Speaking of Wine: Verbal and Perceptual Expertise Mediate Verbal Overshadowing in a Taste Recognition Task

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Abstract

When subjects generate a detailed, memory-based description of complex visual stimuli such as faces, their recognition performance can be worse than nondescribing controls. This effect, termed verbal overshadowing, typically occurs when the stimulus is difficult to describe, not normally verbalized in detail, and when subjects are naive about the task demands. Verbal overshadowing has previously been shown to effect visually based memory (for faces and colors). This experiment was designed to: 1) detect verbal overshadowing in another sense modality, taste, and 2) to determine if domain-related expertise modulates susceptibility to verbal overshadowing. Wine tasting was chosen as a domain in which to attempt to control subjects' relative levels of verbal and perceptual expertise. Based on suggestive data from previous face recognition studies, it was hypothesized that subjects whose perceptual expertise was greater than their domain-related verbal expertise (termed Intermediates) would show verbal overshadowing. On the other hand, subjects with relatively equal perceptual and verbal expertise, either low/low (Novices) or high/high (Experts) would not show verbalization effects. After tasting a target red wine Verbalization subjects wrote detailed taste descriptions from memory while controls participated in an unrelated verbal task. All subjects then attempted to identify the target wine from among three foils. As predicted, the verbalizing Intermediates performed significantly worse than the nonverbalizing controls on Trial 1. No-effect of verbalization was observed for either the novices or experts. The results are explained in terms of the differential development of perceptual and verbal skills in the course of becoming an expert.

Keywords: Verbalization effects, expertise, memory, language, taste recognition.

How often do we seriously try to communicate the nuances of perceptual experiences beyond the conventional of everyday speech? We say, "He was very handsome;" "The soup was delicious;" "The coffee tasted exotic, but bitter." Do such recountings revive experiences or are they merely impressionistic dabs that capture only the coarsest details of our experiences? Then what about this description:? "It was a well balanced wine, almost certainly a Pinot Noir, rather oakey, tinged with a hint of blackberries and a faint, rather endearing mustiness." Does this more elaborated description reflect qualitatively better sensation and perception and better recollection of the experience that produced it? Other questions we have been exploring are: Does describing a memory help or hurt memory for perceptions? Does verbal expertise in a domain enable more effective perceptual discrimination, description, and/or recollection? Motivated by these questions about the nature of the relationships between perception, language, and memory, this study sought to explore the effects of verbalization and expertise on subjects' ability to recognize wine taste samples.

The ancients knew that forming mental images enhances memory for words (e.g., Bower & Winzenz, 1970; Paivio, 1969). Similarly, verbal encoding normally enhances recognition of auditory and visual targets (e.g., Bartlett, 1977; Bower & Holyoak, 1973; Carmichael, Hogan, & Walter, 1932; Daniel & and Ellis, 1972). Paivio's (1986) dual-code theory proposes that using both verbal and nonverbal encoding enhances memory by forming two potential routes for recall or recognition.

However, Schooler and Engstler-Schooler (1990) found that memory facilitation from dual encoding breaks down when subjects verbalize stimuli that are difficult to adequately capture words. Specifically, they found that post-encoding verbal description of visually complex stimuli such as faces and colors impaired subjects' subsequent recognition performance -- an effect they termed verbal overshadowing.

In verbal overshadowing, the failure to benefit from dual encoding is attributed to the relative non-utility of the verbal code. In paradigms in which a dual coding is found to be useful, exclusive access to the verbal code can enable the subject to effectively carry out the task. For example, either remembering the image of a dog or the word "dog" is sufficient to enable one to recall that "dog" was a memory item. Thus access to either a visual or a verbal code can enable successful performance, thereby enabling subjects who have both codes to perform more effectively than those who have only one or the other (cf. Paivio, 1986). However, for stimuli such as faces, possession of a verbal code may be of minimal benefit because, verbal

descriptions are notoriously inadequate representations of ones memory for a face (cf. Fallshore & Schooler, 1995; Polanyi, 1967). Thus, attempting to rely on a verbal code for remembering a face may not only fail to facilitate performance, it may actually hamper performance to the degree that one relies on the verbal code at the expense of the visual one. Consistent with this view, recent studies have observed verbal overshadowing effects for a variety of tasks for which relying on a purely verbal representation could be disruptive, including memory for various perceptual stimuli such as music (Houser, Fiore, & Schooler, 1995), maps (Fiore, 1994), and visual forms (e.g., Brandimonte, Schooler, & Gabbino, 1995) as well as other difficult-to-describe cognitive activities such as insight problem solving (Schooler, Ohlsson, & Brooks, 1993) and affective decision making.

Configural and featural processes in encoding and recognition

In short, verbal overshadowing effects can be broadly construed as resulting from inappropriate use of a verbal code when a nonverbal/perceptual code may be more appropriate. This characterization leaves open the question the precise nature of the information that is disregarded as a result of verbalization. Recent research suggests that the visual information disregarded following verbalization may specifically be the configural properties of the stimulus. Specifically, verbalization may encourage the reliance on featural processing associated with the verbal code, while discouraging the configural processing associated with the visual code. In vision, configural processing provides gestaltic overviews of shape, topography and dimension (cf. Marr, 1982), as well as color, and where appropriate, motion perception. These processes occur rapidly, in parallel, and preconsciously. On the other hand, featural perception is associated with more conscious awareness of discrete packets of information (Diamond & Carey, 1986). It is more analytical, insofar as it involves separate, consciously motivated analyses of discrete features that contributed to configural processing; it also involves verbal labeling. Feature-oriented processing takes place relatively slowly and serially; discrete features are necessarily noted one at a time. Note, finally, that it is relatively difficult to describe the (subconscious) processes of low-level perception. For example, in vision, to precisely name shades of color, or to describe topology and spatial relationships, such as the precise geometrical configuration of the eyes, nose, and mouth, etc.

A verbal overshadowing mechanism

Verbal overshadowing appears to be caused when subjects who have encoded information using perceptual/configural processes are subsequently asked to recode that information using more verbal/featural processes, and thereby inappropriately draw on verbal/featural information at recognition. Schooler and Engstler-Schooler found that verbal overshadowing could be reversed by forcing subjects to make speeded recognition decisions (Schooler & Engstler-Schooler, 1990). This manipulation apparently causes subjects to switch back to their original configural representation.

Central to the above analysis is the suggestion that verbal overshadowing produces impairment when access to perceptual/configural information provides a more veridical reflection of the experience than access to the verbal/featural information. Accordingly, the better an individual is at representing perceptual knowledge in featural/verbal code, the less impaired they should be by verbalization -- the central hypothesis of this study.

Verbal and perceptual expertise and susceptibility to verbal overshadowing

It is important to note that verbal overshadowing has so far only been found under conditions in which subjects have perceptual, but not verbal, expertise in a domain. This discrepancy leads to the hypothesis that susceptibility to verbal overshadowing depends on the relative strengths of one's verbal and perceptual expertise in a domain. Consistent with this view are recent findings (Fallshore & Schooler, in press; Schooler, Ryan, Fallshore, & Melcher, 1995) suggesting that increasing perceptual expertise in a domain may increase susceptibility to verbal overshadowing if it is not accompanied by verbal expertise. Schooler et al. (in press) have noted that "with increasing expertise comes a greater use of configural considerations in which multiple elements interact." Likewise, Fallshore and Schooler (in press) have found that Caucasian subjects who described Caucasian faces (for which they presumably have high perceptual expertise, i.e., exposure and familiarity) were more impaired at recognition than when they described African-American faces (for which they presumably have lower perceptual expertise.). They explained these results as follows: Due to greater perceptual expertise, the Caucasians processed own-race faces configurally but processed other-race faces featurally (cf. Brigham & Malpass, 1985; Diamond & Carey, 1986). Fallshore and Schooler further hypothesized that post-encoding verbalization disrupts memory for configural representations but not for featural representations. This suggests that post-encoding verbalization is disruptive when it cannot capture the nuances of the underlying configural representation. Likewise, post-encoding verbalization is not likely to be disruptive to the extent that the initial processing was featural. In the case of Caucasians trying to recognize African-American faces (where they have neither perceptual nor verbal expertise) verbal overshadowing did not occur. In short, Fallshore & Schooler's results suggest that verbal overshadowing effects occur when perceptual expertise is high and verbal expertise is low, whereas it does not occur when both verbal and perceptual expertise are modest. However, what happens when individuals possess both perceptual and verbal expertise? According to the present analysis such individuals may also be less vulnerable to verbal overshadowing.

This study used a wine-tasting task because, in the course of their training, wine experts learn an extensive vocabulary dedicated to taste and odor detection and

classification in wines. A domain-specific vocabulary may provide a precision and depth that is lacking in ordinary language, thereby facilitating the recall of both the configural and featural processing of perceptual experience. For instance, Lehrer (1983) and Solomon (1990) have that wine experts have more precise wine taste discrimination than novices and that better discrimination may be linked to linguistic skill in the domain. These results are consistent with the hypothesis that verbal expertise commensurate with perceptual expertise may prevent verbal overshadowing. They are also consistent with Schooler, et al.'s (in press) contention that perceptual expertise should be more vulnerable to verbalization effects than expertise based on conceptual or propositional knowledge. It should be noted that increasing verbal expertise in any domain necessarily involves more elaborated conceptual and propositional knowledge. In wine, for instance, verbal expertise is associated with varietal classification, various standard taste categories, etc. Of course, the degree to which knowledge is strictly propositional varies between domains. Wine classification is arguably less precisely propositional and conceptual than, say, disease diagnosis.

Summary and predictions

This study was designed to examine the degree to which verbal overshadowing in the domain of wine recognition may be mediated by individuals relative level of levels of perceptual and verbal expertise. If the rationale just outlined is correct, persons with relatively more perceptual than verbal expertise (herein, subjects who report drinking red wine relatively frequently, but who have little formal training in wine) should be handicapped by the fact that their ability to talk about wines lags their perceptual discrimination skills. In contrast, novices (individuals who drink red wine less than once a month), should be relatively unaffected by verbalization since their perceptual an verbal expertise are commensurately underdeveloped. Such a finding would conceptually replicate Fallshore & Schooler's finding that other race face recognition is relatively immune to verbalization. Finally, wine experts (professionals or individuals with marked wine training) should also show an immunity to verbalization effects, in this case because their verbal and perceptual expertise are both commensurately advanced

To test for the hypothesized interaction between level of expertise and verbalization, subjects were categorized according to their perceptual expertise (frequency of red wine consumption) and verbal expertise (amount of formal wine training). The Novices rarely or never drank red wine and had no training. The Intermediates consumed red wine moderately to frequently but had limited wine training. The Experts were frequent consumers who were either wine professionals or had extensive formal training. It was predicted that there would be no difference in recognition accuracy between verbalizing and control Experts and Novices but that Intermediates' recognition would be impaired by post-encoding verbalization.

Method

Subjects. The subjects were 107 adults between the ages of 21 and 78.

Materials and Design. The wines were eight red varietals from six countries. On each of two trials the wines were arrayed in one of four Latin squares presentation orders; the target wine appeared equally often in each of the four serial positions. Stimulus set presentation counterbalanced over the trials. This was a 3 (Novice/Intermediate/Expert) x 2 (Verbal/Nonverbal) x 2 (Trial) design with expertise and verbalization as between-subjects factors, trial as a within-subjects factor, and target discrimination as the dependent variable.

Procedure. Prior to the trials, subjects completed a questionnaire designed to categorize their levels of wine expertise. It included questions on frequency of red wine consumption, the subject's wine training background, and five general wine knowledge quiz items.

On each of two trials the subjects received a tray of cups with the target and the recognition test array. Subjects tasted the target after having been told to "pay attention to any or all aspects of the sample except for its appearance." Verbal subjects were asked to: "describe this wine as precisely and in as much detail as you can. Describe it uniquely, so that someone else would match it to your description. Consider all elements of the wine's taste, smell, feel, or related associations. . .". Control subjects worked a crossword puzzle during the four minute retention interval. The subjects were then given these recognition test instructions: "The set of four cups contain four different wines. One of them is the wine you just tasted. The other three are different. You are to taste each wine in order. After you taste each sample, please indicate on the page how sure you are whether it is the wine you just tasted. . .".

The subjects indicated their confidence that each sample in the array was/was not the target, on a scale where 7 indicated an absolute "yes" and 1 indicated an absolute "no." The confidence ratings were converted to a discrimination score for each trial. This value was the difference between the confidence rating for the target wine minus the mean rating for the three distractors. A score of 6 indicates perfect discrimination (giving the target the highest score and each distractor the lowest); 0 indicates random discrimination, and negative scores indicate false alarms (ranking one or more distractors higher than the target).

Results

The relationship between verbalization and expertise was mediated by a significant three-way interaction between verbalization, expertise, and trial $F(2,196) = 4.43$, $p < .01$. This trial interaction reflects the fact that verbal overshadowing disappeared on the second trial -- typical in this paradigm (e.g., Fallshore & Schooler, in press; Schooler & Melcher, unpublished data). We therefore

focus on Trial 1, when subjects were naive about the verbalization and recognition tasks. Figure 1 illustrates Trial 1 performance. There was a significant Expertise x Verbalization interaction, $F(2,99)=5.10$, $p=.008$, driven by significant verbal overshadowing among the Intermediates, $t(45)=2.80$, $p=.008$ and nearly significant enhancement among the Novices, $t(35)=2.01$, $p=.052$. The enhancement for Experts was nonsignificant ($p>.6$). Finally, there was a significant main effect of Expertise, $F(2,99)=6.20$, $p=.003$, important insofar as it validates the expertise ranking criteria.

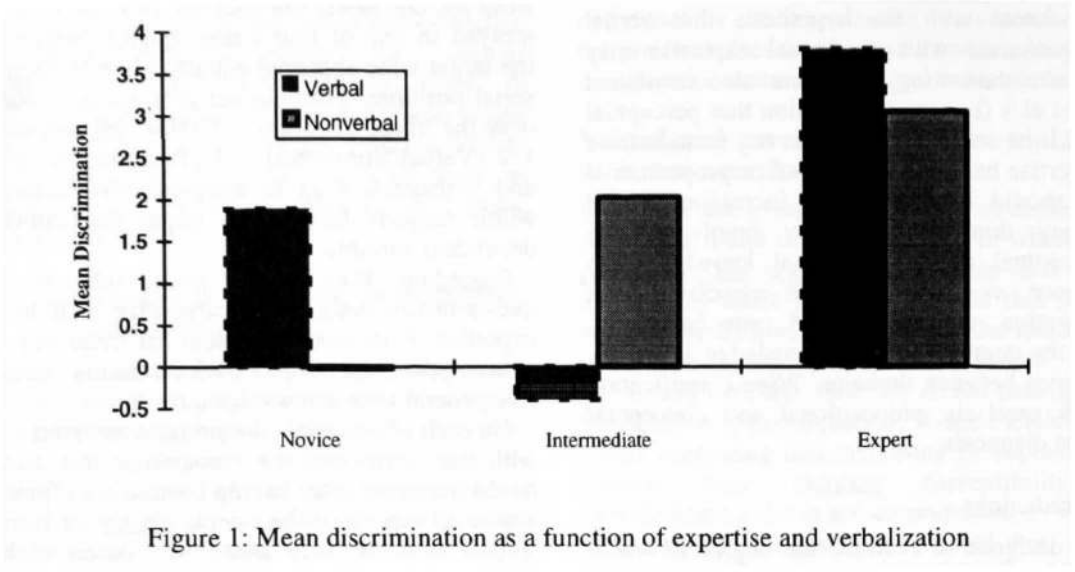

Figure 1: Mean discrimination as a function of expertise and verbalization

The current conceptualization of verbal overshadowing is that it happens when persons who lack the requisite verbal skill shift from the default, nonverbally coded configural memory representation to an inferior featural representation, encoded verbally. Conversely, persons who possess high verbal skill in the domain should tend to benefit from their more precise dual encoding facility. To test this interpretation, all potentially relevant recognition discrimination predictor variables[1] were entered into a stepwise regression to determine which were most predictive of performance for the Verbalization and the Nonverbalization subjects. The regression showed that Nonverbalizers' discrimination was significantly predicted only by the measure of perceptual expertise (consumption frequency) ($r=.39$) whereas Verbalizers' discrimination was only significantly predicted by the measure of verbal expertise (wine knowledge) ($r=.45$; both $ps < .01$). None of the other variables entered significantly into the stepwise regression model.

Discussion

The most important result of this experiment is that its successful manipulation of perceptual and verbal expertise confirms that verbal overshadowing is most likely to occur when verbal expertise is outflanked by perceptual expertise in a domain. In other words, verbal overshadowing results when people who lack the requisite verbal skill nevertheless attempt to verbally/featurally recode a configural representation in memory. This view was supported by the finding that the only subjects whose performance was impaired by verbalization were the those with relatively high perceptual expertise (frequent red wine consumers) but little verbal expertise (little formal wine training).

The role of expertise in mediating the verbalization effects was further illustrated by the stepwise regression analysis examining the relationship between expertise and performance as a function of verbalization condition. This analysis revealed that perceptual expertise was the only significant predictor of Nonverbalizers' discrimination whereas the Verbalizers' discrimination was significantly predicted only by verbal expertise. These findings suggest that Nonverbalizers tend to rely on their configural representation whereas Verbalizers tend to rely on their verbal (i.e., featural) representation -- which helps them to the extent that they are capable verbalizers. This pattern suggests that verbalization shifted the Intermediates away from the configural processing at which they are relatively expert to the featural processing at which they are less adept. Since the novices and experts had better equated verbal and perceptual skills (low/low and high/high) only the intermediates' performance suffered as result of

[1] These variables were: 1) red wine consumption frequency, 2) wine knowledge score, 3) age, 4) gender, and 5) target placement in the recognition arrays.

the verbalization-induced shift from perceptual to verbal processing.

Two other aspects of the intermediates are also worth noting. First, in terms of relative perceptual and verbal expertise their wine expertises are analogous to the average person's face expertise: They have relatively extensive experience with tasting wine (and viewing faces) but relatively less experience in describing wine (and faces). Second, the Intermediates' descriptions demonstrated relatively well developed wine-related verbal skill. They often used Expert-like vocabulary and categories (e.g., balance, nose) but by definition (of limited training) it is reasonable to presume that this skill is less well practiced (Lawless, 1985; Lehrer, 1983; Solomon, 1990). Therefore, the connections between perceptual and verbal nodes are presumably not as strong, not as precisely mapped, nor as automatically activated as among the experts.

The trial effect

As noted in the results, this experiment generated a trial effect often observed in this paradigm (see Schooler, et al., in press): The verbal overshadowing effect ameliorates or disappears after the first trial. The most likely explanation is that verbal overshadowing is due to subjects' initially encoding in the default configural mode, which is resistant to featural analysis when verbal skill is poorly developed. Once subjects have experienced the task demands of the encoding, verbalization, and recognition task they appear to encode the stimuli in a manner more congruent with the needs of verbal description. This experiment did not yield data that directly address this question, but there is other evidence that subjects change their encoding after the first trial. Schooler and Fallshore (1994) found some evidence that verbal descriptions improve over trials. In an ongoing study, subjects are asked whether they were aware of any face-encoding and/or recognition strategy changes after the first trial. Almost to a subject, they state something to the effect that on the first trial they "look at the whole face." On the second and third trials, however, they almost invariably say that they began to inspect the target for specific features that they could verbalize and/or use as benchmarks for the recognition judgments (Schooler & Melcher, unpublished data). That is, these perceptual experts seem to be consciously considering the verbalizable aspects of the stimuli. It is quite conceivable that the wine intermediates took this tack, for on the second trial, the verbalizers' recognition improved dramatically -- equalling the nonverbalizers.

Differential development of perceptual and verbal skills

This study may help illuminate mechanisms underlying earlier research which uncovered differential development between perceptual and verbal skills. The earliest suggestions appeared when Karmiloff-Smith & Inhelder (1974/75) discovered that young children rather quickly learned how to balance "trick" blocks (containing hidden weights). They simply used proprioceptive feedback to determine what works. However, somewhat older children with more sophisticated knowledge of physics took longer to learn to balance the blocks. Finally, the oldest of the three groups of children again learned quickly. Karmiloff-Smith and Inhelder hypothesized that the middle group's failures were based on an implicit theory about balancing (i.e., the best strategy is to balance at the geometric center). However, this otherwise implicit theory caused them to tend to ignore contrary evidence (the effect of the hidden weights). The oldest children performed well, presumably because they could more explicitly reconcile their theory with contrary evidence to generate a more general theory. A particularly startling finding was that the middle-range kids who failed could nevertheless perform the task if they closed their eyes and relied once again on proprioceptive feedback. In short, the perceptual (i.e., proprioceptive feedback skill) developed more quickly than the conceptual (akin to verbal knowledge or expertise). Children who had not yet developed the requisite level of sophistication in articulating physical theory, were therefore handicapped.

Among adults, Lesgold, Feltovich, Glaser, & Wang (1981) and Lesgold et al. (1988) have found that verbal skill apparently matures more slowly than perceptual skill in radiology. Lesgold et al. (1988) studied radiologists as they learned to read x-ray photographs and found that part-way through their training students suffered a decrease in their ability to diagnose lung abnormalities. Lesgold et al. speculated that this drop might reflect differences between a fast "perceptual" learning and a slower "cognitive" learning such that "an emerging cognitive ability will have to contend with a stronger perceptual ability already in place" (p. 337, emphasis added). In the context of the present findings, it might be suggested that as radiology students initially acquired cognitive ability at reading x-rays, they may have been more predisposed to verbalize diagnostic hypotheses based on pattern recognition, or configural, perception. Their possibly undeveloped verbal skill may then temporarily fail to support their perceptual skill. However, as their cognitive/verbal skill develops, the mismatch

between the verbal and perceptual knowledge may disappear, and with it, the interfering effects of verbalization. This explanation raises the intriguing possibility that although verbalization initially overshadows perceptual expertise, with practice it may facilitate it.

Acknowledgments

The writing and research reported here was supported by a grant to the second author from the National Institute of Mental Health.

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