained by language, then describing one's recollections of perceptual experiences might actually impede later access to the nonreportable aspect of those experiences.

There has been a growing accumulation of evidence that verbalization of perceptual memories can interfere with subsequent memory performance. This verbal disruption of nonverbal cognition was initially examined by J. W. Schooler and Engstler-Schooler (1990) in the domain of face recognition. Face recognition is an ideal area in which to examine the impact of verbalization on nonverbal cognition because of the marked disparity between nonverbal memory, as revealed by recognition ability, and verbal memory, as revealed by the (in)ability to describe faces. Indeed, this disparity has served as the jumping-off point for prior philosophical discussions of the relationship between verbal and nonverbal thought. For example, Polanyi (1966) began his seminal discussion of the nature of tacit knowledge with the following observation:

I shall reconsider human knowledge by starting from the fact that we can know more than we can tell. . . . Take an example. We know a person's face, and can recognize it among a thousand, indeed a million. Yet we usually cannot tell how we recognize a face. So most of this knowledge cannot be put into words. (p. 4)

This self-evident disparity between the verbalizable and nonverbalizable aspects of face memory has also been demonstrated empirically. Although face recognition is typically quite good (Shapiro & Penrod, 1986), verbal descriptions of faces are often not precise enough to enable judges to distinguish target faces from similar distractors (e.g., Ellis, Shepard, & Davies, 1980).

If face recognition performance markedly exceeds the ability to articulate the basis for that performance, and if the use of language can influence the application of nonverbal knowledge, then describing one's memory for

a face might actually hamper subsequent recognition. It is important to note that such a prediction is contrary to the standard view that verbal rehearsal generally improves memory performance (e.g., Darley & Glass, 1975; Glenberg & Adams, 1978; Maki & Schuler, 1980). Nevertheless, J. W. Schooler and Engstler-Schooler (1990) found that verbalizing the appearance of a previously seen face significantly impaired subjects' subsequent ability to discriminate the target face from verbally similar distractors. Schooler and Engstler-Schooler termed this interference "verbal overshadowing" on the basis of two hypotheses regarding the nature of this interference: first, that the disruptive effects of verbalization are specifically the consequence of verbalizing nonverbal cognition, and second, that verbalization overshadows but does not eradicate the original perceptual memory. In addition, they introduced a general account of verbal overshadowing effects, termed the "recoding interference hypothesis," based on the premise that the act of verbal recall produces a verbally recoded memory representation that interferes with access to the original visual representation. We review Schooler and Engstler-Schooler's original studies in the context of these three characterizations of verbal overshadowing effects in order to provide a conceptual foundation on which to base our review of the more recent findings on this topic.

### I. Three Premises of Verbal Overshadowing

#### A. THE MODALITY MISMATCH ASSUMPTION

A central component of Schooler and Engstler-Schooler's original account of the negative effects of verbalizing a face is the assumption that the disruptive effects of verbalization are specifically the result of a mismatch between the nonverbal perceptual knowledge associated with the original memory and the verbal knowledge associated with the act of verbalization. This premise, which we here term the *modality mismatch assumption*, is based on the standard premise of many cognitive models that memory can involve two distinct types of knowledge: nonverbal/perceptual information and verbal/conceptual information (e.g., Bartlett, Tull, & Levy, 1980; G. R. Loftus & Kallman, 1979; Mandler, 1980; Pavio, 1986). One central prediction of the modality mismatch assumption is that the effects of verbalization should critically depend on the degree to which memory performance relies on nonverbal knowledge. Schooler and Engstler-Schooler provided several strands of evidence for the role of memory verbalizability in mediating the effects of verbalization. For example, they investigated the impact of verbalizing a previously seen color. As with faces, color represents another

domain of perceptual memory that, although influenced by language, cannot be fully captured in words (cf. Heider, 1972; Lucy & Schweder, 1979). And, as with faces, Schooler and Engstler-Schooler observed that verbalization of a previously seen color impaired subsequent memory performance. When subjects saw a shade of a color (e.g., army green) and then attempted to describe it, their subsequent ability to distinguish that particular shade from other similar shades was impaired relative to control subjects who did not describe the color.

In contrast to the disruptive effects of verbalizing memories for nonverbal stimuli such as faces and colors, Schooler and Engstler-Schooler observed a rather different pattern of results when they examined the impact of verbalization on the recognition of a more verbal stimulus. In this study, after subjects viewed a video tape of a bank robbery, they were asked to engage in one of three tasks: verbally recalling the appearance of the robber's face, verbally recalling what he said, or engaging in an unrelated verbal activity (e.g., naming states). Subjects were then given recognition tests for both the target face and the target statement. As can be seen in Fig. 1, although verbalization markedly impaired recognition of the target face, it numerically improved recognition of the verbal statement, thereby providing further support for the premise that the effects of verbalization critically depend on the degree to which the memory task requires non-reportable knowledge. When nonreportable knowledge is required, as in the case of face and color recognition, verbalization disrupts performance. However, when nonreportable knowledge is not required, as in the case of statement recognition, verbalization is benign.

Additional evidence for the modality mismatch assumption was provided by an examination of the impact of engaging in nonverbal recall, that is, visualization. If the consequences of verbalization are specifically the result of attempting to commit nonverbal knowledge to words, then visual recall should not disrupt performance. Consistent with this prediction, Schooler and Engstler-Schooler observed that, in contrast to verbalization, visualization of a previously seen face did not impair performance. Visualization was also found to have no effect on color recognition.

#### B. THE AVAILABILITY ASSUMPTION

Another premise of verbal overshadowing is that verbal knowledge overshadows but does not eradicate the original nonverbal memory. The central claim of this assumption is that the original memory remains available (Tuving & Pearlstone, 1966), and thus effects of verbalization should be reversible if conditions can be introduced that favor retrieval of nonverbal knowledge. Schooler and Engstler-Schooler addressed the availability of

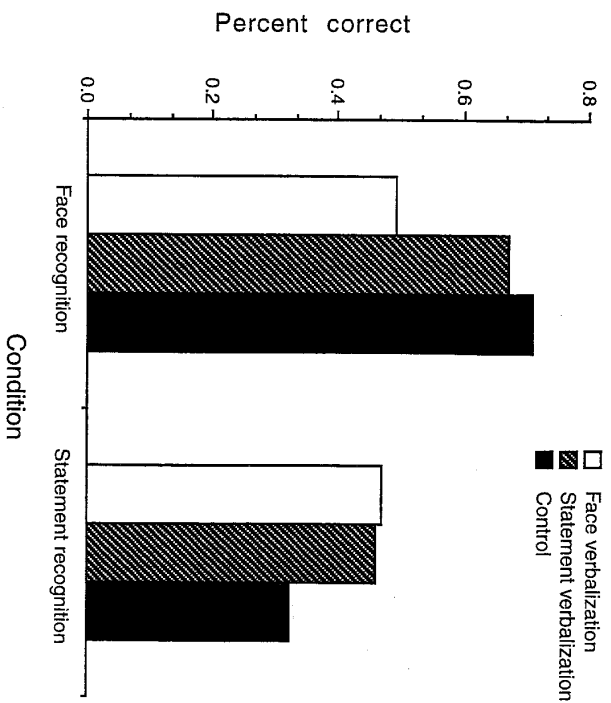


Fig. 1. Percentages of correct face and statement recognition. From J. W. Schooler & Engstler-Schooler (1990, Experiment 4). Copyright 1990 by Academic Press, Inc.

the original memory by drawing on the premise, suggested by a variety of investigators, that visual components of perceptual memories are accessed prior to the verbal components (e.g., Bartlett et al., 1980; Pavio, 1986; Rabinowitz, Mandler, & Barsalou, 1977). This differential access rate of the two types of information suggests that, if subjects are limited in the amount of time given to make a recognition response, they might be compelled to rely primarily on their visual representation, thereby avoiding the disruptive consequences of verbalization. In a final experiment, Schooler and Engstler-Schooler tested this premise by introducing a new condition in which subjects were given only five seconds in which to recognize the target face. Under the standard recognition conditions, the negative impact of verbalization was observed. However, when subjects were forced to make very quick decisions, thereby presumably constraining them to the quickly accessed visual representation, no effect of verbalization was shown. This finding supported the availability assumption and thus the claim that

verbalization overshadows but does not eradicate the original visual memory.

### C. THE RECODING INTERFERENCE HYPOTHESIS

Schooler and Engstler-Schooler accounted for the findings just described by suggesting that the act of verbally recalling a nonverbal memory results in the formation of a new verbally biased representation, which interferes with access to the original visual memory. This recoding interference hypothesis is generally consistent with various memory theories that assume that perceptual memories are often recoded into verbal representations (e.g., Bransford & Franks, 1971; Glanzer & Clark, 1963). The verbal recoding hypothesis also enables verbal overshadowing effects to be readily related to more standard memory interference results. For example, the verbally recoded representation could be viewed as a form of self-generated misinformation (e.g., E. F. Loftus, Miller, & Burns, 1978; J. W. Schooler, Gerhard, & Loftus, 1986), which interferes with the visual memory. Most importantly, the recoding interference hypothesis readily accounted for most of Schooler and Engstler-Schooler's findings. First, it explained why verbalization interferes with visual but not verbal memories. A verbally biased representation is unlikely to provide a veridical description of a nonverbalizable stimulus but should maintain the critical information necessary for the recognition of a verbal stimulus. Second, it explained why visualization does not impair recognition of visual stimuli. Recollection within the same modality is more likely to be veridical and thus less likely to lead to an ill-matched representation. And, third, recoding interference helped to account for why limiting recognition time facilitates performance. With limited recognition time, subjects have less opportunity to access their verbally biased representation.

Although the recoding interference hypothesis was effective in accounting for most of Schooler and Engstler-Schooler's findings, there was one finding for which it was less successful. Specifically, if the negative effects of verbalization are a consequence of relying on a memory representation corresponding to the verbal recollection, then one might reasonably expect a relationship between the contents of subjects' verbalizations and their recognition accuracy. In other words, the recoding interference hypothesis seems to suggest that more accurate verbalizations should lead to greater recognition accuracy than less accurate verbalizations. However, in several experiments, Schooler and Engstler-Schooler failed to find a relationship between subjects' face recognition performance and the accuracy of their descriptions, as assessed by judges using an independently devised coding scheme. Schooler and Engstler-Schooler noted that this lack of a relationship was somewhat problematic for the recoding interference hypothesis,

but suggested that it could be explained by assuming that the recoded representation includes both verbal and visual elements combined in an idiosyncratic manner. As a consequence, they suggested that "the retrieved recoded memory may neither resemble the original visual memory nor the subsequent verbalization" (1990, p. 65), thereby accounting for the absence of a relationship between the contents of subjects' verbalization and their recognition performance.

### D. SUMMARY OF THE ORIGINAL PREMISES OF VERBAL OVERTHROWING

In sum, Schooler and Engstler-Schooler's examination of the disruptive effects of verbalization on perceptual memories introduced three general premises regarding the manner in which language may overshadow nonverbal cognition. The first premise, which we term the *modality mismatch assumption*, presumes that language specifically interferes with the application of the nonreportable aspects of perceptual memories. This assumption was supported both by stimulus differences (i.e., verbal rehearsal disrupts the recognition of several types of nonverbal stimuli, but not verbal stimuli) and by processing differences (i.e., verbal rehearsal impairs performance but visual rehearsal does not). A second premise, which we term the *availability assumption*, asserts that verbalization overshadows but does not eradicate the original visual memory. This assumption was supported by the finding that limiting recognition time attenuates the negative effects of verbalization, presumably by constraining the retrieval of verbal information. A third premise, termed the *recoding interference hypothesis*, assumes that the disruptive effects of verbalization are a consequence of retrieving a nonveridical, verbally biased representation generated during the process of verbalization. This interpretation accounted for all of the primary findings, although it did make one prediction that was not supported, that is, that the contents of subjects' verbal descriptions would be predictive of their recognition accuracy.

Since the publication of Schooler and Engstler-Schooler's original series of studies, additional research, across a variety of domains of perceptual memory, has further investigated all three of the above claims. As will be seen in the following review, there is now substantially more evidence for both the modality mismatch and availability assumptions. The recoding interference hypothesis, however, has proven to be inadequate for accounting for some findings, and has thus required some supplementation.

## II. THE MODALITY MISMATCH ASSUMPTION

The claim that the effects of verbalization are a result of a disparity between verbal and nonverbal knowledge has proven to be a rather powerful princi-

ple that has led to a number of successful predictions. In this section we review the evidence for three distinct predictions of the modality mismatch assumption. (1) *the generality of verbal overshadowing*—if verbalization disrupts the application of nonverbal knowledge, then the effects of verbalization should generalize across domains that rely on nonverbal knowledge; (2) *processing differences*—if it is specifically the language component of verbal rehearsal that produces the interference, then the effects of rehearsal on nonverbal stimuli should be shown to specifically depend on whether or not verbal processes are engaged; (3) *expertise differences*—if verbalization specifically disrupts the application of nonverbal knowledge, then its effect should depend on individuals' relative verbal and nonverbal expertise. Accordingly, individuals whose perceptual expertise markedly exceeds their verbal expertise should be vulnerable to verbalization. In contrast, individuals whose verbal and nonverbal expertise is more commensurate should be relatively unaffected by verbalization. We now consider the evidence in support of these various predictions of the modality mismatch assumption.

#### A. THE GENERALITY OF VERBAL OVERSHADOWING

The claim that language interferes with the application of nonverbal knowledge makes a rather strong prediction about the generality of verbal overshadowing effects, namely that they should apply across the domains of cognition known to rely on nonverbal knowledge. Although this claim naturally follows from the modality mismatch assumption, we have nevertheless been rather surprised to discover the extent to which verbal overshadowing effects apply across domains of perceptual memory, as well as to other areas of cognition known to rely on nonverbal knowledge. We briefly review these various domains.

##### 1. *Memory for Forms*

Memory for forms has long been known to be influenced by language. For example, Carmichael et al. (1932) demonstrated that verbal labels associated with nonverbal forms during encoding could bias the manner in which such forms were subsequently reproduced (see also Daniel, 1972; Riley, 1962). Memory for forms has also been shown to involve knowledge, which, at least for some items, is inherently nonverbalizable. For example, Atneave (1957) found that individuals were able to recognize hard-to-name forms despite their inability to label them. Thus, according to the modality mismatch assumption, memory performance that relies on the nonreportable aspects of memory for visual forms should be vulnerable to verbalization. Recently, several studies by Brandimonte and colleagues (e.g., Brandimonte & Gerbino, 1993, 1996; Brandimonte, Hitch, & Bishop,

1992a, 1992b; Brandimonte, Schooler, & Gabrino, 1997) have provided support for this claim. The basic paradigm used by Brandimonte and colleagues involves having subjects study a set of visual forms like those illustrated in Fig. 2. During this study phase several manipulations have been used to moderate the degree to which individuals verbalize the forms. In some studies, verbalization is manipulated covertly by using either easy- or hard-to-name forms, with the assumption being that subjects will be more likely to spontaneously verbalize easy-to-name as compared to hard-to-name forms. In other studies, verbalization is overtly manipulated by either presenting or not presenting verbal labels with the forms during encoding. After subjects learn the forms under either verbal or nonverbal conditions, they are then given an imagery task that requires them to manipulate their veridical visual memories. For example, in a study by Brandimonte et al. (1992b), subjects were asked to mentally rotate the forms and determine the constituent letters contained in the rotated forms (see Fig. 2). The standard result from these studies is that individuals' ability to successfully complete the memory-based imagery task critically depends on whether the prior encoding conditions encouraged or discouraged verbalization. Under conditions in which verbal encoding occurs (e.g., easy-to-name forms or labeled hard-to-name forms) visual imagery performance is impaired relative to conditions in which verbal encoding is not encouraged (e.g., unlabeled hard-to-name forms).

##### 2. *Memory for Macrospatial Relationships*

Macrospatial memory (i.e., memory for the relationship between spatial locations in the environment) has also been shown to involve distinct types of representations that vary in their reliance on verbal and nonverbal knowledge (e.g., route vs configural representations, Hirtle & Hudson, 1991; procedural vs survey knowledge, Siegel & White, 1975; Thorndyke & Hayes-Roth, 1982). According to the modality mismatch assumption, the existence of such dichotomies suggests that certain aspects of a macrospatial memory should be susceptible to verbalization, while others may be invulnerable. Consistent with this prediction, Fiore and Schooler (1997) found that verbalizing one's memory for the route on a map impaired later performance on a measure of the configural aspects of that map (Euclidean distance estimations), while having no effect on a measure of the more verbalizable featural aspects (route distance estimations).

##### 3. *Memory for Taste*

Taste is another domain of perceptual memory that is known to transcend linguistic depiction, as revealed by common allusions to the "indefinable"

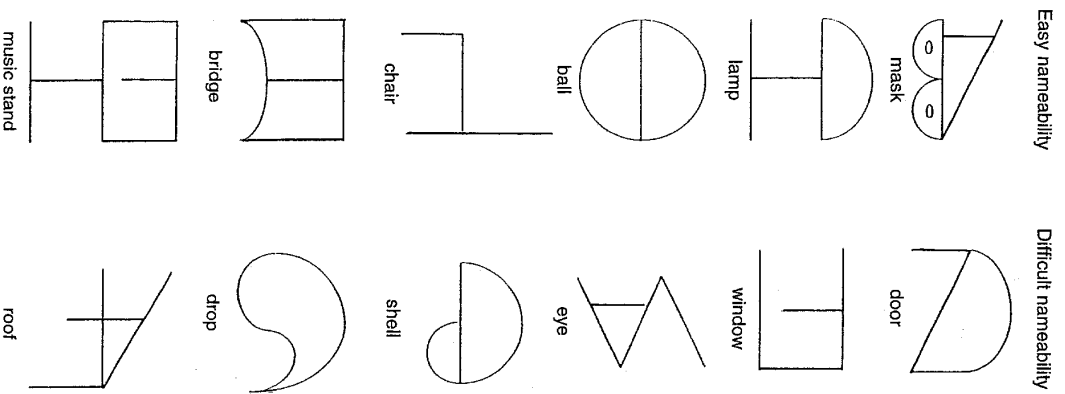


Fig. 2. Easy and difficult nameability stimuli. Originally used in Brandimonte et al. (1992b). Copyright 1992 by the American Psychological Association. Reprinted with permission.

ity' of tastes. Although surprisingly little research has been conducted on taste memory per se, olfaction is a fundamental component of the taste experience (Lawless, 1985) and considerable research has examined the relationship between language and olfaction memory. This literature indicates that, as with other perceptual experiences, memory for smell is frequently influenced by language (e.g., Engen & Ross, 1973). Nevertheless, there are many cases in which individuals' memory for smells exceeds their ability to describe them, that is, they can recognize previously encountered scents that they were unable to label (Lawless & Eagen, 1977). This nonverbalizability of olfactory memory, and by extension taste memory, suggests that it too should be vulnerable to verbalization. Consistent with this prediction, Melcher and Schooler (1996) found evidence that describing the taste of a wine can interfere with its subsequent recognition.

#### 4. Memory for Audition

As with other perceptual domains, auditory memory is known to be influenced by, yet often exceed, linguistic expression. For example, although memory for musical segments can involve both verbal and nonverbal codes (e.g., Krumhansl, 1991; Samson & Zatorre, 1991), novice listeners have been shown to be unable to make use of the verbal code (e.g., Makumo, 1992; Zatorre & Beckett, 1989). Thus, according to the modality mismatch assumption, memory for music also should be vulnerable to verbalization. Consistent with this prediction, Houser, Fiore, and Schooler (1997) found that verbalizing a previously heard musical segment significantly impaired subjects' ability to distinguish it from similar distractors.

#### 5. Other Domains of Nonverbal Cognition

If verbalization interferes with application of nonverbalizable knowledge, then, in principle, the negative effects of verbalization should extend beyond perceptual memory. In further support of the modality mismatch assumption, we, and others, have now found evidence of negative effects of verbalization across several other domains that rely on nonverbal processes.

*a. Affective Decision Making* Knowledge of the basis of one's judgments is a type of cognition that is notoriously difficult to verbalize (e.g., Nisbett & Wilson, 1977). At the same time, affective judgments are known to be influenced by language (e.g., Cooper & Fazio, 1984). Thus, affective judgments represent another domain of cognition that, according to the modality mismatch assumption, might be vulnerable to verbalization. Consistent with this prediction, Wilson and Schooler (1991) found that, relative to nonverbalizing controls, subjects who verbally analyzed the reasons for

affective judgments (e.g., taste quality of strawberry jams) made decisions that were less in line with the opinions of experts. Wilson et al. (1993) further found that verbally analyzing reasons causes individuals to make decisions that result in less postchoice satisfaction (see Wilson & Dunn, 1986; Wilson, Dunn, Kraft, & Lisle, 1989; Wilson & Lafeur, 1995, for additional research on the impact of verbally analyzing reasons for affective decisions).

*b. Insight Problem Solving* Although problem solving is generally characterized as readily lending itself to verbal exposition (Ericsson & Simon, 1980, 1984), insight problem solving ("Aha!"-type problems that require finding alternative ways of conceptualizing the problem) have frequently been claimed to involve nonreportable cognitive processes (Ohlsson, 1992). However, like the other nonverbalizable domains reviewed here, insight problem solving is also known to be influenced by language (e.g., Glucksberg & Danks, 1968). Thus, insight problem solving represents yet another domain that, according to the modality mismatch assumption, may be disrupted by verbalization. Consistent with this prediction, J. W. Schooler, Ohlsson, and Brooks (1993) found that both retrospective and concurrent verbalization impaired individuals' ability to find solutions to insight-type problems. In contrast, logical problem solving, which relies on more verbalizable knowledge (cf. J. W. Schooler & Melcher, 1995), was found to be unaffected by verbalization.

#### 6. Domains Not Affected by Verbalization

If verbalization specifically disrupts the application of nonverbalizable knowledge, then tasks that rely on more verbalizable knowledge should be relatively invulnerable to verbalization. We have already noted a number of situations in which tasks that rely on verbalizable knowledge were found to be relatively invulnerable to verbalization including: word recognition (e.g., Darley & Glass, 1975; Glenberg & Adams, 1978; Maki & Schuler, 1980); statement recognition (J. W. Schooler & Engstler-Schooler, 1990); route distance estimation (Fiore & Schooler, 1997); and logical problem solving (J. W. Schooler et al., 1993; see also Gagne & Smith, 1962). In addition, there are also a number of other domains that rely on verbalizable knowledge for which verbalization has been found to be, at a minimum, benign and often helpful, including the learning of declarative knowledge (Chi, Le Leeuw, Chiu, & LaVancher, 1994) and medical decision making (Henry, LeBreck, & Hozemer, 1989).

#### B. PROCESSING DIFFERENCES

In addition to predicting the domains in which verbalization is likely to be disruptive, a second implication of the modality mismatch assumption is

that the effects of verbal rehearsal should critically depend on whether or not language processes per se are employed. As noted, Schooler and Engstler-Schooler provided some initial evidence for this prediction, showing that, in contrast to verbal rehearsal, visual rehearsal did not impair memory for either faces or colors. Since this initial demonstration additional investigations of the impact of manipulating the use of language during rehearsal have further implicated the critical role of verbalization in disrupting perceptual memory performance, thereby further supporting the modality mismatch assumption.

#### 1. The Effects of Visualization on Map Memory

One possible concern with the visualization manipulations used by Schooler and Engstler-Schooler is that there was no manipulation check to insure that subjects were in fact engaging in visual recall. It is possible that subjects, knowing that their performance could not be monitored, were not adequately engaged in the visual recollection. In a recent map memory study, Fiore (1994) addressed this possible concern by giving subjects a visual scanning task (cf. Kosslyn, Ball, & Reiser, 1978) that directly monitored visualization performance. Subjects studied a map of a small town and then either verbalized their memory for the route shown on the map, engaged in an unrelated verbal activity (describing memory lapses they have experienced), or visualized moving a black dot from one landmark on the map to another. In the mental scanning condition, subjects were presented with pairs of landmarks and were to imagine scanning from one landmark to the other, pressing a button when they "reached" each new destination. As shown in Fig. 3, in this study verbalization significantly hindered subjects' performance on a later map-drawing task compared to both the visualization and control conditions. This study illustrates that even when subjects are given a demanding visualization task that requires compliance with the visual recall instructions, subjects still fail to show a detriment of visual recall. Thus, this study provides further evidence that it is specifically the verbal aspect of verbal recall that produces interference.

#### 2. The Effects of Verbal Suppression on Form Memory

Additional evidence that verbalizing nonverbal knowledge is the critical source of interference in verbal overshadowing effects comes from an examination of the effects of a manipulation known to minimize verbal processing. Verbal suppression (e.g., repeating the phrase "tala" while encoding a stimulus) is a well-known technique for reducing the extent of spontaneous verbal rehearsal (Murray, 1967). Thus, according to the modality mismatch assumption, engaging in verbal suppression during the learning of nonverbal

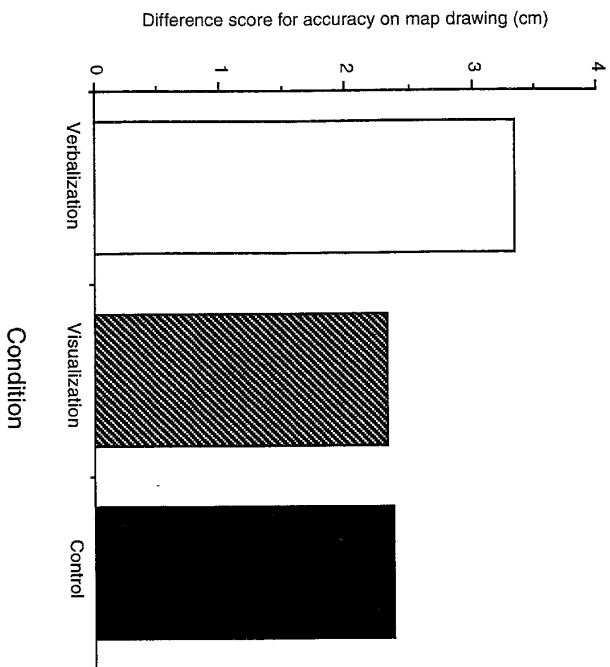


Fig. 3. Difference scores between actual and reproduced maps. From Fiore (1994).

stimuli should attenuate verbal processing and thereby attenuate the effects of verbalization. To investigate this issue, Brandimonte et al. (1992b) had subjects study either easy or hard-to-name forms (see Fig. 2), under either standard encoding conditions or articulatory suppression (repeating the phrase "jala"). After learning the various forms, subjects were given the mental rotation task described earlier. As can be seen in Fig. 4, for subjects who did not engage in articulatory suppression, a verbal overshadowing effect was observed, such that imagery performance was worse for easy-to-name forms relative to hard-to-name forms. In contrast, under verbal suppression conditions, performance on the easy- and hard-to-name forms was comparably high. These findings suggest that preventing verbal processing through verbal suppression reduces the spontaneous verbal labeling of visual stimuli, and thereby prevents verbal overshadowing of nonverbal stimuli.

### C. EXPERTISE DIFFERENCES

A third general prediction of the modality mismatch assumption is that relative differences in verbal versus nonverbal expertise should mediate

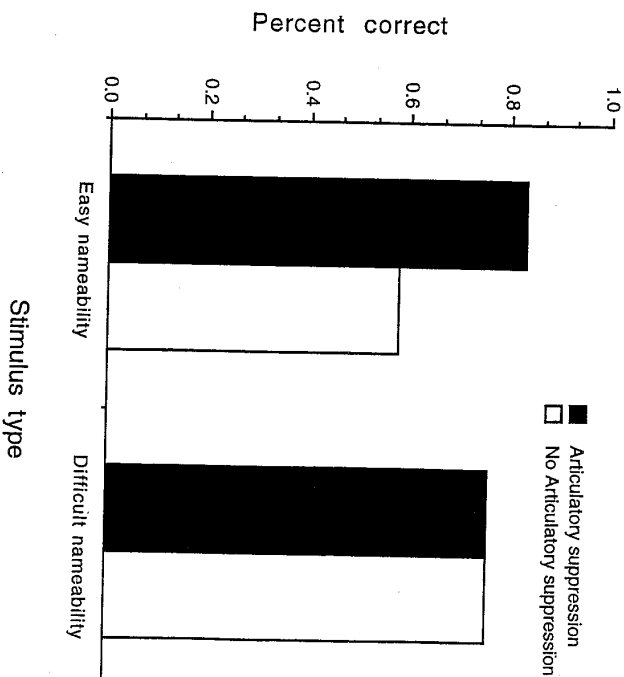


Fig. 4. Effect of articulatory suppression on easy and difficult nameability stimuli. From Brandimonte et al. (1992b). Copyright 1992 by the American Psychological Association. Reprinted with permission.

verbal overshadowing effects. Accordingly, if verbalization specifically interferes with the application of nonverbal knowledge, then the magnitude of such effects should critically depend on individuals' relative verbal versus nonverbal expertise. When nonverbal expertise markedly exceeds verbal expertise, verbal overshadowing should be observed; however, when the two types of knowledge are more commensurate, verbal overshadowing should be avoided. This interaction between verbal overshadowing and expertise has been observed in several domains.

#### 1. *Own-versus Other-Race Face Recognition*

Generally speaking, face recognition represents a classic example of a situation in which perceptual expertise exceeds verbal expertise. Individuals are experts at the nonverbal task of recognizing faces, although most are quite unskilled at the verbal task of describing faces (e.g., Ellis et al., 1980). The magnitude of this discrepancy, however, depends on individuals' degree



of familiarity with different types of faces. Individuals are typically better at recognizing members of their own race, as compared to members of other races (e.g., Brigham & Malpass, 1985; Rhodes, Tan, Brake, & Taylor, 1989). This expertise specifically involves an increased sensitivity to the configural properties of a face (i.e., the interrelationship between features, Rhodes et al., 1989), which are particularly difficult to verbalize (e.g., Wells & Turtle, 1987). If the negative effects of verbalization specifically pertain to nonverbal expertise, and if own-race face recognition particularly relies on such expertise, then own-race face recognition should be especially vulnerable to verbalization.

To examine the relationship between verbalization and perceptual expertise, Fallshore and Schooler (1995) replicated the standard verbal overshadowing paradigm using both same- and other-race faces. Caucasian subjects were presented with Caucasian and African-American stimulus faces and later were asked either to verbally describe the faces or to perform an unrelated, interpolated task. Finally, all subjects were presented with a forced-choice recognition test including the target and similar distractors. As can be seen in Fig. 5, Fallshore and Schooler replicated the standard verbal overshadowing effect for own-race faces. However, for other-race faces, subjects' performance was completely unaffected by verbalization. This interaction between verbalization and race of face can be readily accounted for by the view that the particular expertise associated with recognizing own-race faces is uniquely nonverbal in nature. Along these lines, it is worth noting that in the verbalization conditions, the generally observed own-race face advantage (seen in the control conditions) was entirely eliminated. Indeed, if anything, in the verbalization condition there was a trend for superior performance for other-race faces.

The notion that the interaction between verbalization and race of face was specifically due to the greater role of nonverbal knowledge in own-race face recognition suggests several predictions that were tested in a second study. First, if the expertise that differentiates own- from other-race face recognition is primarily perceptual in nature, then the descriptions of these two types of faces should be relatively comparable in quality. Second, if recognition of other-race faces relies to a greater degree on more

<sup>1</sup> Ideally it would have been quite informative to use non-Caucasian subjects as well. However, African-American populations in the United States, and particularly those attending predominantly Caucasian college campuses, have experience with own- and other-race faces that is quite different from that of Caucasian subjects. The fact that African-American subjects' experience with other-race faces does not mirror that of Caucasian subjects indicates that African-American subjects would not have served as the appropriate comparison group in this study. Rather, what would be needed is individuals of African descent who live in countries where they are the distinct majority. Unfortunately, inclusion of such a population was beyond the means of this study.

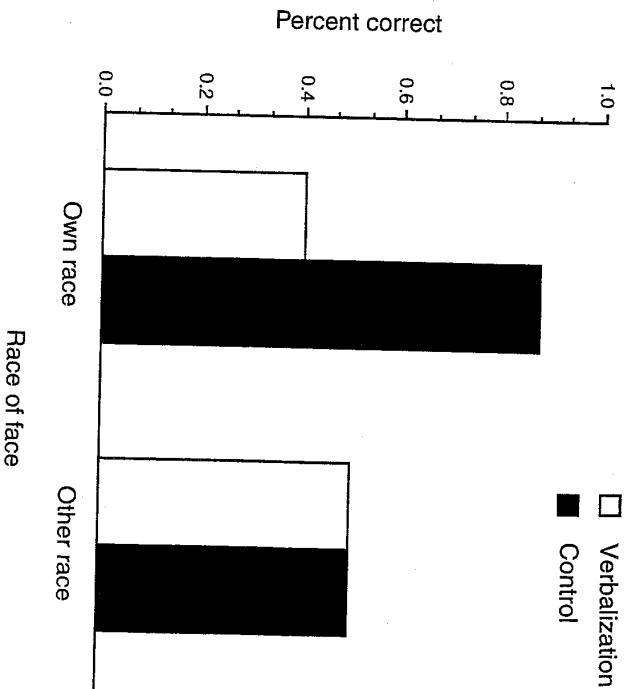


Fig. 5. Percentage of correctly recognized own- and other-race faces. From Fallshore & Schooler (1995, Experiment 1). Copyright 1995 by the American Psychological Association. Reprinted with permission.

readily verbalized information, then the descriptions of other-race faces may be more predictive of subjects' actual recognition performance than those associated with own-race faces. Fallshore and Schooler tested these two predictions using a communication accuracy paradigm (e.g., Lantz & Volney, 1964; Lucy & Shweder, 1979) wherein subject-judges were yoked with each of the verbalization subjects from Experiment 1. Each subject-judge read the verbal description generated by their yoked verbalization subject counterpart and attempted to use the description to identify the target face from the recognition array. Comparison of subject-judges' overall identification performance indicated that there was little difference between the original verbalization subjects' ability in describing own- and other-race faces. Subject-judges' ability to use verbalization subjects' descriptions to identify the target face was actually numerically, though not significantly, greater for other- versus own-race faces (with mean identifica-

tion rates of 32.1 and 26.8%, respectively, with chance equating 16.7%). This finding suggests that, although individuals' recognition performance tends to be better for own- versus other-race faces, their ability to describe the two types of faces is quite comparable. In other words, as predicted, the increase in expertise associated with own-race face recognition appears to be primarily nonverbal in nature.

If, as argued, face recognition expertise is associated with an increased reliance on nonreportable information, then subjects' verbal descriptions of own-race faces should be less predictive of their recognition performance than their descriptions of other-race faces. To explore this issue, Fallschore and Schooler examined the relationship between the identification performance of the subject-judges and the recognition accuracy of the subjects who generated those descriptions. Interestingly, the correlation between the identification accuracy of the subject-judges and the recognition accuracy of their yoked verbalization subject counterparts was significant for other-race faces ( $r = .36$ ), but no such relationship for own-race faces was found ( $r = .12$ ). The fact that verbal descriptions were predictive only of other-race recognition thus provides further evidence that other-race face recognition is distinguished from own-race recognition with respect to its greater reliance on verbal knowledge. Thus, the absence of a verbal overshadowing effect for other-race faces can be seen as yet another source of evidence for the hypothesis that verbal overshadowing specifically involves the verbal disruption of nonverbal knowledge.

## 2. Wine Expertise

The premise that verbal overshadowing occurs when nonverbal expertise exceeds verbal expertise suggests that we should be able to document such a relationship between expertise and verbalization in other domains besides face recognition. Moreover, if verbal expertise is truly a critical component of this phenomenon, then we should find that the effects of verbalization depend not only on individuals' nonverbal expertise in a given domain, but also on how fluent they are in articulating that knowledge. The challenge, therefore, is to find a domain in which individuals can excel in perceptual abilities both with and without commensurate verbal ability; wine tasting, it turns out, is just such a domain.

Many wine drinkers develop a palate for wine such that they can distinguish between many fine wines. Despite possessing a developed perceptual palate, novice wine drinkers, while perhaps being familiar with a few technical wine terms, do not really know how to describe wines with much precision. In contrast, wine professionals and those who have participated in extensive wine tasting training do, with time, develop a vocabulary that

enables them to significantly exceed their novice counterparts in describing wines (e.g., Solomon, 1990). Thus, wine tasting skill provides us with three theoretical levels of expertise in which to examine the hypothesized relationship between expertise and verbalization: non-wine drinkers who possess minimal perceptual or verbal expertise; untrained wine drinkers who have some perceptual expertise but minimal verbal expertise; and trained experts who have both perceptual and verbal expertise. According to the present approach, these three populations should be differentially affected by verbalization. Non-wine drinkers, like individuals verbalizing other-race faces, should show minimal effects of verbalization because their perceptual expertise may fail to markedly exceed their verbal expertise. In contrast, untrained wine drinkers, like individuals recognizing own-race faces, may show a substantial effect of verbalization because they have developed a degree of perceptual expertise (a palate) but lack the vocabulary to express their knowledge. Finally, wine experts possess both perceptual and verbal expertise and consequently should exhibit strong performance regardless of verbalization.

In a recent study, Melcher and Schooler (1996) examined the impact of describing a previously tasted wine on three such populations: non-wine drinkers (individuals who drank less than once a month); untrained wine drinkers (those who drank more than once a month, but had little or no formal training); and experts (individuals who were either in the wine profession or had taken multiple wine courses). Subjects tasted a wine, either described it or not, and then rated four wines (the target and three distractors) for how closely they matched the taste of the target wine. Performance was gauged by taking the difference between the rating given to the target wine and the mean given to the three distractors. As can be seen in Fig. 6, subjects' discrimination performance largely supported the predictions outlined earlier. Neither the nondrinkers nor the trained experts were impaired by verbalization. In fact, if anything, both groups tended to improve following verbalization. In contrast, the untrained wine drinkers showed a marked decline in performance following verbalization.

Our interpretation of these findings is that verbalization reduced subjects' ability to draw on their perceptual expertise, and thus primarily impacted that population of subjects for whom their verbal and perceptual expertise was least commensurate. In further support of this interpretation, Melcher and Schooler examined the correlation between subjects' performance in the two conditions and their scores on independent measures of verbal and perceptual expertise. Verbal expertise was gauged by subjects' responses to a wine knowledge questionnaire. Perceptual expertise was determined by how often subjects reported drinking red wines. In the nonverbalization condition, perceptual expertise was the best predictor of discrimination

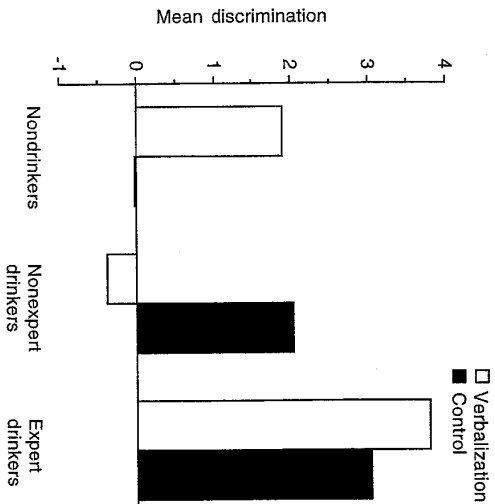


Fig. 6. Mean discrimination score for wine drinkers of differing levels of expertise. From Melcher & Schooler (1996). Copyright 1996 by Academic Press, Inc.

performance, suggesting that when subjects do not verbalize they tend to rely on their perceptual experience. In contrast, in the verbalization condition, verbal expertise was the best predictor of performance, suggesting that engaging in verbalization forces subjects to rely on their verbal knowledge.

#### D. SUMMARY OF EVIDENCE FOR THE MODALITY MISMATCH ASSUMPTION

In sum, three distinct strands of evidence converge on the general claim that verbalization uniquely disrupts nonreportable knowledge: (1) the disruptive effects of verbalization have been found to generalize across a surprisingly wide array of domains that rely on nonverbal knowledge; (2) manipulations that minimize verbal processing prevent the disruptive effects of verbalization; and (3) the effects of verbalization are limited to situations in which nonverbal expertise exceeds verbal expertise.

### III. The Availability Assumption

A long-standing issue in investigations of memory interference is what happens to the original memory. This issue dates back to classic "A:B

A:C" list-learning studies. For example, Melton and Irwin (1940) suggested that encountering new associations extinguishes the earlier associations making them irrecoverable. In contrast, McGeech (1942) argued that both associations existed in memory and that impairment of the original association was a consequence of response competition. More recently, this debate has played itself out in the context of accounting for the negative effect of misinformation on memory. For example, like Melton and Irwin (1940), E. F. Loftus and Loftus (1980) argued that the original memory is lost following exposure to misleading postevent information. In contrast to this "destructive updating" account, others offered a view comparable to that of McGeech, arguing that the original memory and the postevent memory coexist but compete or are confused at the time of retrieval (e.g., Bekerian & Bowers, 1983; Christnaesen & Ochsle, 1983; Lindsay & Johnson, 1989; Zaragoza & Lane, 1994).

As mentioned at the outset, a central assumption of the verbal overshadowing framework is that verbalization overshadows but does not eradicate the original visual memory. In support of this claim Schooler and Engstler-Schooler observed that limiting subjects' recognition time attenuated the negative effects of verbalization, presumably by reducing access to the more slowly retrieved verbal knowledge.<sup>2</sup> Several studies have provided further support for the availability assumption and the general claim that verbalization overshadows but does not eradicate the original memory. We briefly review these more recent studies.

#### A. FACE RE-PRESENTATION

If verbalization overshadows but does not eradicate the original visual memory, then manipulations that reinstate the original visual memory should reverse the negative effects of verbalization. Recently J. W. Schooler, Ryan, and Reder (1996) described a study that provided evidence that reinstating the original visual memory can eradicate the negative effects of verbalization. Specifically, Schooler et al. examined the effect of re-presenting the target face following verbalization. Subjects viewed a tar-

<sup>2</sup> The limited response time manipulation appears to be a somewhat delicate intervention. On one hand, limiting response time has also been found to attenuate the effects of verbalization in the related domain of attitude judgments (T. Y. Schooler, 1990; T. D. Wilson, personal communication, October, 1996). On the other hand, using stimulus/test face recognition materials different from those used by J. W. Schooler and Engstler-Schooler (1990), several studies have observed negative effects of verbalization even in the limited response time condition (Dodson, Johnson, & Schooler, 1997; Read & Schooler, 1994). It seems likely that the impact of limiting response time may depend on the specific stimulus/test materials that are used. Such materials undoubtedly influence the test inspection time necessary for successful recognition, and may thereby determine the critical duration at which limiting response time is most apt to be beneficial. Future research might profitably investigate this issue.

get face, and then either described it or engaged in an unrelated filler activity. After the control or verbalization activities, subjects assigned to the re-presentation condition were shown the target photo again. Finally, all subjects were given the recognition array that included a different photo of the target face and five similar distractors. If verbalization eradicates the original visual memory, then one would expect that, even after re-presentation of the target face, subjects in the verbalization condition should show poorer performance than subjects in the control condition. Alternatively, if verbalization simply makes the visual memory less accessible, then reinstating it through re-presentation should make the visual memory more accessible, thereby attenuating the negative effects of verbalization. As can be seen in Fig. 7, our prediction was generally observed, but with a twist. To our surprise, re-presentation not only eliminated the verbalization effect, it reversed it! This reversal in the effects of verbalization following re-presentation was somewhat unexpected, although subsequent studies proved it to be reliable. We defer our present account for this reversal until the final section of this chapter. Suffice it to say, for the present purposes, verbalization subjects' superior performance in the re-presentation condition strongly suggests that their original memories remained intact, thereby enabling them to show such substantial gains following re-presentation.

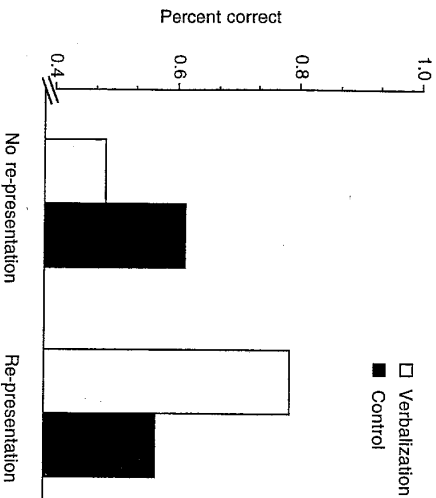


Fig. 7. Effects of verbalization and re-presentation on recognition performance. From Schooler, Ryan, & Reder, 1996. Copyright 1995 by Lawrence Erlbaum Associates. Reprinted with permission.

#### B. CONTEXT REINSTATEMENT OF MEMORY FOR FORMS

The issue of the availability of the original visual memory is of particular pertinence to the verbal overshadowing paradigm as it has been applied to memory for forms. As described earlier, Brandimonte and colleagues have reported numerous demonstrations in which either implicit or explicit verbal labeling of forms during encoding hampers subsequent imagery performance. Their interpretation of this finding is similar to that of other verbal overshadowing experiments in which the verbalization is completed after the stimulus is no longer in view: namely that verbalized information interferes with the successful *retrieval* of potentially available visual information. However, because the verbalization in the Brandimonte et al. studies (1992a, 1992b) occurs at the time of encoding, rather than postencoding (as it does in the other perceptual memory paradigms described in this chapter), there is an alternative account of their findings. It is possible that rather than interfering with the retrieval of visual information, verbalization may interfere with the *encoding* of such information. Indeed, an encoding disruption account was suggested by several prior researchers who found evidence that verbal processing during encoding interferes with visual memories (e.g., Bahrick & Boucher, 1969; Nelson & Brooks, 1973; Pezdek et al., 1986). For example, Nelson and Brooks suggested "forced involvement of the verbal system may have reduced the time available for coding the superior pictorial representation" (p. 48).

One important prediction of an encoding disruption account is that any reduction in visual memory performance following verbalization should be irreversible. If the information never made it in to memory, then it cannot be expected to ever be retrieved from memory. In short, an encoding disruption account of verbalization effects makes a very unambiguous prediction regarding the fate of the original visual information: it should be unavailable under any retrieval conditions. In contrast, if, as we have hypothesized, the locus of verbalization effects is at retrieval, then in principle, given the appropriate retrieval conditions, verbal overshadowing effects should be attenuated.

Recently, Brandimonte, Schooler, and Gabbino (1997) conducted several experiments to assess the availability of the original visual memory within the form memory paradigm. Brandimonte et al. investigated the effects of introducing, at the time of retrieval, visual cues that were present during encoding. The logic of this manipulation was that re-presentation of the visual cue during retrieval should increase the likelihood of accessing any intact visual memory. Accordingly, if verbalization interferes with the retrieval of intact visual information, then emphasizing visual components of the memory during retrieval may attenuate the effects of verbalization.

If, however, verbalization reduces the quality of the initial encoding of visual information, then visual retrieval cues should be ineffective.

In one study, subjects learned either easy- or hard-to-name line drawings (see Fig. 2), which were drawn on colored cards (the assumption being, as mentioned earlier, that easy-to-name drawings are more likely to be spontaneously verbalized than hard-to-name drawings). Subjects were then asked to complete the mental imagery task, which required them to recall detailed visual characteristics of the stimuli in order to identify the letters hidden in the figure. In each condition, just before performing the imagery task, half the subjects were re-presented with the color of the card on which each picture was originally viewed and half performed the task without exposure to the color cues.

As can be seen in Fig. 8, the results provided evidence that the original visual information does in fact remain potentially available following verbal-

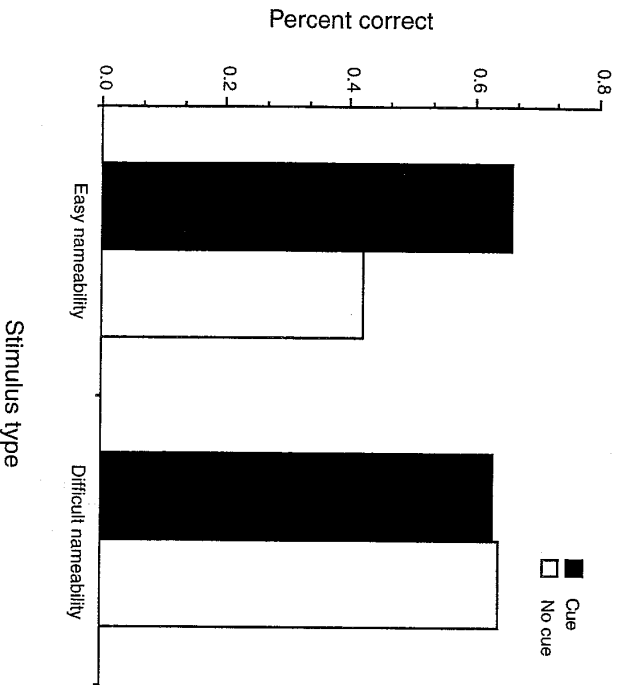


Fig. 8. Percentage of letters correctly identified in mental imagery task in the Cue and No-cue conditions as a function of nameability. From Brandimonte, Schooler, & Gabbino (1997, Experiment 1). Copyright 1997 by the American Psychological Association. Reprinted with permission.

ization. As in prior studies, (e.g., Brandimonte et al., 1992a, 1992b) under standard retrieval conditions, subjects who encoded easy-to-name figures had greater difficulty subsequently deciphering the letters in their images relative to subjects who encoded hard-to-name figures. On the assumption that easy-to-name figures are more likely to be spontaneously verbalized than hard-to-name figures, this result suggests that verbalization during encoding hampered subsequent memory performance in the no-cue condition. However, when a color cue was presented prior to the imagery task, the difference between imagery performance with easy- versus hard-to-name pictures was attenuated. This latter finding suggests that introducing retrieval conditions that favor access to the visual information enables subjects to retrieve their intact visual memories.

A second study further demonstrated the availability of visual form memory following verbalization. This study was similar to the first, except the method of inducing verbalization was changed. Rather than covertly inducing verbalization through the use of easy-to-name forms, verbalization was overtly induced by supplying verbal labels to hard-to-name forms. As can be seen in Fig. 9, the results of this second experiment paralleled those of the first. As predicted, in the no-cue condition, overt verbalization impaired imagery performance. However, when subjects were supplied with visual cues, the impaired imagery performance associated with labeled forms was attenuated. These findings thus provide further evidence that verbalization does not interfere with either the formation or the storage of visual memory. Rather, the effect of verbalization, even when introduced at encoding, is to overshadow an intact visual representation.

#### IV. The Recoding Interference Hypothesis

As mentioned at the outset, J. W. Schooler and Engstler-Schooler (1990) suggested a recoding interference account for why verbalization interfered with access to nonverbal memory. It was hypothesized that verbalization of a nonverbal memory results in the formation of a nonveridical, verbally biased representation that is accessed instead of the original visual memory. This notion of recoding interference is consistent with many theories of memory interference based on competition between distinct memory representations (e.g., Johnson, Hashtroudi, & Lindsay, 1993; Morton, Hammersley, & Bekarian, 1985), and also accounted for most of Schooler and Engstler-Schooler's original findings. However, as it has turned out, the results of a number of studies suggest that, at least in the case of memory for faces, the recoding interference hypothesis cannot account for the detrimental effects of verbalization. We review the various sources of difficulty

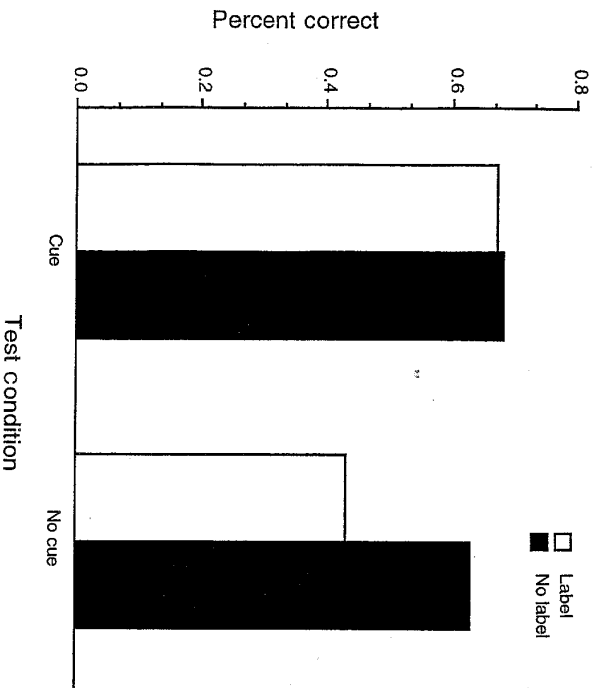


Fig. 9. Percentage of letters correctly identified in mental imagery task in the Cue and No-cue conditions as a function of presence of labels. From Brandimonte, Schooler & Gabbino (1997, Experiment 2). Copyright 1997 by the American Psychological Association. Reprinted with permission.

for the recoding interference hypothesis and then consider several potential alternatives.

#### A. THE RELATION BETWEEN VERBALIZATION CONTENT AND RECOGNITION PERFORMANCE

As previously noted, there was one thorn in the side of Schooler and Engstler-Schooler's original recoding interference interpretation of verbal overshadowing—the absence of a relationship between the contents of subjects' verbal descriptions and their subsequent performance. If the negative effects of verbalization are the consequence of subjects' reliance on a nonveridical memory representation corresponding to their memory for the face description, then one might expect that the quality of the description would be predictive of recognition performance. One possible explanation for why Schooler and Engstler-Schooler failed to find such a relation-

ship is that they used a potentially weak measure of description accuracy: coding the number of correct and incorrect features in each description. A limitation of coder-ratings of verbal descriptions is that such ratings fail to take into account the possibility that some features may be more discriminating than others. A potentially superior technique is the communication accuracy approach (e.g., Lantz & Volney, 1964; Lucy & Schweder, 1979), mentioned earlier, in which the verbal descriptions generated by subjects are given to subject-judges who must identify the target on the basis of the description alone. This technique has the advantage of clearly determining the degree to which reliance on the verbal description alone is sufficient for making a correct identification. However, as noted, Fallschore and Schooler (1995) observed that even with this more sensitive measure, there was no relationship between the contents of subjects' verbal descriptions and recognition performance. Moreover, this lack of a relationship cannot be attributed to a lack of sensitivity of the communication accuracy paradigm, because Fallschore and Schooler did find a communication accuracy correlation for other-race faces. However, these faces were not associated with negative effects of verbalization. In this context it is worth noting that Schooler and Engstler-Schooler also found a relationship between verbal description quality and recognition performance only for the stimuli for which they did not find a negative effect of verbalization: verbal statements. Thus, it appears that a relationship between description quality and recognition performance is observed only for relatively verbalizable stimuli, which are precisely the stimuli that are invulnerable to verbalization. In contrast, memory stimuli that are difficult to translate into words are both vulnerable to verbalization and associated with an absence of a correspondence between verbalization performance and recognition performance. Although this pattern of findings is quite consistent with the modality mismatch assumption, it is somewhat harder to reconcile with the claim that verbal overshadowing effects result from an inappropriate reliance on memory representations corresponding to the verbal description.

#### B. THE EFFECTS OF WARNING SUBJECTS

Another prediction of the recoding interference hypothesis is that the negative effects of verbalization may be attenuated if subjects are warned to ignore their memory for how they described the face. Warnings of this sort have been found to be quite effective in other paradigms involving source confusions between distinct memory representations. For example, a number of researchers have found that the negative effects of verbal postevent misinformation on visual memory can be attenuated if subjects are explicitly instructed to distinguish between what they originally saw

and what they later read (e.g., Lindsay & Johnson, 1989; Zaragoza & Koshmider, 1989; Zaragoza & Lane, 1994; see also Christaansen & Ochalek, 1983). Given the effectiveness of such source monitoring instructions in the context of misinformation studies, it follows that if the negative effects of verbalization involve the equivalent of a self-generated misinformation effect (as the recoding interference hypothesis suggests), then source monitoring instructions might be comparably effective in reversing verbal overshadowing effects as well. To test this hypothesis, Dodson et al. (1997) conducted a verbal overshadowing study in which they explicitly warned subjects that "In completing the following task you should ignore your memory for how you described the face and only rely on *your memory for seeing the face*" (p. 5). Strikingly, Dodson et al. found that these instructions did not at all reduce the magnitude of the verbal overshadowing effect; in fact, if anything, warning subjects to ignore their verbalizations increased the negative effects of verbalization.

### C. THE EFFECTS OF VERBALIZATION ON NONVERBALIZED STIMULI

Still further evidence against the original formulation of the recoding interference hypothesis comes from studies investigating the impact of verbalization on nonverbalized stimuli. If verbal overshadowing effects result from retrieving a memory representation corresponding to the process of describing the stimulus, then one would expect that the effects of verbalization would be limited to the stimulus that was described. However, in several experiments Dodson et al. demonstrated that describing one face can actually interfere with the recognition of a different face. For example, in one experiment subjects viewed two faces, one male and one female. Subjects were then instructed to verbalize either the male face, the female face, or to engage in an unrelated verbal activity. Remarkably, Dodson et al. found that describing a nontarget face produced impairment comparable to that associated with describing the target face. In another experiment, Dodson et al. found that verbally recalling the appearance of a parent's face impaired recognition of a previously seen face. These findings strongly argue against the premise of the recoding interference hypothesis that the disruptive effects of verbalization are a consequence of subjects' specific reliance on their memory of the verbal description.

### V. How Does Verbalization Disrupt Perceptual Memories?

The findings reviewed thus far provide strong support for the claim that verbalization specifically disrupts the application of nonverbal knowledge

(the modality mismatch assumption) and the premise that this interference is not permanent, but can be attenuated if conditions encourage retrieval of nonverbal information (the availability assumption). However, contrary to our initial conceptualizations, the disruption associated with verbalization does not, at least in the case of face recognition, appear to involve a reliance on a recoded memory representation corresponding to the verbalization process. The question thus arises: How does verbalization disrupt the use of nonverbal knowledge?

### A. DOES VERBALIZATION CAUSE MEMORY INTERFERENCE OR A STRATEGY SHIFT?

The finding that verbalization of one face can interfere with the recognition of a different face raises the possibility that the disruptive effects of verbalization may not involve memory interference at all, but may rather reflect a shift in subjects' recognition strategies. Accordingly, verbalization may produce a general predisposition to favor verbal knowledge over nonverbalizable knowledge. To the degree that such verbalizable knowledge is nondiscriminating, such a shift in recognition strategies could lead to impaired performance. This verbal strategy explanation could readily account for why verbalization exclusively disrupts nonverbal processes in that excessive consideration of verbal knowledge would be detrimental only for nonverbalizable stimuli. The verbal strategy explanation could also account for the reversibility of verbal overshadowing effects with the assumption that presenting retrieval conditions that favor perceptual information attenuates the bias toward verbal information. A verbal strategy account could also explain why verbalization of one face might interfere with the recognition of a different face by simply assuming that verbalization of any nonverbal stimulus may be sufficient to induce the adoption of verbal recognition strategies. The resolution of this issue requires the identification of a measure that can specifically assess the type of knowledge that individuals are employing in making their recognition decisions.

There have been several major advances in the use of self-report measures to assess the degree to which subjects' recognition strategies rely on verbalizable versus nonverbalizable knowledge. Tulving (1985) introduced the know/remember distinction that uses a self-report measure to differentiate between "remember" recognition judgments based on specific episodic cues and "know" recognition judgments that are not based on awareness of any specific cues. Since Tulving's original introduction of the know/remember distinction, a number of studies have demonstrated that this distinction interacts with a variety of variables in a manner quite consistent with other memory measures known to distinguish between the reliance

on explicit (reportable) versus implicit (nonreportable) knowledge (for reviews, see Gardiner & Java, 1993; Rajaram & Roediger, 1997). A similar self-report measure was introduced by Dunning and Stern (1994) in the context of a multiple-choice face recognition paradigm. In this paradigm, reliance on nonreportable versus reportable knowledge was determined by subjects' agreement with statements such as "His face just popped out" versus "I compared the photos to each other in order to narrow the choices." Consistent with the claim that face recognition critically relies on nonreportable knowledge, Dunning and Stern found that subjects' reported reliance on nonverbalizable strategies was predictive of accuracy.

Although the self-report measures used in the Know-Remember and Dunning and Stern (1994) paradigms have been applied in different settings (i.e., yes/no vs multiple choice recognition), invoke different verbalizable strategies (e.g., reliance on episodic context vs use of process of elimination), and vary with respect to their emphasis (i.e., the nature of the memory experience vs the recognition decision), they both suggest the value of using self-reports to distinguish between recognition decisions made on a verbalizable versus nonverbalizable basis. Indeed, the two approaches are strikingly similar with respect to their characterization of the use of nonreportable knowledge, with Know classification involving judgments of subjects who "are fully aware that the memory belongs to their personal past [but] they are unable to determine the basis of this conscious experience" (Rajaram & Roediger, 1997, p. 235) and automatic classifications corresponding to judgments in which subjects "just recognized him, I cannot explain why" (Dunning & Stern, 1994, p. 818). This similarity suggests that these two approaches may correspond to a more general distinction, which we term the Just Know/Reason distinction, between judgments that rely on a nonreportable versus reportable knowledge.

### 1. *Verbalization, Face Recognition, and the Just Know/Reason Distinction*

Recently we (J. W. Schooler, Fiore, Melcher, & Ambadar, 1996) developed and employed a self-report measure based on the Just Know/Reason distinction, in order to assess the impact of verbalization on the use of strategies involving verbalizable and nonverbalizable knowledge. In this paradigm subjects were first shown a video tape of a bank robbery including a target individual. Subjects were then introduced to the Just Know/Reason distinction in the context of a word learning/recognition task modeled after Gardiner (1988). Prior to engaging in recognition, subjects were instructed:

Sometimes when you make a judgment, you are aware of specific reasons for that judgment, this is what we call a "reason" decision. Other times, your decision may be

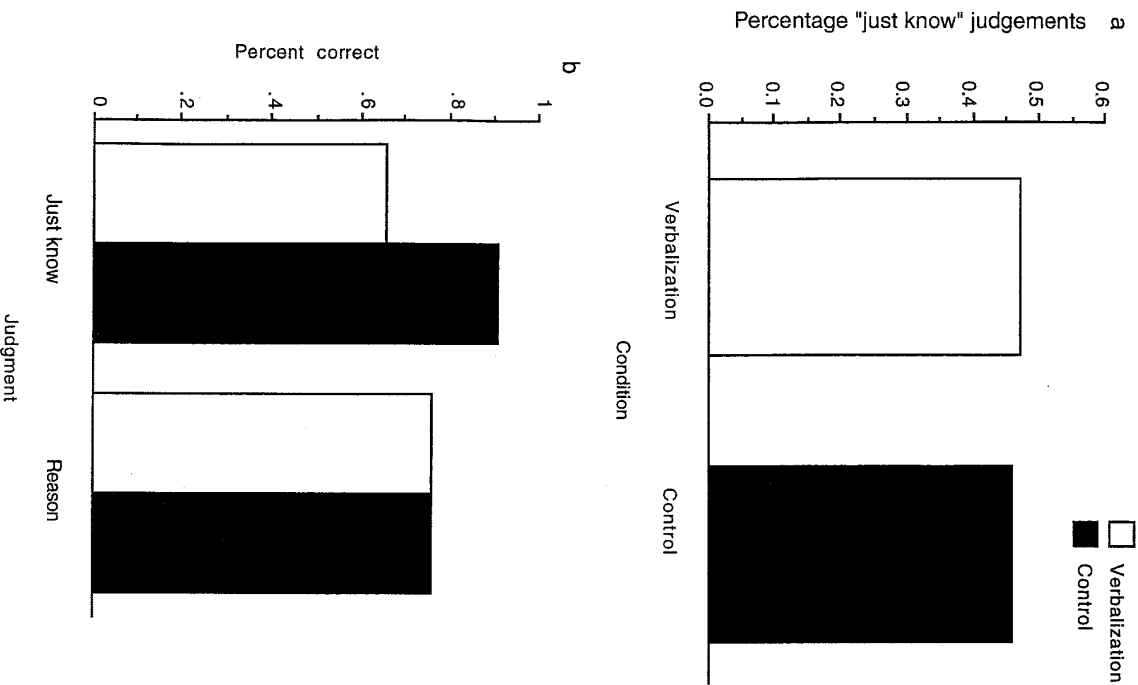
just based on a "gut" reaction without any specific reasons. This is what we call a "just know" decision.

After completing the word recognition task,<sup>3</sup> subjects participated in either the verbalization or the control activities. Finally, subjects were given a recognition test and were asked to "assess how you just made this face recognition decision and decide, as you previously did with the words, whether it was a 'just know' or 'reason' decision." Before reviewing the results, consider again the respective predictions of the verbal strategy and memory interference hypotheses. If verbalization causes subjects to adopt a verbally oriented recognition strategy, then it should alter their relative inclination to rely on verbal versus nonverbal knowledge, as would be reflected in the *frequency* with which they report making reason versus just know-based recognition decisions. In contrast, if verbalization produces some form of memory interference that influences the relative accessibility of verbal and nonverbal knowledge, then the effects of verbalization should be associated with changes in the relative *accuracy* of reason versus just know-based judgments.

As can be seen in Fig. 10A, contrary to the predictions of the verbal strategy hypothesis, verbalization had no effect whatsoever on the frequency with which individuals reported relying on verbal and nonverbal knowledge. However, as can be seen in Fig. 10B, verbalization had a marked effect on the accuracy of just know versus reason judgments. Verbalization substantially impaired the accuracy of recognition decision judgments classified as just know, while having no effect whatsoever on decisions classified as reason. This latter finding suggests that the reduction in recognition performance resulting from verbalization is specifically the consequence of a reduced accessibility of nonverbalizable knowledge. Following verbalization, subjects continue to attempt to use nonverbalizable knowledge to make recognition judgments; they are simply less successful at doing so.

<sup>3</sup> Although we used instructions that were somewhat different (and much simpler) than those used by Tulving (1985) and Gardiner (1988) (that is, we made no mention of the construct of remembering nor did we give subjects any indication of the type of reasons on which they might have relied), we nevertheless found word recognition findings that were virtually identical to these earlier studies. The advantage of semantic encoding was exclusively limited to reason-based judgments. This interaction parallels that of other measures of explicit (reportable) and implicit (nonreportable) knowledge (i.e., semantic elaboration influences recall but not implicit priming, e.g., Graf, Mandler, & Haden, 1982; Jacoby & Dalas, 1981), and thus helps to validate that the Just Know/Reason instructions used here were in fact distinguishing between the use of reportable and nonreportable knowledge.





2. *Verbalization, Voice Recognition, and the Just Know/Reason Distinction*

The finding that verbalization does not alter subjects' self-reported recognition strategies but rather influences the ability to rely on nonreportable knowledge, is of marked value in helping us to conceptualize verbal overshadowing of face recognition. However, to demonstrate its general applicability to verbal overshadowing effects, it is important to show that this characterization applies to the various other domains in which verbal overshadowing has been observed. Schooler, Fiore, Melcher, and Ambadar (1996) completed a second study indicating that the unique effects of verbalization on "just know" recognition judgments extend to at least one other domain: voice recognition. In this study, subjects listened to a brief audio recording of a spoken statement. After either describing the speakers voice or engaging in an unrelated activity, subjects were given a voice recognition test consisting of the same statement heard before, spoken by the person heard at encoding and by three similarly sounding foil voices. As Fig. 11A and 11B illustrate, this study revealed the same relationship between verbalization and just know/reason judgments as was observed with faces. Verbalization impaired just know judgments, without influencing either the accuracy or the frequency of reason judgments, thus once again demonstrating that verbalization does not alter subjects' self-reported recognition strategies, but rather reduces their access to nonverbalizable knowledge.

**B. TRANSFER-INAPPROPRIATE RETRIEVAL**

The unique effects of verbalization on just know recognition decisions suggest that the primary effect of verbalization is to disrupt individuals' ability to apply nonverbal knowledge. However, contrary to Schooler and Engstler-Schooler's original recoding interference hypothesis, at least in the case of face recognition, this disruption does not appear to involve the inappropriate emphasis on a recoded memory representation corresponding to the verbalization activity; rather, it appears to involve a more general form of interference. In reconceptualizing the nature of the interference that results from verbalization it may be useful to briefly revisit Schooler and Engstler-Schooler's original account.

According to the original verbal overshadowing theory: "visual memory interference following verbal processing may occur as a result of the interac-

Fig. 10. (A) Frequency of "Just Know" judgments by condition for face recognition task. (B) Accuracy of "Just Know/Reason" judgments by condition for face recognition task.

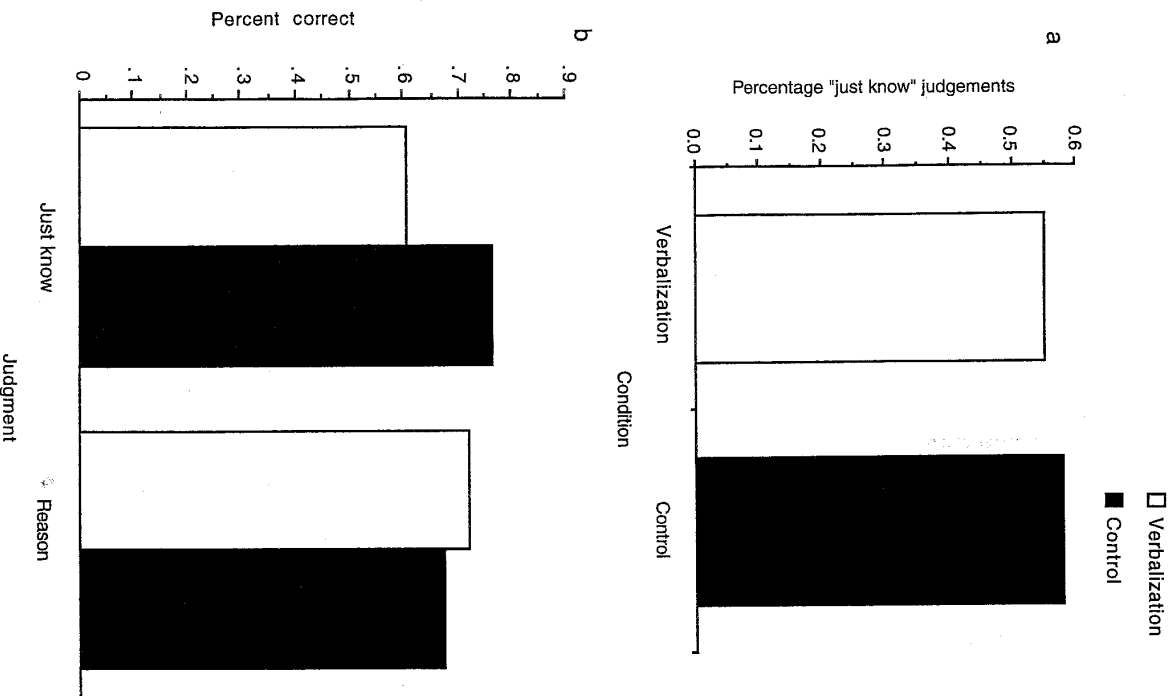


Fig. 11. (A) Frequency of "Just Know" judgments by condition for voice recognition task. (B) Accuracy of "Just Know/Reason" judgments by condition for voice recognition task.

tion of two processes: a) the influence of retrieval cues, and b) the consequences of recollection" (J. W. Schooler & Engstler-Schooler, 1990, p. 40). Verbal retrieval cues were hypothesized to elicit a nonveridical, verbally biased recollection. The resulting inaccurate recollection was then hypothesized to interfere with the original visual memory (cf. J. W. Schooler, Foster, & Loftus, 1988) by causing subjects "... to generate a recorded memory, disproportionately emphasizing the verbal code. This verbally biased recoding may then interfere with the application of the original memory" (p. 41). As noted, current evidence reveals that this recoding interference account is inadequate for accounting for a variety of verbal overshadowing findings. Nevertheless, we suggest that Schooler and Engstler-Schooler may still have been correct in attributing the negative effects of verbalization to an interaction between verbal retrieval cues and the act of recollection. They simply did not get the impact of these two factors quite right.

### 1. The Role of Retrieval Cues: Transfer-Appropriate Processing

A central assumption of the recoding interference account of verbal overshadowing is that verbalization produces a conflict between two memory representations, one corresponding to the original memory, and another corresponding to the verbalization activity. Although it remains possible that interference between distinct memory representations may characterize some verbal overshadowing effects, such an account simply cannot accommodate a variety of findings reported in this chapter. There is, however, another general way of conceptualizing conflicts in memory that does not entail the assumption of distinct memory representations. Specifically, rather than involving a competition between memory representations, it is possible that verbal overshadowing effects result from a conflict between memory processes (Kolers, 1973; Kolers & Roediger, 1984). A central premise of transfer-appropriate processing theories (e.g., Morris, Bransford, & Franks, 1977; Roediger, Weldon, & Challis, 1989) is that memory performance depends on the "extent to which operations required at test recapitulate or overlap the encoding operations performed during learning" (Roediger et al., 1989, p. 16). If retrieval conditions fail to elicit the processing operations involved during encoding, then retrieval failures can ensue. Such processing mismatches have, in the past, been revealed following

disparities between the operations encouraged by encoding and retrieval conditions. For example, Morris et al. (1977) found that the recognition of acoustically encoded information was maximized if the test emphasized acoustical operations, whereas the recognition of semantically encoded information was maximized if the test emphasized semantic operations. In principle, however, it is possible that other factors besides the similarity between encoding and retrieval conditions could also influence the match between encoding and retrieval processes.

A central assumption of transfer-appropriate processing theory is that memory retrieval does not necessarily invoke all of the processes entailed during encoding, rather the processes elicited during retrieval depend on the nature of the retrieval cues. Thus, transfer-appropriate processing theory suggests that verbalization instructions are likely to maximize verbal memory processes but not perceptual memory processes. If a primary emphasis on verbal operations can influence the memory processes that are invoked on a subsequent memory test, then this could provide a foundation for verbal overshadowing effects. Indeed, this possibility seems especially plausible in light of recent studies examining the impact of retrieval on subsequent memory performance.

## 2. *The Role of the Act of Recollection: Retrieval-Induced Forgetting*

There have been some impressive demonstrations of the surprising impact that retrieval can have on the accessibility of nonretrieved information. Anderson and Spellman (1995) report that the cued retrieval of some members of previously studied categorical word lists can impair the subsequent recall of the nonretrieved items. So, for example, studying *fruit: orange, banana*, and then retrieving *fruit or \_\_\_\_\_*, impairs the subsequent recall of *fruit: banana*. More strikingly, Anderson and Spellman further find that this retrieval-induced forgetting generalizes beyond the nonretrieved members of the retrieved category. So, for example, if subjects study two category lists (e.g., *green: emerald, lettuce* and *soups: mushroom, chicken*) and are then encouraged to retrieve some members of one of the lists (e.g., *green: emerald*), this can impair the subsequent recall of both the nonretrieved member of the retrieved category (e.g., *lettuce*) and its categorical associates in the nonretrieved list (e.g., *mushroom*). Anderson and Spellman's results illustrate that the retrieval of information from memory can reduce the accessibility of both nonretrieved items and items that are related to nonretrieved items. As we show, when combined with the construct of transfer-appropriate processing, this generalized but category-

bound retrieval-induced forgetting may provide the necessary ingredients for an account of many verbal overshadowing findings.<sup>4</sup>

## 3. *Transfer-Inappropriate Retrieval*

Consideration of the principles of transfer-appropriate processing together with the findings of retrieval-induced forgetting suggest a relatively straightforward approach for conceptualizing verbal overshadowing, which we term "transfer-inappropriate retrieval." This approach is based on the following four assumptions: (1) verbal recall encourages the application of verbal processes and consequently the retrieval of the verbalizable aspects of the memory. This premise follows naturally from the assumption of transfer-appropriate processing, that retrieval processes are determined by retrieval cues; (2) selective recall of the verbal aspects of a memory can reduce the accessibility of the nonrecalled information (i.e., of nonreportable knowledge). This assumption is supported by the various demonstrations that partial retrieval of prior experiences can hamper access to nonretrieved

<sup>4</sup> One possible concern in drawing parallels between retrieval-induced interference effects and verbal overshadowing is that such effects are often observed with recall measures but not with recognition measures (Anderson & Spellman, 1995; Bjork, 1989; Slamecka, 1975). In contrast, verbal overshadowing effects typically involve recognition paradigms. The standard explanation of the greater sensitivity to interference of recall measures relative to recognition measures is that the latter introduces more retrieval cues, which thereby attenuate interference effects. In this respect, it is worth noting that in all of the verbal overshadowing studies using face recognition, the target individual is depicted in a different manner at encoding and test (either two different photos, or a video during encoding and a photo at test). In so doing, we may have minimized the degree to which the recognition test provides unique retrieval cues (cf. Read, Hammersley, Cross-Calvert, & McFadden, 1989). It is also worth noting that verbal overshadowing effects, though replicated in many studies and in many different labs (R. Chaffin, personal communication, November, 1990; Dodson et al., 1997; C. M. Kelley, personal communication, November, 1992; Halberstadt, 1996; Lovett, Small, & Engstrom, 1992; Experiment 2); K. Pezdek, personal communication, November, 1996; Read & Schooler, 1994; Westernman, 1991), have been found to be somewhat fragile. Occasionally verbal overshadowing effects have not been observed under situations in which they would have been expected (e.g., D. S. Lindsay, personal communication, January, 1989; Lovett et al., 1992; Experiment 1); Yu & Geiselman, 1993). Indeed, it would be quite consistent with the present theorizing to suggest that the fragility of verbal overshadowing effects is due to the fact that most of the verbal overshadowing paradigms typically rely on recognition measures. Consistent with this prediction, using the form memory paradigm, Brandimonte, Schooler, and Gabbino (1997) observed verbal overshadowing with a recall measure (deciphering embedded forms) but not with a recognition measure. It seems quite likely that verbalization effects, like other memory effects that depend on the absence of adequate retrieval cues (e.g., context reinstatement effects, cf. Murman & Phelps, 1994; Smith, 1988), can be observed with both recall and recognition, but are apt to be inherently more robust when tested with recall measures. Unfortunately by the very nature of nonverbal stimuli, it is often difficult to find recall measures that enable subjects to do justice to their memories.

information (e.g., Anderson & Spellman, 1995; Roediger, 1974); (3) the interference resulting from verbal retrieval is relatively broad in scope involving a disruption in the application of the type of nonreportable processes omitted in the initial verbal retrieval. This assumption is perhaps the most controversial of the set; however, it is generally consistent with Anderson and Spellman's (1995) finding that retrieval-induced forgetting can generalize to information that is related to nonretrieved information; (4) the reduced accessibility of nonverbal knowledge/processes can be reversed if retrieval conditions are introduced that favor the application of perceptual/nonverbal processing. This assumption follows quite naturally from the principles of transfer-appropriate processing. As the following brief review illustrates, this *transfer-inappropriate retrieval* account of verbal overshadowing may help to explain many of the findings that we have reported in this chapter.

*a. The Generality of Verbal Overshadowing* According to the transfer-inappropriate retrieval approach, verbal overshadowing should be limited to situations in which memory performance relies on knowledge/processes not invoked by the initial process of verbal recall. Thus, this approach can account, in principle, for why verbal overshadowing effects are observed across a variety of domains of nonverbal memory, but do not apply to domains that rely on more verbalizable knowledge.

*b. Processing Differences* A central premise of transfer-inappropriate retrieval is that verbal overshadowing effects result from a mismatch between the processes used during encoding and verbal retrieval. Thus, this approach readily explains why nonverbal retrieval does not produce comparable interference. Accordingly, visual recall should encourage retrieval processes that are consistent with the original visual encoding operations, and thus should not impair the subsequent retrieval of information associated with such information. The transfer-inappropriate retrieval approach further suggests that visual retrieval of verbal stimuli might interfere with the subsequent access to verbal knowledge. Indeed such "visual overshadowing" might be a fruitful topic for further investigation.

*c. Expertise Differences* Transfer-inappropriate retrieval can also account for the relationship between verbalization and expertise. If verbal recall reduces access to nonverbal knowledge, then the costs of verbal recall should be greatest to the degree that nonverbal expertise exceeds verbal expertise. In addition, transfer-inappropriate retrieval also suggests an additional reason for why verbal recall does not interfere with the perceptual memory performance of wine experts. With training, individuals may be more likely to engage in a combination of perceptual and verbal processes

during encoding. Thus, for experts, verbal retrieval may engage processes that are more appropriately matched with those initiated during encoding. As a consequence, for experts, verbal recall may be more apt to compliment rather than to clash with the processes invoked during the initial encoding of the wine.

*d. The Availability of Verbalized Memories* The transfer-inappropriate retrieval approach readily accounts for the effectiveness of manipulations that attenuate verbal overshadowing effects.<sup>5</sup> Accordingly, introducing retrieval conditions that encourage the engagement of nonverbal perceptual processes reinstates access to the perceptual knowledge associated with such processes. In addition to providing a general explanation for the attenuation of verbal overshadowing effects, the transfer-inappropriate retrieval approach may also help to explain two previously anomalous findings regarding the reversal of verbal overshadowing: the beneficial effects of re-presentation and the elimination of verbal overshadowing effects over repeated trials.

As mentioned previously, J. W. Schooler et al. (1996) observed that re-presentation of the target face increases the performance of verbalization subjects to such a degree that they exceed that of nonverbalization subjects (see Fig. 7). In the context of the transfer-inappropriate retrieval framework, this finding can be explained as follows. When subjects engage in verbal recall of a visual stimulus they rehearse and potentially strengthen the verbal knowledge, but at the expense of impairing access to visual knowledge. However, when the target is re-presented the perceptual operations are reinstated, giving verbalization subjects the best of both worlds: rehearsed verbal knowledge and refreshed perceptual operations.

Another previously perplexing situation in which verbal overshadowing effects have been observed to reverse is following repeated participation in the verbal overshadowing paradigm. Specifically, in a number of studies we have observed marked verbal overshadowing effects for the first stimulus/test set, and with little or no verbal overshadowing effects on

<sup>5</sup> At first blush, the availability assumption could be viewed as providing a possible challenge to the applicability of retrieval-induced interference. Specifically, a central premise of the availability assumption is that verbal overshadowing can be attenuated if conditions are introduced that cue the perceptual processes used during encoding. However, Anderson and Spellman posit that retrieval-induced forgetting may be cue independent (Tulving, 1974), that is, it should occur regardless of the nature of the retrieval cues. Nevertheless, they note that "more systematic exploration of which cues do and do not reinstate the ability to recall the impaired items is clearly desirable" (p. 92). In addition, they speculate that re-presenting the target stimulus may be one condition that reverses retrieval-induced forgetting, suggesting that such "disfission" is consistent with the notion that the representations of items are inhibited by retrieval but not damaged in any permanent sense" (p. 93). Thus, in fact the availability assumption is actually quite consistent with retrieval-induced forgetting literature.

subsequent trials. The attenuating effects of verbal overshadowing over trials has now been observed in a number of domains of perceptual memory including memory for faces (Fallshore & Schooler, 1995; J. W. Schooler, Ryan, & Reder, 1991), tastes (Melcher & Schooler, 1996), and audition (Houser et al., 1997). Although the precise reason for this trial effect remains unknown, it stands to reason that, over trials, the processes elicited during encoding, verbalization, and test may become more synchronized, making transfer-inappropriate retrieval less apt to occur.

*e. The Lack of a Relationship between Verbal Descriptions and Performance* The transfer-inappropriate retrieval approach provides a straightforward account for the lack of a relationship between verbal descriptions and performance. A central premise of this approach is that the interference associated with verbalization is *not* a consequence of an excessive reliance on a memory representation corresponding to the verbal activity. Rather, verbal recall is hypothesized to interfere with the successful application of nonreportable processes. As a consequence, there is no reason to expect a relationship between the specific contents of verbalization and performance.

*f. The Effect of Warnings* The transfer-inappropriate retrieval framework also accounts for the ineffectiveness of warnings in preventing the negative effects of verbalization. Accordingly, if verbal retrieval reduces the accessibility of the perceptual aspects of a memory, then admonishing subjects to rely exclusively on their perceptual memories should not be helpful. Indeed, the transfer-inappropriate retrieval framework may help to explain the tendency for warnings to exacerbate negative effects of verbalization. Accordingly, if verbalization impairs access to the perceptual aspects of a memory while maintaining some potentially useful verbal information, then the verbalization warning may compel subjects to ignore a potentially viable source of information.

*g. The Effects of Verbalizing a Nonverbalized Face* One of the greatest strengths of the transfer-inappropriate retrieval approach is its ability to account for the effects of verbally recalling one face on the recognition of a different face. As discussed earlier, retrieval-induced forgetting has been shown to involve a generalized form of interference that hampers the retrieval of information categorically related to the nonretrieved information (Anderson & Spellman, 1995). The assumption of transfer-inappropriate retrieval is that this generalized interference can apply to not only semantic categories, but also types of processes. Thus, this approach specifically predicts that engaging in retrieval that exclusively emphasizes verbal processes should produce a generalized interference that hampers

the subsequent retrieval of perceptual information associated both with the verbalized stimulus and with related nonverbalized stimuli. The negative effects of verbalizing one face on the subsequent recognition of a different face clearly support this aspect of the approach.

*h. The Effects of Verbalization on Just Know/Reason Judgments* Finally, the transfer-inappropriate retrieval approach readily accounts for the manner in which verbalization interacts with just know and reason judgments. This approach predicts that verbal retrieval should specifically interfere with the subsequent application of nonreportable knowledge/processes. And that is precisely the pattern of findings suggested by the Just Know/Reason paradigm. Verbalization impairs just know judgments, without influencing either the accuracy or the frequency of reason judgments. Thus, in accord with the assumptions of transfer-inappropriate retrieval, it appears that verbalization specifically disrupts the type of knowledge that is least likely to be accessed during the initial verbal retrieval process, that is, nonreportable knowledge that subjects "just know."

#### 4. Caveats and Future Directions

The transfer-inappropriate retrieval framework provides a reasonably compelling account of many of the complex findings surrounding the impact of verbalization on perceptual memories. Nevertheless, in its present form, it remains a relatively rough-hewn framework that will need further testing and refinement. One critical issue that awaits further research is the applicability of the transfer-inappropriate retrieval account to the various domains in which verbal overshadowing has been observed. As noted, several of the key sources of evidence for abandoning a recoding interference account in favor of the transfer-inappropriate retrieval approach come from investigations in the domain of face recognition. On one hand, as the present review has shown, there are good reasons for suspecting that very similar mechanisms may underlie verbal overshadowing across the various perceptual memory/recognition paradigms reviewed in this chapter. The paradigms are quite similar, and even idiosyncratic findings such as the interactions between verbalization and expertise, the trial effect, and the unique relationship between verbalization and just know/reason judgments have been observed across domains. On the other hand, as noted, other verbal overshadowing paradigms, such as the Brandimonte et al. (1992a, 1992b, 1997) visual form procedure, differ in more notable respects. For example, in the Brandimonte et al. paradigm, verbalization is introduced at encoding rather than postencoding, and verbalization involves labeling the stimuli rather than describing them. Although, as argued, it seems likely that all verbal overshadowing effects involve a conflict between verbal and nonverbal

sources, the precise nature of this conflict may depend on the particular paradigm. In some cases (e.g., the face recognition paradigm), the conflict appears to involve an interference between verbal and nonverbal processes. In other paradigms, however (e.g., the form imagery paradigm), the conflict may still be best characterized by the original notion of recoding interference, that is, as competition between distinct verbal and nonverbal memory representations. Future research will be needed to determine the conditions under which verbalization elicits processing conflicts, representational conflicts, or some combination of the two (cf. Dodson et al., 1997).

If, as suggested, verbal overshadowing effects can involve a general disruption in the application of nonverbal processes, then future research will also be needed to determine the scope of this disruption. One possibility is that the processing disruption is stimulus specific. For example, the generalized effects of verbalizing a face might involve processes that are unique to face recognition (e.g., configural face processing; cf. Fallschore & Schooler, 1995; Rhodes et al., 1989). Alternatively, verbal recall might produce a more global disruption in the application of nonverbalizable perceptual processes. Consistent with this latter alternative is an unpublished finding by Westerman (1991) suggesting that even verbalizing the appearance of a previously seen car is sufficient to interfere with subsequent face recognition. This finding suggests that the processing disruption associated with verbalization may, like the verbal overshadowing effect itself, generalize broadly across domains of nonverbal processing. However, confirmation of this claim also awaits further research.

In addition to investigating the scope of the processing interference introduced by verbal retrieval, additional research is also needed to clarify the premises postulated by the transfer-inappropriate retrieval approach. For example, Anderson and Spellman (1995) argued that retrieval-induced forgetting may specifically involve inhibitory processes. Although we have been cautious in adopting this inhibitory assumption due to the fact that many seemingly inhibitory processes can be accounted for otherwise (cf. Cohen & Servain-Schreiber, 1992), it nevertheless remains a real possibility that inhibitory processes may be involved in verbal overshadowing effects. In this regard, it may be useful to find converging evidence for such inhibitory processes using a combination of neurological (e.g., Shimamura, Jurica, Mangels, & Gershberg, 1995) and individual difference (e.g., Hasher, Stoltzfus, Zacks, & Rypina, 1991) measures of inhibition.

Finally, if transfer-inappropriate retrieval does in fact turn out to be a critical mechanism underlying at least some verbal overshadowing effects, then it seems likely that it may be operative in other situations as well. For example, transfer-inappropriate retrieval may provide a way of accounting for Graf and Mandler's (1984) finding that instructing subjects to complete

word fragments with previously seen words actually impairs fragment completion performance. Accordingly, explicit memory retrieval may emphasize conceptual/semantic memory processes that may thereby hamper subjects' ability to draw on the perceptual/nonreportable processes necessary for implicit priming. More generally, the transfer-inappropriate retrieval account suggests that perceptual/nonverbal and conceptual/verbal processes are not, as is often assumed, entirely independent (e.g., Jacoby, Yonelinas, & Jennings, 1997; Paivio, 1986). Rather, at least in some situations, the application of verbal processes may be at the expense of the subsequent application of nonverbal processes.

## VI. Closing Remarks

In closing it may be useful to revisit the issue with which we opened this chapter, namely, the relationship between language and thought. In the past, the primary approach for investigating this relationship has involved examination of the linguistic relativity hypothesis, that is, whether concepts differ as a function of the language that one speaks (see Hunt & Agnoli, 1991, for a recent review). However, the present analysis suggests that evidence pertinent to the relationship between language and thought may be found much closer to home, by investigating the impact of committing nonverbal thoughts to words. Moreover, verbal overshadowing findings illustrate that the effects of language on thought are not, as is often assumed in Whorfian accounts (Whorf, 1956), a necessary consequence of the particular words available to a language. It seems that the impact of language on thought may not simply depend on whether words *exist* for a particular experience but additionally on whether or not words are *applied* to that experience. The central conclusion of verbal overshadowing research is that various forms of nonverbalizable knowledge may be best served by avoiding the application of language.

In his seminal treatise on the relationship between language and thought, Wittgenstein (1922/1961) observes that it is possible to apprehend experiences that transcend language, noting, "there are indeed things that cannot be put into words" (p. 156). However, he argues that such experiences are beyond the purview of philosophy and, by extension, science, observing, "The correct method in philosophy would really be the following: to say nothing except what can be said" (p. 151). Although Wittgenstein may not have had in mind the types of indescribable cognitions that we have been exploring here, his conclusions nevertheless have relevance. On one hand, contrary to Wittgenstein claims, we have found that inexpressible experiences are quite amenable to empirical analysis and scientific discussion (see

also J. W. Schooler & Fiore, 1997; J. W. Schooler & Melcher, 1995). At the same time, our research suggests new merit to Wittgenstein's closing admonition, "Where of one cannot speak, there of most one be silent" (cited in Black, 1964, p. 377). However, given that describing the indescribable is not merely futile, but actually disruptive, a more prescriptive variant may be in order: Where of one cannot speak, there of *should* one be silent.

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