

Schooler, J. S., Ryan, R. & Reder, L. M. (1996). The cost and benefits of verbally rehearsing memory for faces. In Herrmann, D. J., Johnson, M. K., Hertzog, C., McEvoy, C. & Hertel, P. (Eds.) *Basic and Applied Memory Research, Vol. II*. Hillsdale, NJ: Erlbaum, pp. 51-65.

## The Costs and Benefits of Verbally Rehearsing Memory for Faces

Jonathan W. Schooler  
Robert S. Ryan  
*University of Pittsburgh*

Lynne Reder  
*Carnegie Mellon University*

Witnesses of a crime are typically asked to describe the appearance of the perpetrator. Such descriptions can be of great help in assisting investigators. However, recent research suggests that one potential cost of describing a previously seen face is that, at least under some circumstances, verbalization can actually disrupt subsequent recognition performance. For example, in a study by Schooler and Engstler-Schooler (1990) subjects viewed a videotape of a bank robbery and then, after a brief delay, verbalization subjects were asked to describe the appearance of the bank robber in as much detail as possible, whereas control subjects engaged in an unrelated filler activity. All subjects were then given a recognition test that included photos of the target person and seven similar-appearing distractor photos. Compared to control subjects, verbalization subjects were significantly less accurate at recognizing the target face. In this chapter, we first review the evidence and current explanations for the disruptive effects of verbalizing previously seen faces (termed *verbal overshadowing*), and then describe some recent findings that reveal situations in which verbalization of faces can be helpful.

### A BRIEF REVIEW OF VERBAL OVERSHADOWING

The basic finding that verbalizing a previously seen face can interfere with subsequent recognition performance has been replicated numerous times in the Schooler lab (Fallshore & Schooler, 1995; Ryan, 1992; Schooler &

Engstler-Schooler, 1990; Schooler, Ryan, & Reder, 1990) as well as in other labs (e.g., R. Chaffin, personal communication, 1990; Doxson, Johnson, & Schooler, in press; C. Kelley, personal communication, 1991; Read & Schooler, 1994; Westerman, 1991). The verbal overshadowing effect can be conceptualized within a more general framework that assumes that many activities involve a combination of both verbalizable and nonverbalizable task components. For example, as discussed in more detail later, face recognition can involve both an attention to verbalizable features (e.g., moles, shape of nose, size of ears, color of eyes, etc.) as well as difficult to articulate configural characteristics (e.g., the relationship between the features). From this perspective, a reasonable account of the effects of verbalization is that verbalization causes subjects to emphasize the reportable task components, thereby deemphasizing (overshadowing) the nonreportable components.

Consistent with the interpretation that verbalization shifts subjects' relative emphasis on verbalizable versus nonverbalizable components, verbalization has been shown to impair a variety of other activities for which successful performance is likely to require the substantial use of knowledge or processes that are difficult to articulate. They include: color memory (Schooler & Engstler-Schooler, 1990), insight problem solving (Schooler, Ohlsson, & Brooks, 1993), affective judgments (Schooler & Wilson, 1991; Wilson et al., 1993; Wilson & Schooler, 1991), implicit learning (Berry, 1984; Fallshore & Schooler, 1993), visual imagery (Brandimonte, Schooler, & Gabbino, 1995), recognizing deep structure analogies (Sieck, 1993), taste memory (Melcher, 1994; Melcher & Schooler, in press), map memory (Fiore, 1994; Fiore, Eisen-gart, & Schooler, 1993), and music memory (Houser, Fiore, & Schooler, 1995; Houser & Schooler, 1994). In contrast, verbalization has been shown to help or at least not impair performance when success can be effectively achieved by relying on readily reported knowledge. Such tasks include: memory for word lists (Darley & Glass, 1975), memory for a spoken statement (Schooler & Engstler-Schooler, 1990), analytic problem solving (Gagne & Smith, 1962; Schooler & Melcher, 1995; Schooler et al., 1993), and learning declarative knowledge (Chi, de Leeuw, Chiu, & LaVancher, 1994). The observation that verbalization disrupts a substantial variety of activities that depend on nonverbalizable information or processes while not disrupting more readily verbalized activities supports the notion that verbalization deemphasizes nonverbalizable task components.

In the domain of face recognition, additional research has been conducted in an effort to more precisely characterize the verbalizable and nonverbalizable task components that may be differentially affected by verbalization. Many conceptualizations of face recognition assume that it involves the consideration of two general types of information: featural information corresponding to the characteristics of individuals facial features and configural information corresponding to the relationship between those features (Carey &

& Diamond, 1977; Diamond & Carey, 1986; Sergent, 1984; Tanaka, 1993; Wells & Hryciw, 1984). The featural aspects of faces are much easier to describe than are the configural components, which may account for why subjects who describe faces as they encode them are better able to identify the appropriate features with which to produce composite faces, whereas subjects who encode faces configurally by making personality judgments are better able to recognize the face (e.g., Wells & Hryciw, 1984). From the general characterization of verbal overshadowing outlined earlier, it follows that verbalization of the appearance of a previously seen face may cause subjects to focus on the featural aspects of a face while deemphasizing the configural aspects.

Fallshore and Schooler (1995) explored the relative effects of verbalization on the use of featural and configural information by examining the interaction between verbalization and other variables believed to influence the relative contribution these two types of facial information. Previous research has suggested that when the target face is of a different race than the subject (e.g., Rhodes, Tan, Brake, & Taylor, 1989) or when the recognition array is presented upside down (e.g., Bartlett & Searcy, 1993; Diamond & Carey, 1986; Young, Hellawell, & Hay, 1987), subjects rely more on featural information and less on the configural relationships between the features. If verbalization disrupts performance by reducing the use of nonreportable configural information, then the effects of verbalization should be maximized under conditions in which configural information is most likely to be used and minimized under conditions in which configural information is least likely to be used. Consistent with this prediction, Fallshore and Schooler observed that verbalization interfered with subjects' recognition of same-race faces when the recognition array was presented upright. However, verbalization did not impair recognition of other race faces, nor of same-race faces tested with inverted recognition arrays. A reasonable interpretation of these findings is that verbalization reduces subjects' use of configural information, and therefore its impact is minimized under situations in which configural information is less apt to be used.

Although consistent with the notion that verbalization deemphasizes configural information, it should be noted that Fallshore and Schooler's results are also consistent with the more general suggestion that verbalization may deemphasize visual information. From a dual code perspective (e.g., Pavio, 1986), the visual code is assumed to maintain a spatial analog and consequently should be expected to preserve configural information. In contrast, because the verbal code maintains propositions, it would be less likely to maintain difficult-to-describe configural information. Thus, the findings that verbalization may deemphasize the use of configural information are also consistent with the suggestion that verbalization deemphasizes visual information (e.g., Brandimonte et al., 1995; Schooler & Engstler-Schooler, 1990) and, more generally, with the suggestion that verbalization deemphasizes nonreportable information and processes (e.g., Schooler et al., 1993).

Additional research has sought to understand why subjects seem to favor the information associated with the verbalization activity. For example, one possibility involves the self-generated quality of the verbalizations. From the perspective of the generation effect (Slamecka & Graf, 1978), subjects might remember the information associated with their self-generated verbalization better than that associated with the merely presented visual stimuli. However, recent findings indicate that reading a verbal description of a face produces as great an impairment as self-generating a description (Dodson et al., in press). Another possibility is that subjects experience a source monitoring confusion in which they confuse what they said with what they saw. However, warning subjects about the possibility of such confusions fails to prevent the negative effects of verbalization (Dodson et al., in press).

The possibility that verbalization causes subjects to rely on the specific content of their descriptions is further discounted by the repeated failures to find any relationship between the content of subjects' descriptions and their recognition performance. For example, Schooler and Engstler-Schooler (1990) had independent raters code each description for the number of accurate and inaccurate features and found no relationship between the quality of subjects' descriptions and their recognition performance. Similarly, Schooler (1989) and Fallshore and Schooler (1995) gave the verbalization subjects' descriptions to yoked subject-judges who attempted to identify the target face solely on the basis of the descriptions. Although subject-judges' identification performance was above chance, there was no correspondence between the identification accuracy of subject-judges and the recognition accuracy of their yoked verbalization counterparts. Although it is possible that verbalization subjects were relying on idiosyncratic elements of their descriptions, uninterpretable to other subjects, the lack of a relationship between verbal descriptions and performance suggests that verbalization subjects were not simply relying on their verbal description but instead were engaging in a more general shift towards the type of information associated with verbal descriptions and away from the nonreportable information considered during encoding.

Additional evidence for the suggestion that verbalization may shift subjects' general focus away from the nonverbalizable information to which they attended during encoding is suggested by the finding that when subjects were asked to verbalize the appearance of one of two previously seen faces, impairment was observed for both the verbalized and the nonverbalized face (Dodson et al., in press). This generalized effect of verbalization suggests that it is not the specific content of subjects' verbalizations that is causing the interference but, instead, a more general disparity between the type of information emphasized during encoding versus verbalization.

In sum, although many questions remain to be answered, a reasonable account of the effects of verbalization is that it increases emphasis on ver-

balizable task components and decreases emphasis on nonverbalizable task components. In the context of face recognition, this shift may be associated with a deemphasis on configural information. This deemphasis of nonverbalizable components of face memory, typically attended to during encoding, results in a disparity between the type of information emphasized during encoding and that emphasized during test (cf. Morris, Bransford, & Franks, 1977; Tulving & Thomson, 1973).

### THE BENEFICIAL EFFECTS OF VERBAL REHEARSAL OF FACES

The suggestion that the effects of verbalization are due to the disparity between the nonreportable information typically emphasized during encoding and the verbalizable information emphasized at test raises the possibility that face verbalization need not necessarily be disruptive. Accordingly, although an emphasis on the difficult-to-articulate aspects of a face appears to be the default approach taken in encoding and recognition, it is, in principle, possible to focus on more verbalizable features of the face. For example, if one notices that a face has a distinguishing mole, this could be extremely useful for subsequent recognition. In short, although verbalization may disrupt the recognition of faces encoded under default conditions, if subjects encoded faces in a manner that was consistent with their later verbalization activity, their performance might not be impaired, and might even be facilitated if they were able to identify some critical discriminating feature.

According to this view, if subjects encoded a face with an awareness of the impending verbalization activity and the nature of the subsequent recognition array, then verbalization might not be as disruptive. Consistent with this prediction, we have observed on a number of occasions that the effects of verbalization are often reduced over repeated trials (e.g., Fallshore & Schooler, 1995; Houser et al., 1995; Melcher & Schooler, in press; Schooler, Ryan, & Reder, 1990). When subjects engage in repeated trials of the verbal overshadowing paradigm (i.e., encoding-verbalization-test), the negative effects of verbalization tend to attenuate. Although the precise reason for this trial effect is not known, if the disruptive effects of verbalization are the result of a disparity between the information considered at encoding, verbalization, and test, it stands to reason that over repeated trials subjects might learn to become more consistent in what they attend to.<sup>1</sup>

<sup>1</sup>There are, of course, other possible explanations for the reduced effect of verbalization over trials. For example, the verbalizations elicited on multiple trials may interfere with one another, thereby canceling out their impact. Subjects may also get fatigued in later trials (describing faces is rather difficult) and may consequently devote fewer resources to the verbal description, thereby reducing its impact.

### The Effects of Re-Presenting the Face

The claim that verbalization effects are due to a disparity between the non-reportable information typically considered during encoding and the verbalizable information emphasized during verbalization suggests that these effects of verbalization should be eliminated if subjects are given the opportunity to see the face again after verbalization. Accordingly, if impairment is due to the inconsistency between the information emphasized under default encoding conditions and that emphasized during verbalization, then re-presenting the target face might enable subjects to recode the face in a manner that reduces this inconsistency and thereby eliminate the disruptive effects of verbalization. To address this issue, we examined the effects of re-presenting a target face after subjects had verbalized its appearance. Subjects viewed a target face, and then verbalization subjects were asked to describe it while control subjects engaged in an unrelated filler activity. After engaging in 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.

Based on the importance of the disparity of the information emphasized during encoding and verbalization, our prediction was that the disruptive effects of verbalization would be eliminated when the target face was re-presented following verbalization. As can be seen in Fig. 4.1, our prediction was generally observed, but with a twist. To our surprise, re-presentation not only eliminated the verbalization effect; it reversed it!

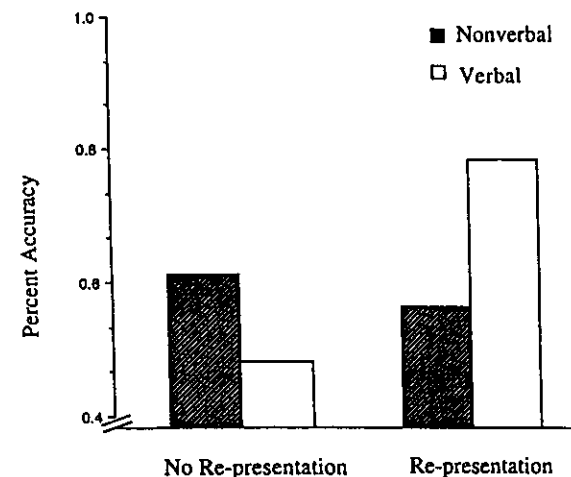


FIG. 4.1. The effects of verbalization and re-presentation on recognition accuracy.

Due to the somewhat surprising observation that re-presentation not only eliminated the negative effects of verbalization but actually reversed it, we replicated the procedure with a different set of faces, to ensure that the effect was both reliable and generalizable. To get a better understanding of the possible boundary conditions of this effect, we also added a third condition in which we re-presented the target face in an inverted position. Accordingly, if subjects extracted very simple featural information from the re-presented target face, then even inverted re-presentation could be of some value. If re-presentation refreshed subjects' configural memory or facilitated a more sophisticated analysis of individual features, then only the upright re-presentation should be of value. As can be seen in Fig. 4.2, the beneficial effects of re-presentation combined with verbalization were clearly replicated in the upright condition; however, there was no similar benefit for re-presentation of the inverted face.

The observation that re-presentation and verbalization reliably interacted in the manner that they did provides an important constraint on how we interpret the effects of re-presentation. Had re-presentation merely attenuated the verbal overshadowing effect, then the effects of re-presentation could have been attributed to a refreshing of the configural information, thereby reducing the disparity between the information emphasized during encoding and verbalization. Had re-presentation affected performance in both the verbalization and no-verbalization condition, then the effects of re-presentation could have been attributed simply to rehearsal. However, the fact that re-presentation improved performance only when subjects previously verbalized the face suggests that verbalization was responsible for causing subjects to extract new information from the face during re-presentation.

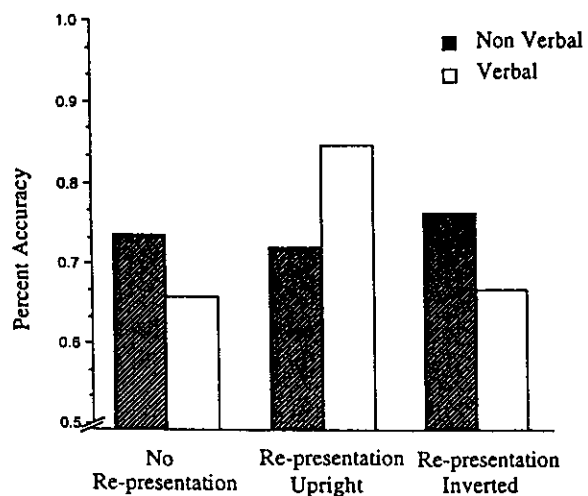


FIG. 4.2. A replication of the re-presentation study with the addition of an inverted re-presentation condition.

The impact of previously attempting to verbalize a face on subjects' subsequent ability to benefit from seeing it again is reminiscent of the beneficial effects of working on a problem without immediately being given its solution. When subjects are required to solve problems on their own, they often show better learning than when they are given the solutions simultaneously with the problems (Charney & Reder, 1986). Moreover, even when subjects work on problems that they are unlikely to solve on their own, they still benefit from working on the problems before being given the solutions (Needham & Begg, 1991). This benefit of working on a problem prior to receiving a solution has been attributed to subjects' hypothesized increased ability to appreciate the gaps in their knowledge. Accordingly, subjects who are given a solution without working on a problem fail to recognize which aspects of the solution are particularly helpful. A similar account may explain why verbalization enables subjects to benefit from re-presentation. Subjects who view re-presented faces following verbalization may be able to appreciate the aspects of the face that they failed to generate or generated inaccurately during verbalization, and thus may be better prepared to fill in or correct their memories.

This account leaves open the question of what type of information subjects used to repair their memories. The finding that subjects did not benefit from re-presentation of the face when it was inverted argues against the notion that verbalization subjects are benefiting from the very basic featural information that is extractable from inverted faces (e.g., moles, scars). The question remains: What exactly were subjects extracting from the upright faces that was unavailable from the inverted faces? It seems likely that re-presentation of the upright face may have refreshed subjects' memory for the nonreportable aspects of the face that they had deemphasized as a consequence of verbalization. Nevertheless, a "refreshing" explanation does not explain why verbalization not only eliminated the verbal overshadowing effect but actually reversed it. Although we can only speculate at this time, it seems likely that the unique benefit of verbalization plus upright re-presentation results from a combination of both refreshing the visual/configural memory and increasing subjects' ability to inspect the features for subtle qualities that may not have been available to subjects in the inverted condition. Although speculative, such an interpretation would also be consistent with Tanaka's (1993) finding that subjects' sensitivity to subtle featural differences is reduced when the configural properties of a face are disrupted. In short, when verbalization is followed by re-presentation, subjects may be in a position to optimally apply all of the facial information potentially at their disposal. On the one hand, reviewing the face in its entirety may have refreshed subjects' memories for the otherwise de-emphasized nonreportable aspects of the face. On the other hand, verbalizing the face at length may have prepared subjects to carefully inspect the re-presented face to determine which aspects they remembered correctly and which they had wrong.

Although this account must still be considered somewhat speculative at this time, the general finding that re-presentation of the target face can reverse the negative effects of verbalization does offer some rather straightforward insights into the nature of the effects of verbalization. First, the fact that reencoding the face following verbalization eliminates the verbal overshadowing effect further supports the suggestion that the disruptive effects of verbalization are due to the inconsistency between the information emphasized under standard encoding conditions and the information emphasized following verbalization. Second, the fact that verbalization is actually helpful when combined with re-presentation of the face supports the claim that consideration of verbalizable aspects of a face can be helpful, particularly when it is done in such a way as to not be inconsistent with the manner in which the face was encoded.

### The Relationship Between Verbalization and Interference

In the standard verbal overshadowing paradigm, subjects view a single face, verbalize it or not, and then are tested. However, real-world settings may not be as tightly controlled; subjects may see many faces at the time of the witnessed event, or they may be exposed to multiple mug shots after the event. Although a few studies have found that the deleterious effects of verbalization can persist for some time after subjects viewed and verbalized the face (2 days in the case of Schooler & Engstler-Schooler, 1990; 2 weeks in the case of Read & Schooler, 1994), it is still possible that the effects of verbalization would be quite different if subjects were exposed to multiple faces at the time of encoding. For example, Deffenbacher, Carr, and Leu (1981) found that exposure to multiple faces near the time of encoding of a target face produced a significant degree of interference, even though subjects were generally resistant to additional forgetting when tested 2 weeks later. This finding is also consistent with other demonstrations that the interference associated with seeing multiple faces primarily occurs from exposure to faces presented under comparable encoding conditions (e.g., Davies, Sheperd, & Ellis, 1979). Thus, although verbalization effects have been shown to be relatively unaffected by delay, it is an open question as to whether verbalization interacts with the effects of interference associated with encountering multiple faces within the context of the encoding situation.

In fact, there is some reason to believe that verbalization might help to insulate subjects against the interfering effects of seeing multiple faces. For example, Deffenbacher et al. (1981) also observed that, relative to faces, words were less susceptible to interference resulting from encountering intervening stimuli between encoding and test. Thus, another potentially useful characteristic of face verbalization is that it may provide semantic tags that

may help subjects keep track of the target face when they are exposed to multiple faces prior to being tested.

To address the relationship between verbalization and interference, Ryan and Schooler (1994) conducted a face verbalization experiment in which the recognition test was introduced after subjects had viewed (and verbalized if assigned to the verbal condition) four faces. In this experiment subjects viewed a face, verbalized it or not, and then repeated this procedure for the remaining three faces. Subjects were then given a series of four recognition tests presented in an order corresponding to that in which the target faces originally appeared. The order of faces was counterbalanced so that each face appeared equally often in each position.

The results are presented in Fig. 4.3. As can be seen, control subjects' performance declined substantially for faces that were presented and tested later in the procedure (i.e., comparing performance on Face 1 to Face 4). This result suggests the possible impact of both proactive interference (the encoding of faces occurring later in the sequences may have been impaired by prior exposure to earlier faces) and retroactive interference (the retrieval of faces that were tested in later trials may have been impaired by the prior exposure to earlier recognition tests). What is particularly striking about these data, however, is the fact that subjects who engaged in verbalization showed markedly less interference than control subjects.

Although it is not possible at present to determine precisely why verbalization reduces the interfering effects of exposure to multiple faces, it seems likely to do with the differential susceptibility of words and visual stimuli to interference. As mentioned, Deffenbacher et al. (1981) observed that faces

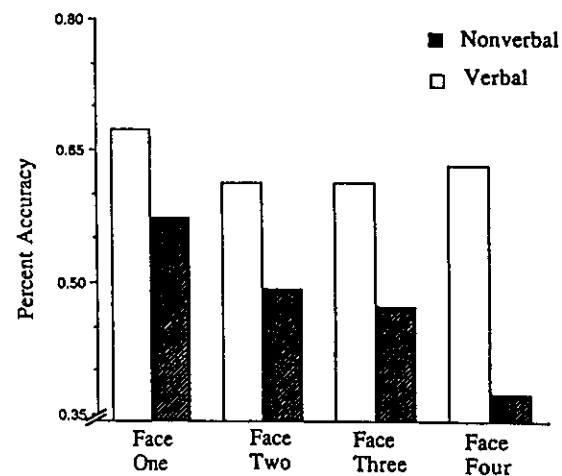


FIG. 4.3. The effects of verbalization and interference from the presentation of interpolated faces.

(and landscapes) were more susceptible than words (nouns) to retroactive interference. Deffenbacher et al. speculated that this difference might be due to the relative role of phonological and semantic encoding mechanisms for visual and verbal stimuli. They suggested: "Interference is not initially observed for the nouns, however, because the phonological and semantic encoding mechanisms are much more successful with them than the landscapes and faces, activating already learned well established codes that could possibly serve as pegs on which to hang episodic information" (Deffenbacher et al., 1981, p. 304).

It may be that the verbalization of a face helps to associate it with a semantic code that provides a tag which enables subjects to differentiate it from other faces to which they have been exposed. In short, verbalizing faces may cause them to be treated more like words; on the one hand, this may disrupt the consideration of the unique configural properties of faces, but on the other hand, this may enable faces to be better tagged and therefore to withstand the interference associated with exposure to multiple faces.

#### CONCLUSIONS, CAVEATS, AND IMPLICATIONS

In sum, there appear to be both costs and benefits to verbal rehearsal of faces. On the down side, verbalization can deemphasize critical nonreportable task components associated with a variety of nonverbal activities. In the domain of face recognition, verbalization of faces appears to result in a deemphasis at the time of recognition of the configural information typically involved in the encoding of upright same-race faces. This disparity between the nonreportable configural information emphasized during encoding and the more readily verbalized information emphasized at test can result in reduced performance of subjects who attempt to verbalize a previously seen face.

On the positive side, when the disparity between the information attended to during encoding and postencoding verbalization is reduced through re-presentation, the negative effects of verbalization are not only reduced but actually reversed. This combination of verbalization and re-presentation may improve subjects' performance both by eliminating the inconsistency between encoding and postencoding activities and by highlighting differences between subjects' verbalized memories and the target, thereby providing subjects with an opportunity to fill in and correct their memories. Another positive effect of verbalization is to insulate subjects against the disruptive effects of interference, perhaps by providing semantic tags that enable them to better differentiate the faces.

The potential for practical applications of this research is quite substantial. First, it seems clear that we must not assume that asking witnesses to describe the appearance of the perpetrator has no consequence on the witnesses'

memory. Instead, it appears that verbalization may have both costs and benefits, depending on a variety of factors. With respect to the findings reported here, the observation that subjects benefit from verbalization when seeing a face re-presented raises the possibility that it may be helpful if, during a crime, witnesses verbalize the perpetrator's appearance to themselves and then recheck the face to see how their verbalization fits. (Of course, it is not clear how often witnesses would have the presence of mind to be able to engage in such complex processing activity!) There may also be some practical significance to the finding that verbalization may offer insulation against interference. Specifically, verbalization may help to protect subjects against the interference that can result from exposure to multiple mug shots (e.g., Davies et al., 1979).

Although this line of research has potentially important practical implications, some caveats should be considered before direct applications are contemplated. Most important, it should be noted that, although the negative effects of verbalization on face recognition have been replicated many times in various labs, they are not always observed (e.g., S. Lindsay, personal communication, 1990; Lovett, Small, & Engstrom, 1992; Yu & Geiselman, 1993). It is not entirely clear why these differential effects of verbalization are sometimes observed; many possible factors may be involved. For example, in the studies reviewed here it has been seen that the presence of verbalization effects depends on the degree to which subjects spontaneously rely on nonreportable face components (e.g., configural) at encoding, the degree to which subsequent recognition considerations are shifted away from what was emphasized during encoding, and whether interference is encountered. It is possible that some of the failures to find disruptive effects of verbalization may have been the result of variations in these variables.

There also may be important population variables at play. It seems quite possible that subjects vary in the degree to which they spontaneously focus on nonreportable face components during encoding, which may mediate whether or not they are subsequently impaired by verbalization. Consistent with this view, Ryan and Schooler (1995) found that verbalization impaired the performance of subjects who scored above the median on various visual memory tasks (e.g., embedded figures, general face recognition tasks), but not subjects who scored below the median on these tasks. It is also possible that subjects may differ in their ability to apply verbal processes to faces, and this difference may also mediate the impact of verbalization. For example, Ryan and Schooler also observed that subjects with above-average GPAs (and presumably higher verbal abilities) showed less impact of verbalization than subjects with below-average GPAs. Additional evidence for the importance of verbal ability comes from research in a very different domain: verbalization and expertise in wine. Melcher and Schooler (in press) observed that verbalization impaired the wine recognition performance of nonexpert wine drinkers

but not wine professionals. Wine professionals also showed markedly greater verbal wine knowledge, which suggests that their relative resistance to verbal overshadowing was due to their superior wine vocabulary.<sup>2</sup>

There appear to be quite a few variables that can influence how verbalization influences performances. The complexity of factors involved in mediating verbal overshadowing effects constrains our ability to offer hard and fast advice about how this research should be applied in real-world contexts that typically involve many uncontrolled variables. Thus, more research will be needed before we can move this research endeavor from the potentially applicable to the truly applied (cf. Herrmann, in press). Nevertheless, we are well on the way toward an understanding of the general principles involved in determining when verbalization is likely to be harmful, helpful, or of no consequence.

#### ACKNOWLEDGMENTS

The research reported in this chapter was supported by a grant to the first author from the National Institute of Mental Health and by grant BNS-8908030 to the third author from the National Science Foundation. We thank Stephen Fiore for helpful comments on earlier drafts of this chapter.

#### REFERENCES

- Bartlett, J. C., & Searcy, J. (1993). Inversion and configuration of faces. *Cognitive Psychology*, 25, 281-316.
- Berry, D. C. (1984). *Implicit and explicit knowledge in the control of complex systems*. Unpublished doctoral dissertation, University of Oxford, United Kingdom.
- Brandimonte, M. A., Schooler, J. W., & Gabbino, P. (1995). *Preventing verbal overshadowing through visual retrieval cues*. Manuscript submitted for publication.
- Carey, S., & Diamond, R. (1977). From piecemeal to configurational representation of faces. *Science*, 195, 312-314.
- Chamey, D. H., & Reder, L. M. (1986). Designing tutorials for computer users: Effects of the form and spacing of practice on skill learning. *Human Computer Interaction*, 2, 297-317.

<sup>2</sup>Interestingly, wine novices (individuals who drank wine less than once a month) also showed no effect of verbalization. Comparison of the effects of verbalization on the performance of wine novices and nonprofessional wine drinkers thus replicates, in principle, Fallshore and Schooler's (1994) finding that verbalization impairs face recognition exclusively within domains where subjects possess a substantial degree of perceptual expertise (i.e., verbalization disrupts memory for same-race but not other-race faces). This interaction is also consistent with Ryan and Schooler's (1995) finding that verbalization impaired subjects with high perceptual abilities but not low perceptual abilities. Presumably in all three cases this interaction occurs because the effects of verbalization are limited to those domains in which subjects' perceptual memories exceed what they are able to verbalize about their memories.

- Chi, M. T. H., de Leeuw, N., Chiu, M., & LaVancher, C. (1994). Eliciting self-explanations improves understanding. *Cognitive Science*, 18, 439-477.
- Darley, C. F., & Glass, A. L. (1975). Effects of rehearsal and serial list position on recall. *Journal of Experimental Psychology: Human Learning and Memory*, 104, 453-458.
- Davies, G., Shepherd, J., & Ellis, H. (1979). Effects of interpolated mugshot exposure on accuracy of eyewitness identification. *Journal of Applied Psychology*, 64, 96-101.
- Deffenbacher, K. A., Carr, T. H., & Leu, J. R. (1981). Memory for words, pictures, and faces: Retroactive interference, forgetting, and reminiscence. *Journal of Experimental Psychology: Human Learning and Memory*, 7, 299-305.
- Diamond, R., & Carey, S. (1986). Why faces are and are not special: An effect of expertise. *Journal of Experimental Psychology: General*, 115, 107-117.
- Dodson, C. S., Johnson, M. K., & Schooler, J. W. (in press). Can subjects escape the verbal overshadowing effect? *Memory and Cognition*.
- Fallshore, M., & Schooler, J. W. (1993). Post-encoding verbalization impairs transfer on artificial grammar tasks. In *Fifteenth Annual Meeting of the Cognitive Science Society* (pp. 412-416). Boulder, CO: Cognitive Science Society.
- Fallshore, M., & Schooler, J. W. (1995). The verbal vulnerability of perceptual expertise. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 1608-1623.
- Fiore, S. M. (1994). *Verbal overshadowing of macro-spatial memory*. Unpublished masters thesis, University of Pittsburgh.
- Gagne, R. H., & Smith, E. C. (1962). A study of the effects of verbalization on problem solving. *Journal of Experimental Psychology*, 63, 12-18.
- Herrmann, D. J. (in press). Applied cognitive psychology vs. applicable cognitive psychology: Review of *Cognitive Psychology Applied* (edited by Chizuko Izawa). *Applied Cognitive Psychology*.
- Houser, T., & Schooler, J. W. (1994). [Verbal overshadowing and music memory]. Unpublished data.
- Lovett, S. B., Small, M. Y., & Engstrom, S. A. (1992, November). *The verbal overshadowing effect: Now you see it, now you don't*. Paper presented at the Annual Meeting of Psychonomic Society, St. Louis, MO.
- Melcher, J. M. (1994). *Speaking of wine: Differential effects of verbalization on wine recognition across various levels of expertise*. Unpublished masters thesis, University of Pittsburgh.
- Melcher, J., & Schooler, J. W. (in press). The misremembrance of wines past: Verbal and perceptual expertise differentially mediate verbal overshadowing of taste. *The Journal of Memory and Language*.
- Morris, C. D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior*, 16, 519-533.
- Needham, D. R., & Begg, I. M. (1991). Problem-oriented training promotes spontaneous analogical transfer: Memory-oriented training promotes memory for training. *Memory & Cognition*, 19, 543-557.
- Pavio, A. (1986). *Mental representations: A dual coding approach*. New York: Oxford University Press.
- Read, J. D., & Schooler, J. W. (1994, August). *Verbalization decrements in long-term person identification*. Paper presented at the Third Practical Aspects of Memory Conference, College Park, MD.
- Rhodes, G., Tan S., Brake, S., & Taylor, K. (1989). Expertise and configural coding in face recognition. *British Journal of Psychology*, 80, 313-331.
- Ryan, R. S. (1992). *Does transfer appropriate processing mediate the verbal overshadowing effect?* Unpublished masters thesis, University of Pittsburgh.
- Ryan, R. S., & Schooler, J. W. (1994). *Verbalization can reduce interference*. Unpublished manuscript, University of Pittsburgh.

- Ryan, R. S., & Schooler, J. W. (1995, June). *Describing a face impairs the face recognition of holistic processors more than analytic processors*. Poster presented at the annual meeting of the American Psychological Society, New York.
- Schooler, J. W. (1989, November). *Verbalization can overshadow the non-verbal components of visual memories*. Paper presented at the Annual Meeting of the Psychonomic Society, Atlanta, GA.
- Schooler, J. W., & Engstler-Schooler, T. Y. (1990). Verbal overshadowing of visual memories: Some things are better left unsaid. *Cognitive Psychology*, 17, 36-71.
- Schooler, J. W., & Melcher, J. (1995). The ineffability of insight. In S. M. Smith, T. B. Ward, & R. A. Finke (Eds.), *Creative cognition approach* (pp. 97-133). Cambridge, MA: MIT Press.
- Schooler, J. W., Ohlsson, S., & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, 122, 166-183.
- Schooler, J. W., Ryan, R., & Reder, L. M. (1990, July). *Better the second time around: Re-presentation reverses verbalization's impairment of face recognition*. Paper presented at The International Conference on Memory, Lancaster, United Kingdom.
- Schooler, J. W., & Wilson, T. W. (1991). When words hurt: The disruptive effects of verbally analyzing reasons. In M. Lynn & J. M. Jackson (Eds.), *Annual Convention of the American Psychological Association* (p. 29). San Francisco: American Psychological Association.
- Sergent, J. (1984). An investigation into component and configural processes underlying face preception. *British Journal of Psychology*, 75, 221-242.
- Sieck, W. (1993). *Verbal overshadowing effects on the judgement of analogy*. Unpublished honors thesis, University of Pittsburgh.
- Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning and Memory*, 4, 592-604.
- Tanaka, J. W. (1993). Parts and wholes in face recognition. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 46A, 225-245.
- Tulving, E., & Thompson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 352-373.
- Wells, G. L., & Hryciw, B. (1984). Memory for faces: Encoding and retrieval operations. *Memory & Cognition*, 12, 338-344.
- Westerman, D. L. (1991, April). *The effects of verbalization on face and car recognition*. Paper presented at the North East Ohio Undergraduate Psychology Conference.
- Wilson, T. D., Lisle, D. J., Schooler, J. W., Hodges, S. D., Klaaren, K. J., & Laflour, S. J. (1993). Introspecting about reasons can reduce post-choice satisfaction. *Personality and Social Psychology Bulletin*, 19, 331-339.
- Wilson, T. D., & Schooler, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology*, 60, 181-192.
- Young, A. W., Hellawell, D., & Hay, D. C. (1987). Configurational information in face perception. *Perception*, 16, 747-759.
- Yu, C. J., & Geiselman, R. E. (1993). Effects of constructing indenti-kit composites on photospread identification performance. *Criminal Justice and Behavior*, 20, 280-292.