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Verbal Vulnerability of Perceptual Expertise

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Three experiments explored the role of perceptual expertise in mediating the finding (termed *verbal overshadowing*) that describing a face can impair later recognition. In Experiment 1, verbalization impaired White participants' recognition of White faces (expert domain) but not African American faces (novice domain). In Experiment 2, judges attempted to identify targets on the basis of the verbal descriptions generated in Experiment 1. Experiment 2 revealed a significant relationship between verbalization participants' recognition performance and yoked judges' identification performance for other-race but not own-race faces, suggesting that other-race recognition may involve a unique reliance on "verbalizable" information. In Experiment 3, the interaction between verbalization and race of face was replicated with upright faces but was attenuated with inverted recognition arrays (a manipulation that reduces the influence of configural information). Collectively, these findings suggest that verbalization may disrupt the nonreportable configural processes associated with recognizing stimuli with which one is an expert.

Being an expert does not necessarily enable one to articulate the knowledge on which that expertise is based. Athletes are often unable to describe their techniques (Allard & Starkes, 1991), professional chicken sexers have difficulty explaining what they look for when sexing chickens (Biederman & Shiffrar, 1987), and, to take a more everyday example, few people can fully articulate the information on which their expert face recognition is based (Polanyi, 1966). This discrepancy between expertise at a task and describing the factors that contribute to that expertise raises a possible dilemma: What happens when people attempt to articulate the basis for their performance on tasks for which their expertise surpasses their explanatory abilities? Do people ignore what they say and simply continue the task as usual, or do they alter their performance to bring it in line with their verbalizations?

Face recognition represents one area of expertise in which explanatory ability is not commensurate with recognition ability. Despite remarkable face recognition abilities (Bahrick, Bahrick, & Wittlinger, 1975; Ellis, 1981; Goldstein, 1977), individuals have great difficulty articulating the basis for their recognition judgments (Ellis, 1984). This discrepancy between individuals' expertise in recognizing faces and their inaptitude for describing faces may account for the recent observation that verbally describing a previously seen face can impair later recognition of that face (Dodson, Johnson, & Schooler, in press; Schooler, 1989; Schooler & Engstler-Schooler, 1990; Schooler, Ryan, & Reder, in press). Specifically, verbalization of a face may cause individuals to ignore the "nonverbalizable" configural information that is typically associated with perceptual expertise (e.g., Diamond & Carey, 1986) and instead rely on the featural information that is commonly associated with verbalization (e.g., Wells & Turtle, 1987).

Verbal Overshadowing of Nonverbal Stimuli

Schooler and Engstler-Schooler (1990) provided initial evidence that verbalization may overshadow the nonverbalizable information typically associated with nonverbal tasks. In the original verbal overshadowing study, participants viewed a difficult-to-describe stimulus such as a face or a color, and then later some were asked to write a description of the face. When given a forced-choice recognition test, participants who previously described the target were markedly less accurate at discriminating the target from verbally similar distractors than control participants who had not described the target. The interpretation of this form of memory interference, termed *verbal overshadowing,* is that verbalization can cause individuals to draw on verbally relevant information at the expense of more appropriate nonverbal information. Consistent with this interpretation, Schooler and Engstler-Schooler reported a number of experiments indicating that disruption was particularly associated with the verbalization of nonverbal stimuli. For example, they observed that verbalization, but not visualization, of a previously seen face impaired recognition. Moreover, the effects of verbalization depended on the "verbalizability" of the stimulus: Verbalization impaired memory for both faces

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and colors while numerically improving memory for a verbal stimulus, a spoken statement.

Since the original demonstration of verbal overshadowing, the disruptive effects of verbalization on face memory have been replicated numerous times in the Schooler lab (Ryan, 1992; Schooler et al., in press) as well as in other labs (R. Chaffin, personal communication, November, 1990; Dodson et al., 1995; C. Kelley, personal communication, November, 1992; Lovett et al., 1992 [Experiment 2]; Read & Schooler, 1994; Westerman, 1991; although see Lovett et al., 1992 [Experiment 1] and Yu & Geiselman, 1993, for situations in which the effect has not been observed). In addition to face recognition, verbalization has also been shown to impair a variety of other activities hypothesized to rely on nonverbal cognition; these activities include insight problem solving (Schooler, Ohlsson, & Brooks, 1993), affective judgments (Wilson et al., 1993; Wilson & Schooler, 1991), implicit learning (Berry, 1984; Fallshore & Schooler, 1993), visual imagery (Brandimonte, Schooler, & Gabbino, 1995), taste memory (Melcher & Schooler, 1995), map memory (Fiore, Eisengart, & Schooler, 1995), and music memory (Houser, Fiore, & Schooler, 1995). In contrast, verbalization has been shown to help or at least not impair performance on tasks that can effectively be performed by relying on readily reported knowledge. These tasks include memory for word lists (Darley & Glass, 1975), memory for a spoken statement (Schooler & Engstler-Schooler, 1990), memory for geographical routes (e.g., take a left at the stop sign; Fiore, Eisengart, & Schooler, 1995), analytic problem solving (Gagne, 1962; Schooler & Melcher, 1995; Schooler et al., 1993), and learning declarative knowledge (Chi, de Leeuw, Chiu, & LaVancher, 1994).

The observation that verbalization[1] uniquely disrupts tasks involving nonverbal information or processes supports the general contention that verbalization results in the de-emphasis of critical nonreportable task components. In the context of face recognition, the question remains open as to the best way to characterize this nonreportable information. One reasonable hypothesis, however, is that verbalization causes participants to de-emphasize the configural information that is typically associated with face recognition and expertise (Diamond & Carey, 1986; Rhodes, Tan, Brake, & Taylor, 1989) and to overemphasize featural information that is typically associated with verbalization and poorer recognition performance (Wells & Hryciw, 1984; Wells & Turtle, 1987).

Configural Versus Featural Processing of Faces

There is growing evidence that face processing may involve two relatively distinct types of information: one corresponding to an attention to individual features (e.g., nose and eyes), and the other corresponding to the configural relations between features and general information about face shape (for recent reviews, see Bartlett & Searcy, 1993; Rhodes, Brake, & Atkinson, 1993; Tanaka, 1993). The two types of information have been characterized in several ways: component and configural (Sergent, 1984), piecemeal and configural (Diamond & Carey, 1986), and featural and holistic (Wells & Hryciw, 1984; Schooler & Engstler-Schooler, 1990). We opt for using the terms *featural* and *configural* processing[2] because these best characterize the different types of information that are believed to be involved in the two processes (i.e., a focus on individual features vs. a focus on the configural relationship between features). Evidence for this distinction between featural and configural information comes from a variety of different paradigms including face inversion studies (Yin, 1969), multidimensional scaling studies (Sergent, 1984), interference associated with combining top and bottom halves from different faces (Young, Hellawell, & Hay, 1987), and evidence that the grotesque effects of reversing individual features within a face (the Thatcher illusion in Thompson, 1980) are eliminated when the face is inverted (Bartlett & Searcy, 1993; Rhodes et al., 1993; Rock, 1988).

Of particular relevance for the present discussion is the evidence that (a) configural processing of faces is associated with perceptual expertise, and (b) featural processing of faces appears to be particularly associated with verbalization. We discuss these two lines of research in turn.

Expertise and Configural Processing

Evidence for the role of perceptual expertise in mediating the use of configural processing comes from studies examining the effects of inversion on recognition. Inversion, a manipulation that appears to particularly disrupt the use of configural information (e.g., Bartlett & Searcy, 1993; Carey & Diamond, 1977; Diamond & Carey, 1986; Rock, 1973, 1974; Rhodes, 1993; Yin, 1969), has also been shown to interfere with recognition of stimuli within perceptual experts' areas of specialization. For example, Diamond and Carey (1986) compared the effects of inversion on novice and expert dog trainers' ability to recognize faces and dogs. Although both groups were equally affected by inversion of the face pictures, dog experts' ability to recognize the dog pictures was particularly impaired by inversion relative to the novices. Because, as noted, inversion is believed to interfere with the use of configural information, Diamond and Carey concluded that the experts' inability to recognize inverted stimuli was due to the disruption of the configural information on which they typically rely. Bruyer (1992) provided further support for this interpretation with a conceptual replication of Diamond and Carey that used natural handwriting as stimuli. In this study, inversion disrupted the handwriting recognition abilities of handwriting experts more than novices.

In the domain of face recognition, evidence that expertise causes an increased reliance on configural information comes

[1] It should be noted that most of the documentations of disruptive effects of verbalization have involved written as opposed to spoken verbalizations. Written descriptions have been favored over spoken descriptions primarily for pragmatic reasons; that is, participants can write verbalization in groups; whereas speaking requires testing participants individually. Although there may be unique effects of spoken versus written verbalization, at least one study (Schooler et al., 1993) found relatively comparable disruptive effects for written and spoken verbalizations.

[2] We use the term *processing* only in its most conservative sense of attention to specific types of information.

from research comparing own-race and other-race face recognition. Most studies examining cross-racial identification have observed that individuals are better at recognizing faces of their own race than faces of other races (Brigham & Barkowitz, 1978; Brigham & Malpass, 1985; Chance, Goldstein, & McBride, 1975; Ellis & Deregowski, 1981; Luce, 1974; Malpass & Kravitz, 1969; Malpass, Lavigueur, & Weldon, 1973; Platz & Hosch, 1988; Rhodes et al., 1989). A common explanation for the typical advantage in identifying own-race faces is that individuals have more experience with, and consequently greater expertise in recognizing, faces of their own race (Ellis, Deregowski, & Shepherd, 1975; Goldstein & Chance, 1985; Lindsay, Jack, & Christian, 1991; Rhodes et al., 1989). Using an inversion paradigm, Rhodes et al. recently provided evidence that the expertise involved in own-race face recognition may particularly be associated with configural processing. Rhodes et al. observed that the recognition performance of both White[3] and Chinese participants was significantly disrupted when own-race faces were presented inverted during recognition. However, when participants attempted to recognize other-race faces, the effects of inversion were reduced. Rhodes et al. concluded that their results, in conjunction with those of Diamond and Carey (1986), provided converging evidence for the importance of configural information for expert face recognition.

Despite the compelling results of Diamond and Carey (1986) and Rhodes et al. (1989), the effects of inversion and expertise are not unequivocal. In a study by Valentine and Bruce (1986), using a similar procedure, the opposite result ensued: For a group of White participants, recognition of other-race (Black) faces was more impaired than recognition of own-race faces. However, this study confounded race of face with presentation time. White faces were shown for 2 s during acquisition; whereas Black faces were shown for 5 s to equate familiarity (the method for determining these times was not explained). It seems quite possible that the extra time spent viewing Black faces made these faces more familiar than the White faces and, therefore, more amenable to configural processing by the participants. This greater familiarity with the Black faces compared with the White faces used in this study may explain why inversion had a greater effect on recognition of Black faces than of White faces.

Verbalization and Featural Processing

Although expert face recognition appears to involve configural processes, verbalization of the appearance of a face seems to more closely correspond with the use of featural information. For example, in a study by Wells and Turtle (1987), participants viewed faces and then judged the faces with respect to either personality traits or physical features. Participants then engaged in either a recognition task or a verbal description task. As is typically observed (e.g., Bower & Karlin, 1974; Winograd, 1981), participants in the personality judgment condition demonstrated higher recognition performance than participants in the physical-feature judgment condition. However, participants who judged features subsequently wrote better descriptions, as determined by independent raters, than participants who judged traits. Wells and Turtle concluded that although configural information may be more closely associated with recognition, featural information is more closely associated with verbalization.

Is There a Relationship Between Verbal Overshadowing, the Configural–Featural Distinction, and Expertise?

In summary, previous research suggests that verbalizing the appearance of a previously seen face may de-emphasize the nonverbal information that is typically used when recognizing faces, presumably by overemphasizing information that more closely corresponds to the verbalization. Although the precise nature of these competing sources of information is not known, one reasonable possibility is the distinction between configural and featural information. Specifically, although expertise in face recognition seems to be associated with an ability to process the configural aspects of a face, face verbalization seems to correspond to the featural aspects of faces in particular. This analysis suggests that the effects of verbalization may depend on the degree to which configural information is used, and this in turn should depend on participants' expertise with the stimuli. In three experiments we explored the relationship between verbal overshadowing, configural–featural processing, and expertise by examining the effects of verbalization on participants' ability to recognize faces for which their expertise varies.

Experiment 1

In Experiment 1 we examined the effect of verbalization on participants' ability to recognize own-race versus other-race faces. White participants were presented with White and African American stimulus faces and were later asked either to verbally describe the faces or to perform an unrelated, interpolated task. Finally, all participants were presented with a forced-choice recognition test including the target and similar distractors.

If verbalization reduces the use of configural information, and if the use of configural information critically underlies expert performance, then the effects of verbalization should depend on participants' relative expertise in recognizing different race faces. Individuals have frequently been shown to have more expertise at recognizing members of their own race than other races (Brigham & Barkowitz, 1978; Brigham & Malpass, 1985; Chance et al., 1975; Ellis & Deregowski, 1981; Luce, 1974; Malpass & Kravitz, 1969; Malpass et al., 1973; Platz & Hosch, 1988; Rhodes et al., 1989). Therefore, the above-mentioned analysis makes the straightforward prediction that verbalization should cause a greater decrement in White

[3] In keeping with current usage and recent discussions of cross-racial identification (i.e., Lindsay et al., 1991) we use the term *White* to refer to Caucasian individuals and *African American* to refer to individuals of African descent from U.S. populations. Individuals of African descent from non-U.S. populations (e.g., England) are referred to as *Black*. When referencing articles involving individuals other than White or African American (e.g., Rhodes et al., 1989), we use the terminology used in the article itself.

participants' recognition of own-race, as compared with other-race, faces.

Method

Participants. The participants were 165 University of Pittsburgh undergraduates who took part in the present experiment.[4] The participants were recruited during a single term from an introductory psychology class at the University of Pittsburgh and received course credit for their participation.

Materials. Stimulus pictures were taken from college yearbooks. There were four target pictures: an African American man, an African American woman, a White man, and a White woman. For the target pictures, two different photographs were used: the one used in acquisition was different from the one used in the recognition array. The photographs were black and white, and only the face was exposed, with as little clothing and background shown as possible. The photos were presented to the participants on slides. The acquisition pictures were candid shots; whereas all of the recognition array pictures were posed and formal.

Procedure and design. Participants were tested in groups ranging in size from 1 to 10 participants per session. Participants were randomly assigned to verbalization or no-verbalization conditions. All participants were told that they would be shown a face and that they should pay close attention to it. No indication was made that they would later have to recognize the face.

Participants were then shown one of the target faces for 5 s. After viewing the face, they engaged in an unrelated filler activity (crossword puzzles) for 5 min. Participants in the verbalization condition were then asked to describe the face seen in as much detail as possible for 5 min; whereas the control participants engaged in a verbal listing task for the 5 min. The listing task involved receiving a category name (e.g., states) and writing down as many category members as they could think of. We refer to the participants who described the faces as the verbalization participants and to the control participants as the no-verbalization participants. At the end of 10 min, all participants were given a recognition test consisting of the target photo and five distractors and were asked to identify the target face. Participants were given as much time as needed to choose the correct face. This procedure was repeated for the other three target faces. The order of presentation of target faces was counterbalanced across subjects by using a modified Latin square design so that each face appeared in each trial an equal number of times. The counterbalancing resulted in four different orders, with 15 participants in each order. For control participants, a different listing category was provided after each face. The categories included states, capitals of the states, presidents of the U.S., and countries of the world. The order in which the categories were provided was the same for all control participants.

The design was a 2 (own-race or other-race face) × 2 (verbalization or no verbalization) × 4 (trial) design with race of face and trial as within-subject variables and verbalization as a between-subjects variable. There were 60 participants in the verbalization condition and 60 participants in the no-verbalization condition.

To code accurately the participants for race, we distributed a demographic survey after the experimental task. Completion of the survey was voluntary, and any participant who chose not to complete it, or indicated that he or she was non-White, was not used.

Results

An analysis of variance (ANOVA) revealed a significant Verbalization × Race of Face × Trial interaction, $F(1, 464) = 5.55$, $p < .02$, $MSE = 0.21$, indicating that the effect of verbalization on participants' performance changed over trials.

Table 1
Mean Proportion Correct for All Trials and Conditions in Experiment 1

Trial/ condition	Race of face: Own race	Race of face: Other race
Trial 1		
Verbalization	.40	.50
No verbalization	.87	.50
Trial 2		
Verbalization	.73	.60
No verbalization	.80	.53
Trial 3		
Verbalization	.83	.73
No verbalization	.70	.63
Trial 4		
Verbalization	.90	.57
No verbalization	.77	.50

Although there was a sizable interaction between verbalization and race of face in Trial 1, $F(1, 464) = 7.79, p < .001, MSE = 0.21$, this interaction was reduced in later trials, $F(1, 464) < 1$, $MSE = 0.21$. As can be seen in Table 1, the elimination of the interaction between race of face and verbalization in later trials reflects the observation that in Trial 1 there was a substantial difference between recognition of own-race faces in the verbalization and no-verbalization conditions, whereas there was little difference between verbalization and no-verbalization participants' identification of own-race faces in later trials. The attenuation of the verbal overshadowing effect across trials has been observed in a number of recent studies (e.g., Houser, Fiore, & Schooler, 1995; Melcher & Schooler, 1995; Schooler et al., in press; Experiment 3 of this article). These carry-over effects could be due to a large number of uncontrollable factors (see Experiment 2 and the *Discussion* section for Experiment 1). For the present purposes, we limited our analyses to Trial 1 in which participants' performance was uncontaminated by previous exposure to the paradigm.

A log-linear analysis revealed no main effect for race of face, $\chi^2(1, N = 120) = 2.18, p > .05$, but did show a significant main effect for verbalization, $\chi^2(1, N = 60) = 6.72$, $p < .01$, with faces being accurately recognized more often in the no-verbalization condition than in the verbalization condition. This result may best be understood by the significant two-way interaction between race of face and verbalization, $\chi^2(1, N = 120) = 8.07, p < .001$, as shown in Figure 1. As predicted, verbalization impaired recognition of own-race faces, $\chi^2(1, N = 60) = 14.067, p < .001$), but had no effect on recognition of other-race faces $\chi^2(1, N = 60) = 0.00, p > .05$. It might be noted, however, that as can be seen in Table 1, over trials there was a numerical, although not statistically significant, advantage in recognizing other-race faces for verbalization participants as compared with no-verbalization participants,

[4] Data from 24 participants were excluded because they did not respond to a demographic survey or indicated that they were a race other than White. To equalize the number of participants in the various counterbalanced cells, we randomly discarded 21 participants by using a random numbers table.

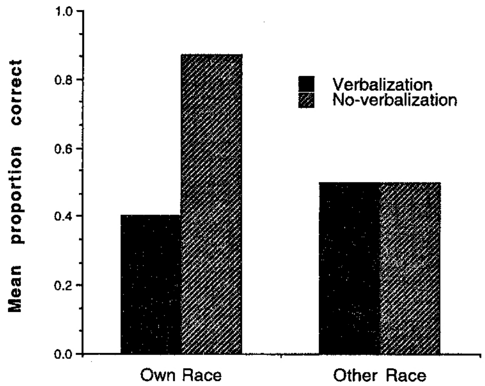

Figure 1. Mean proportion of correctly recognized faces on Trial 1 of Experiment 1.

$F(1, 232) = 3.60 p > .05, MSE = 2.47$. In the no-verbalization condition, there was a significant main effect for race of face, $\chi^2(1, N = 60) = 9.32, p < .005$, with own-race faces being recognized correctly more often than other-race faces.

Discussion

Experiment 1 provided initial evidence that verbalization may disrupt some of the processes associated with expertise in face recognition. Verbalization substantially impaired White participants' recognition of own-race faces while showing no evidence of impairing other-race face recognition. Considering the frequent demonstration of White participants' higher performance at recognizing members of their own race (Brigham & Barkowitz, 1978; Brigham & Malpass, 1985; Chance et al., 1975; Cross, Cross, & Daly, 1971; Luce, 1974; Malpass & Kravitz, 1969; Malpass et al., 1973; Platz & Hosch, 1988; Rhodes et al., 1989; Shepherd, Deregowski, & Ellis, 1974), the observation that verbalization impaired only own-race recognition supports the hypothesis that verbalization interferes with processes associated with expertise in face recognition. Furthermore, previous demonstrations of the relationship between perceptual expertise and configural processing (Diamond & Carey, 1986; Rhodes et al., 1989) support the hypothesis that verbalization specifically disrupts the use of configural information. On the basis of these studies, it seems likely that the reason verbalization disrupts own-race recognition is because it disrupts the use of configural information typically involved in the recognition of stimuli with which one is an expert. Because White participants are not expert at recognizing African American faces, it seems reasonable that they should be less inclined to process African American faces configurally, and consequently their recognition should be less affected by procedures that disrupt configural information. This argument nicely accounts for why inversion—another manipulation that has been shown to disrupt configural processing—has little effect on recognition of other-race faces (Rhodes et al., 1989); it similarly accounts for why verbalization did not impair White participants' recognition of other-race faces.

In principle, our analysis suggests that a participant population having proportionately greater experience with African American faces and less experience with White faces than our participants would show results opposite to the present. That is, verbal overshadowing effects would occur with African American faces but not with White faces for this population. However, African American populations in the United States, and particularly African American students attending predominantly White college campuses, have experience with own- and other-race faces that is quite different from that of White students. This experiential difference may help to account for why African American participants do not always show the own-race advantage invariably demonstrated by White participants (e.g., Lindsay et al., 1991; Malpass & Kravitz, 1969). The fact that African American students' experience with other-race faces does not mirror that of White students indicates that African American participants drawn from the student population used in this study would not represent the appropriate comparison group. Rather, what would be needed is individuals of African descent who live in countries in which they are the distinct majority. Although inclusion of such a population was beyond our means, we recognize its importance and hope that future studies will be able to compare the effects of verbalization on two different populations with comparable experiences with own- and other-race faces.

One unexpected finding in these results was the attenuation of the verbal overshadowing effect over trials. On the first trial (a trial consisting of seeing a face, either verbalizing it or not verbalizing it, and then receiving an unexpected recognition test), we observed a marked effect of verbalization on own-race face recognition. However, on subsequent trials, this effect was not observed. Although this trial effect was not observed in an earlier multiple-trial experiment (Schooler & Engstler-Schooler, 1990, Experiment 6), it has been replicated in subsequent face verbalization studies (e.g., Schooler et al., in press; Experiment 3 of this study) and in studies documenting the effects of verbalization on other nonverbalizable stimuli such as taste (Melcher & Schooler, 1995) and music (Houser, et al., 1995).

There are a number of possible explanations for this trial effect. For example, participants may learn to improve the quality of their face descriptions or, alternatively, they may learn to ignore their descriptions. We address some of these alternatives in Experiment 2 and in the General Discussion section. However, whatever the ultimate resolution of this trial effect, it should not overly detract from the significance of the effects of verbalization on the initial trial. After the first trial, participants are no longer naive about the experiment; they know they will have to describe a face and have had practice at it; they expect to be given a recognition test and are familiar with the type of targets and distractors that will be used. In short, although it is of interest to understand why the effects of verbalization attenuate on subsequent trials, it is the first trial that represents the most valid assessment of the manner in which verbalization influences recognition under normal circumstances (i.e., uncontaminated by knowledge of the specific procedure used in this experiment).

Experiment 2

A central premise in our interpretation of Experiment 1 is that own-race face recognition relies on nonverbalizable configural information; whereas other-race face recognition relies to a greater degree on verbalizable featural information. This assumption suggests that descriptions of other-race faces should be more predictive of recognition performance than own-race face descriptions. Previous studies have found little relationship between the quality of a participants' description of a face and whether or not they recognize that face (e.g., Piggott & Brigham, 1985; Schooler & Engstler-Schooler, 1990; Wells, 1985). However, in all of these studies, own-race face recognition was used, which, as mentioned, is believed to rely on configural face characteristics that are typically not captured in face descriptions. If, as argued, other-race face recognition relies to a greater degree on verbalizable featural information, then verbal descriptions should be predictive of other-race face recognition, even if it is not predictive of own-race recognition.

Another potential shortcoming of previous investigations of the relationship between verbal description quality and face recognition is the method used for assessing the quality of the facial descriptions. Specifically, all of the studies that have addressed this issue have used feature description analysis in which raters count the relative number of correct and incorrect features in each description and score the descriptions accordingly. Although this method results in high interrater reliability, it has one major shortcoming: There is no a priori method for determining how to weight the relative importance of accuracy on different features.

An alternative method of description analysis that gets around this difficulty is communication accuracy that was pioneered by researchers examining color memory (Lantz, 1963, cited in Brown, 1966; Lantz & Volney, 1964; Lucy & Shweder, 1979). In this paradigm, participants see a memory stimulus, describe it, and then attempt to recognize it. Participants' descriptions are then given to yoked participant judges (herein referred to as *judge*) who must identify the target stimulus solely on the basis of the description. Using this technique, color researchers observed a significant correlation between the recognition performance of participants and the identification performance of the judges. That is, participants who accurately recognized colors were more likely than inaccurate participants to generate color descriptions that enabled judges to identify the color. This finding led these researchers to conclude that color recognition relies to a considerable degree on recollection of a verbal description of the memory stimulus. Although communication accuracy has been used in face recognition paradigms to assess the quality of verbal descriptions (e.g., Malpass et al., 1973), this technique has not previously been used to examine the relationship between the quality of individual participants' face descriptions and their corresponding recognition performance.

In Experiment 2 we used a communication accuracy paradigm to explore the relationship between the quality of verbalization participants' descriptions and their recognition performance. The descriptions generated by verbalization participants in Experiment 1 were given to yoked judges who were asked to identify the target in the recognition array solely on the basis of the descriptions. This procedure enabled us to determine verbalization participants' reliance on their verbal descriptions for both own- and other-race faces. It also gave us an opportunity to explore further the trial effect observed in Experiment 1.

Method

Participants. The judges were 224 undergraduates from the University of Pittsburgh who participated in this experiment for course credit.[5]

Materials. The face descriptions generated by 56[6] of the verbalization participants in Experiment 1 were transcribed word for word, but with spelling and punctuation corrections so that the judges would not be distracted by such errors. This resulted in 224 unique descriptions (four trials and 56 participant descriptions). The descriptions were copied onto a response sheet with an answer grid identical to that used in Experiment 1.

Procedure. This experiment was performed after participants took part in another face recognition experiment. Each judge was given a description of a face and the same recognition test shown to the yoked verbalization participant. The judges were asked to identify the face described solely on the basis of the description. After all of the judges were done, the process was repeated with a new description and face. The two faces judged were different from any faces the judges might have seen in the earlier face recognition experiment. The descriptions were presented so that each was read twice: once in a first trial by one judge and once in a second trial by a different judge.

Results

In keeping with our analyses in Experiment 1, our primary concern was with the judges' performance when using descriptions generated in Trial 1 of Experiment 1. We report these analyses first and then consider the judges' performance on descriptions generated in later trials in an attempt to shed light on the trial effect reported in Experiment 1.

Overall accuracy for Trial 1 descriptions. The judges' identification rate was 27% for own-race faces and 32% for other-race faces. According to the binomial distribution, this performance level reflects above-chance performance for both types of faces ($p < .05$; chance = 17% accuracy) and indicates that the judges were comparable in their ability to identify own-race and other-race target faces on the basis of verbalization participants' descriptions, $\chi^2(1, N = 112) = 0.387, p > .05$.

Correspondence between the accuracy of judges and verbalization participants for Trial 1 descriptions. The performance of each yoked pair of judges was combined to provide a communication accuracy score that ranged from zero to two. If neither judge was correct, the score was zero; if one judge was correct, the score was one; if both judges were correct, the score was two. This score was then correlated with the performance of the yoked verbalization participant in Experiment 1 (either zero or one), thereby producing a communication accuracy correlation. For own-race faces, there was no significant

[5] The data from 66 participants were ommitted from the analyses because of responses of non-White on the demographic survey, participant error (e.g., no answer), or experimenter error.

[6] Only 56 of the verbal participants' transcriptions in each condition were used because one of the participant's written work was illegible. Therefore, to maintain equal numbers of descriptions for each face from each trial, we randomly eliminated one description from each of the other three orders, leaving 14 participants' descriptions per order.

relationship between the judges' identification performance and the recognition performance of the yoked verbalization participants ($r = .12, p > .05$). However, for other-race faces there was a significant communication accuracy correlation ($r = .36, p < .05$). This result indicates that participants relied more on the accuracy of the description for recognition of other-race than for own-race faces.

Judges' performance and the trial effect. One possible explanation of the trial effect observed in Experiment 1 was that participants might have come to increasingly ignore their verbal descriptions. This interpretation would predict that the correlation between the performance of verbalization participants and yoked judges would decrease over trials. However, as can be seen in Table 2, there was no evidence for such a decrease. For own-race faces, the correlations remain nonsignificant; whereas for other-race faces, they remain significant.

A second possible explanation of the trial effect observed in Experiment 1 is that participants' descriptions improved over trials. One way we addressed this issue was to compare the judges' identification performance on first-trial face descriptions to later-trial face descriptions. As can be seen in Table 3, identification of the own-race faces numerically improved for descriptions generated in later trials, though not significantly, $t(222) = 1.255, p > .05$. There was no change whatsoever in the communication accuracy scores for other-race faces, $t(222) = 0.166, p > .05$. Although the numerical increase in description identification accuracy for own-race faces was not statistically reliable, there was other evidence suggesting that the descriptions may have increased in precision over trials. As can be seen in Table 4, for own-race faces, the correlation between the identification accuracy of the yoked judges (i.e., between judges who were given the same description) was not significant in Trial 1 ($p > .05$). However, this correlation was significant in later trials ($p < .01$), suggesting that the descriptions became increasingly distinctive, thereby allowing the judges to more consistently agree on the correct face. There was no change in the correlation between the judges' identification of other-race faces (both *p*s $> .05$).

Discussion

The results of Experiment 2 suggest a relationship between perceptual expertise and the use of verbalized information. Although the race of the target face had little impact on the judges' identification performance, it did influence the correspondence between the judges' identification accuracy and the recognition accuracy of the yoked verbalization participants from Experiment 1. For White faces, there was no significant relationship between the judges' face identification performance and the recognition performance of the participants on whose descriptions the judges relied. This finding suggests that the recognition of White faces in Experiment 1 involved a reliance on information not included in participants' verbal descriptions and is thus consistent with the suggestion that verbalization interferes with the use of nonreportable information associated with own-race face recognition. In contrast, for the other-race faces, the judges were more likely to identify correctly the target face when they received descriptions generated by verbalization participants who had themselves correctly recognized the target. This latter finding suggests that participants' recognition of other-race faces in Experiment 1 may have depended in part on the information included in their descriptions. This reliance on their verbal descriptions suggests that the act of verbalization may have served as an opportunity for participants to rehearse information that was ultimately to be used in recognizing the target face, thereby preventing verbal disruption and perhaps accounting for the numerical (although not statistically significant) advantage of verbalization participants in recognizing other-race faces in the later trials of Experiment 1.

We might have expected that verbalization participants' recognition of own-race faces from Trial 1 of Experiment 1 would correspond to the identification performance of the judges. Accordingly, if verbalization participants' reduced performance resulted from an overreliance on the specific contents of their verbal descriptions, then their verbal descriptions should have been predictive of their performance. However, our results support previous findings that the mechanism underlying the disruptive effects of verbalization goes beyond simply focusing participants on the contents of their descriptions. For example, Schooler and Engstler-Schooler (1990) found no relationship between the quality of verbalization participants' descriptions as rated by judges and their recognition performance. The lack of a relationship between verbalization participants' descriptions and their recognition

Table 3
Mean Percentages and Standard Deviations of Correct Identifications for Descriptions Generated in Trial 1 Versus Trials 2–4

Faces	Trial 1 *M*	Trial 1 *SD*	Trials 2–4 *M*	Trials 2–4 *SD*
Own race	26.8	0.45	35.7	0.48
Other race	32.1	0.47	31.0	0.46

Table 2
Correlations Between the Identification Accuracy of Verbalization Participants and Yoked Judges for Descriptions Generated in Trial 1 Versus Trials 2–4

Faces	Trial 1[a]	Trials 2–4[b]
Own race	.12	.11
Other race	.36*	.31**

[a]$n = 28$. [b]$n = 84$.
*$p < .05$. **$p < .01$.

Table 4
Correlations Between the Identification Accuracy of Yoked Judges for Descriptions Generated in Trial 1 Versus Trials 2–4

Faces	Trial 1[a]	Trials 2–4[b]
Own race	.18	.39***
Other race	.02	.22*

[a]$n = 28$. [b]$n = 84$.
*$p < .05$. ***$p < .001$.

performance led Schooler and Engstler-Schooler to suggest that verbalization participants do not simply base their performance on their verbal descriptions. Rather, verbalization may cause a more general "verbal bias" in which the actual descriptions that participants generate are less important than the general shift in processing that the verbalization activity may elicit. Consistent with this interpretation, Dodson et al. (in press; see also Schooler, 1989) observed that verbalizing the appearance of one of two previously seen faces impaired not only the recognition of the verbalized face but also that of the nonverbalized face.

The absence of a relationship between face-description quality and own-race face recognition, observed here and elsewhere (e.g., Chance & Goldstein, 1974; Goldstein, Johnson, & Chance, 1979; Piggott & Brigham, 1985; Wells, 1985), makes the present observation of a significant correlation between the judges' and verbalization participants' identification of other-race faces particularly notable. It appears that the age-old question of the relationship between language and memory (cf. Hunt & Agnoli, 1991) may be different for memories of own- and other-race faces. Specifically, whereas own-race face recognition seems to rely on nonreportable information, our findings suggest that other-race recognition may be at least somewhat verbally mediated. The apparently greater role of verbal mediation in the recognition of same versus other-race faces may also offer an important clue for understanding where verbal overshadowing effects are likely to occur. That is, verbal overshadowing appears more likely to occur with stimuli for which verbal performance does not correspond to recognition performance and appears less likely to occur with stimuli for which there is a relationship between verbalization and recognition performance.

Experiment 2 also provided more information about the nature of the trial effect observed in Experiment 1. One possible interpretation of the trial effect is that participants begin to ignore their descriptions after the first trial. However, this experiment provided no evidence that verbalization participants relied on their verbal descriptions when recognizing own-race faces in Trial 1. If participants are not relying on their verbal descriptions in the first place, then it seems unlikely that the effect of multiple trials is to reduce this reliance. A second interpretation of the trial effect is that participants improved in their ability to describe the faces. Although there was not strong support for this hypothesis, the data did hint at the possibility that verbalization participants' descriptions may have improved to some degree. Though not statistically reliable, the description identification rate did improve numerically in later trials (from 27% on the first trial to 36% in later trials). Moreover, the agreement between the judges was substantially greater for descriptions generated in later trials compared with the first trial. Although the basis for this increased agreement is not entirely clear, it suggests that the descriptions may have become more precise in later trials. Of course, the suggestive evidence that the reduced effect of verbalization over trials may have been associated with more distinct descriptions does not demonstrate a causal relationship. Rather, the improvement may be an independent reflection of participants' increasing sensitivity to the specific demands of the experiment. For example, participants may have learned to encode the faces in a manner that is more commensurate with the task of verbal description.

Experiment 3

The results of Experiments 1 and 2 suggest that verbalization may have distinct effects on own- and other-race faces because the recognition of these faces differentially relies on reportable and nonreportable processes. The purpose of Experiment 3 was to pursue more direct evidence that verbalization specifically disrupts the difficult-to-describe configural information that has previously been associated both generally with perceptual expertise (Diamond & Carey, 1986) and specifically with own-race face recognition (Rhodes et al., 1989).

One technique that has often been used to examine the role of configural processing in face recognition is face inversion. Although inversion may not affect configural processing under all circumstances (Tanaka & Farah, 1991; Valentine, 1988), there is considerable evidence that viewing a face upside down can interfere with recognition performance by reducing people's ability to focus on the configural relationships between features (Carey & Diamond, 1977; Diamond & Carey, 1986; Rock, 1973, 1974; Yin, 1969).

In addition to standard face recognition, there is evidence from other types of face perception tasks that suggests that inversion disrupts configural processing. Rhodes, Brake, and Atkinson (1993) found that inversion interfered with participants' ability to detect face modifications involving isolated features (e.g., presence of facial hair) to a lesser degree than those involving relational features (e.g., internal feature spacing). Young et al. (1987) examined latencies for the recognition of the combined top and bottom halves of different famous faces. They observed that when the face combinations were presented upright, the famous-face sections were better recognized when they were misaligned than when they were aligned to form a new face. However, when the faces were presented upside down, the advantage for the misaligned faces was attenuated. The most straightforward interpretation of these findings is that the upright face combinations were processed configurally, and consequently when the two sections were aligned, the features from each section interacted, making it difficult to recognize the individual halves. However, when the faces were inverted, configural processing was reduced, and the features of the top and bottom halves of the aligned faces no longer interacted.

A final source of evidence that inversion disrupts configural processing comes from Bartlett and Searcy's (1993) examination of the Thatcher illusion. In the Thatcher illusion, the mouth and eyes of a face are inverted within an otherwise normal face; the altered construction seems grotesque when the face is viewed upright but not when it is viewed upside down. Bartlett and Searcy compared the effects of inversion on faces that were grotesque as a result of either individual features (i.e., grotesque posed expressions) or configural relations between features (i.e., Thatcherized faces and distorted faces in which the distance between features was abnormal). They observed that inversion did not reduce the perceived grotesqueness of featurally grotesque faces but did reduce the perceived grotesqueness of configurally grotesque faces, thus further supporting the view that inversion specifically disrupts the ability to process the configural characteristics of faces.

The converging evidence that inversion reduces configural processing of faces suggests that inversion provides a good technique for further exploring the observation that verbalization disrupts White participants' recognition of own-race but not other-race faces. We hypothesized that this interaction occurs because verbalization reduces the configural processing typically used in the recognition of faces with which one is an expert (i.e., own-race faces). Given the converging evidence that inversion disrupts the use of configural information, we predicted that the interaction between verbalization and race of face should be attenuated when participants attempt to recognize inverted faces. In short, if the value of configural information is reduced through inversion, then both the benefits of expertise and the disruptive effects of verbalization should similarly be reduced through inversion.

Experiment 3 replicated the general paradigm used in Experiment 1 with the addition of a third variable: face inversion. In addition, to further ensure the generality of our findings, we doubled the number of White and African American test–recognition sets that were used.

Method

Participants. The participants were 369 University of Pittsburgh undergraduates who participated in this experiment for course credit.[7] The experiment was run over two semesters.

Materials. Stimulus pictures (four White and four African American faces) were taken from college yearbooks and were presented on slides. Two of the White faces and two of the African American faces were the same as those used in Experiment 1. For the target faces, different photographs were used in the acquisition and recognition phases. The photographs were black and white, and only the face was exposed.

Procedure and design. The procedure replicated that used in Experiment 1 with the addition of an inversion manipulation of the recognition arrays. Because we were most interested in normal face processing, the faces in acquisition were all presented in an upright orientation. In test, for half of the participants, the recognition array was presented in an upright orientation; for the other half, it was inverted. In addition to the introduction of the inversion manipulation, a few other minor changes in procedure were also made. To expedite the experiment, we eliminated the initial 5-min filler activity. Immediately after viewing, the target face was removed from view, and participants either wrote a description of the target face or engaged in an unrelated filler task (listing states, capitals, presidents, and countries). As in Experiment 1, the basic procedure was repeated four times with four different faces. However, in Experiment 3, participants viewed only one race of face (i.e., either four own-race faces or four other-race faces). The order of faces was counterbalanced so that each face appeared equally often in each trial, thus creating eight different face orders. Five participants took part in each order.

The design was a 2 (own-race or other-race face) × 2 (verbalization or no verbalization) × 2 (upright or inverted recognition array) × 4 (trial) design with all variables, except trial, as between subjects. There were 40 participants in each condition.

Table 5
Mean Proportion Correct for All Trials and Conditions in Experiment 3

Trial/condition	Upright presentation: Own-race face	Upright presentation: Other-race face	Inverted presentation: Own-race face	Inverted presentation: Other-race face
Trial 1				
Verbalization	.575	.575	.475	.250
No verbalization	.800	.450	.500	.400
Trial 2				
Verbalization	.700	.525	.450	.450
No verbalization	.775	.575	.475	.375
Trial 3				
Verbalization	.800	.500	.650	.375
No verbalization	.850	.525	.500	.250
Trial 4				
Verbalization	.675	.550	.575	.350
No verbalization	.650	.650	.600	.275

Results

Once again there was a significant trial effect as indicated by a four-way interaction between verbalization, race of face, orientation, and trial, $F(1, 312) = 4.98, p < .03, MSE = 0.235$. This interaction reflects the fact that there was a significant Verbalization × Race of Face × Orientation interaction in Trial 1, $F(1, 312) = 4.80, p < .03, MSE = 0.235$, but no such interaction in later trials, $F(1, 312) = 1.33, p > .05, MSE = 0.235$. As in Experiment 1, this trial effect can be attributed to the observation that in Trial 1, recognition of upright White faces markedly differed between verbalization and no-verbalization participants (mean accuracy of 58% and 80%, respectively), whereas there was little difference between the two conditions in later trials (mean accuracy of 73% and 76%, respectively). See Table 5 for participants' mean performance over trials. Therefore, as in Experiment 1, all analyses were based on participants' performance on the initial trial, which was uncontaminated by previous exposure to or participation in the experiment.

A log-linear analysis revealed a significant main effect of orientation, $\chi^2(1\ N = 320) = 12.52, p < .001$, indicating that, overall, faces were recognized better in the upright condition than in the inverted condition. There was also a main effect of race of face collapsed over orientation and verbalization, $\chi^2(1, N = 320) = 9.16, p < .005$, with own-race faces being more accurately recognized than other-race faces. There was no significant main effect of verbalization collapsed over orientation and race of face, $\chi^2(1, N = 320) = 1.51, p > .05$.

Of primary importance, there was a significant three-way interaction between race of face, orientation, and verbaliza-

[7] The responses of 49 participants who did not respond to the demographic survey or who indicated that they were non-White were omitted from the analyses.

tion, $\chi^2(1, N = 320) = 5.36, p < .02$. As can be seen in Figure 2, this three-way interaction reflects the observation that the two-way interaction between verbalization and race of face differed for upright and inverted faces. For upright faces, the interaction between verbalization and race of face observed in Experiment 1 was replicated, $\chi^2(1, N = 160) = 5.62, p < .02$. Verbalization impaired recognition of own-race faces, $\chi^2(1, N = 80) = 4.713, p < .05$, while again numerically, although not significantly, improving recognition of other-race faces, $\chi^2(1, N = 80) = 1.251, p > .05$; see the "upright" half of Figure 2). For inverted faces, however, a different pattern of results emerged. There was no significant interaction between verbalization and race of face, $\chi^2(1, N = 160) = 0.81, p > .05$, with no reliable effect of verbalization for either own- or other-race faces: $\chi^2(1, N = 80) = 0.05$ and $\chi^2(1, N = 80) = 2.051$, respectively, both *p*s > .05.

Additional analyses were performed to determine whether Experiment 3 replicated the interaction between race of face and inversion as reported by Rhodes et al. (1989). This analysis compared orientation and race of face in the no-verbalization (control) condition only. Consistent with the findings of Rhodes et al., participants were significantly impaired by inversion of own-race faces, $\chi^2(1, N = 80) = 7.912, p < .005$; whereas inversion of other-race faces had no significant effect on recognition performance, $\chi^2(1, N = 80) = 0.205, p > .05$. We should note, however, that this Orientation × Race of Face interaction only approached significance, $\chi^2(1, N = 160) = 3.08, p < .08$.

The relationship between orientation and race of face was also examined for verbalizations participants, revealing a nonsignificant interaction, $\chi^2(1, N = 160) = 2.30, p > .05$. Nevertheless, examination of the effects of inversion on verbalization participants' recognition of own- and other-race faces revealed some interesting findings. As predicted, inversion did not affect verbalization participants' recognition of own-race faces, $\chi^2(1, N = 80) = 0.802, p < .05$. However, surprisingly, inversion significantly reduced verbalization participants' recognition of other-race faces, $\chi^2(1, N = 80) = 8.717, p < .01$.

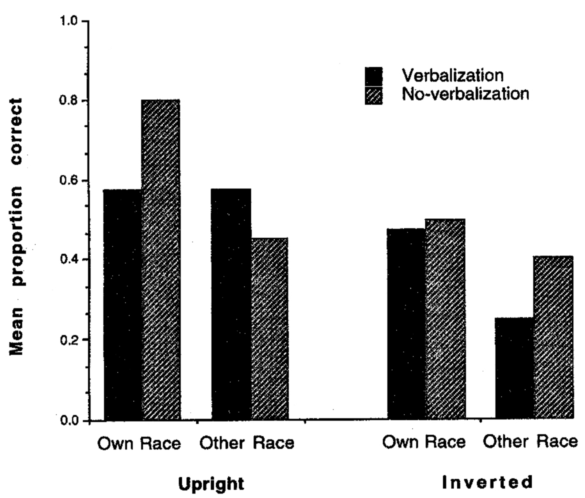

Figure 2. Mean proportion of correctly recognized faces on Trial 1 of Experiment 3.

Discussion

In Experiment 3, face inversion eliminated the previously observed interaction between verbalization and race of face. When White participants were given an upright recognition test, the interaction between verbalization and race of face observed in Experiment 1 was replicated: Verbalization markedly disrupted own-race recognition while having no effect on recognition of other-race faces. However, when participants were given a recognition test with upside-down faces, this interaction was eliminated. In this case, verbalization had no effect on the recognition of either own- or other-race faces.

The results of Experiment 3 suggest that verbalization interferes with the same mechanism that is disrupted by both face inversion and a lack of expertise with a particular race of face: configural processing. As mentioned earlier, there is now considerable evidence that face inversion reduces the degree to which people process the configural relationships between facial features (e.g., Bartlett & Searcy, 1993; Carey & Diamond, 1977; Diamond & Carey, 1986; Rhodes et al., 1989; Rock, 1973, 1974). This evidence suggests that if a face recognition manipulation reduces the use of configural processing, then the effects of this manipulation should in turn be reduced with inverted faces in which little configural processing occurs. On the basis of this logic, the interaction between inversion and perceptual expertise observed by Rhodes et al. and Diamond and Carey has been interpreted as evidence that perceptual expertise involves configural processing. It also follows that the three-way interaction between verbalization, race of face, and inversion observed in this experiment can similarly be attributed to the role of configural processing. In short, when faces are presented upside down, the critical configural information is less salient; consequently, verbalization can no longer disrupt the configural processing typically associated with own-race face recognition.

Although the pattern of results in Experiment 3 was overall quite consistent with the suggestion that verbalization disrupts the configural processes associated with perceptual expertise, there was one unexpected finding. Although neither verbalization alone nor inversion alone affected other-race recognition, the combination of the two produced the lowest level of performance of any condition. Because this finding was unexpected, our interpretation of it is necessarily post hoc. Nevertheless, one reasonable explanation follows from the assumption that inversion, while not disrupting featural processing in general, may interfere with participants' ability to make a direct mapping between their feature descriptions and the features of the faces in the recognition test sets. Accordingly, if, as suggested by Experiment 2, verbalization participants' recognition of other-race faces involves a reliance on the contents of their descriptions, then, given the above assumption, they would be expected to have trouble mapping their verbalizations to the inverted recognition test. The attractive quality of this explanation is that it also accounts for why inversion did not significantly impair verbalization participants' recognition of own-race faces. Specifically, the results from Experiment 2 suggest that verbalization participants do not rely on the precise contents of their verbal descriptions for own-race recognition, so a difficulty in mapping verbalized features to an inverted test array would not be expected to pose a problem for own-race identification. A possible future way to test this analysis would be to examine judges' ability to recognize inverted faces on the basis of verbalization participants' descriptions. If inversion does in fact interfere with the ability to map verbal descriptions with faces, then judges' identification performance should be impaired when using inverted faces.

General Discussion

The present findings suggest that verbalization can disrupt people's ability to apply their perceptual expertise. In Experiment 1, describing the appearance of a previously seen face markedly impaired White participants' ability to recognize own- but not other-race faces, suggesting that verbalization primarily influences the recognition of faces with which one has particular expertise. In Experiment 2 we examined the hypothesis that the differential effects of verbalization on the own- and other-race faces used in Experiment 1 resulted from the differing degrees to which the recognition of these faces relied on verbalized information. For own-race faces, there was no significant relationship between the identification performance of judges and the recognition performance of the participants on whose descriptions the judges' identifications were based. In contrast, for other-race faces, there was a significant correlation between the performance of verbalization participants and the judges. These findings suggest that own-race face recognition in Experiment 1 was vulnerable to verbalization because it was based on nonreportable information; whereas other-race recognition was resistant to the effects of verbalization because it at least partially relied on verbalizable information. Experiment 3 provided evidence that verbalization may specifically disrupt the use of nonreportable configural information involved in the recognition of own-race faces. When face recognition arrays were presented upright, verbalization impaired recognition of own-race but not other-race faces. However, when the recognition arrays were presented upside down, the interaction between verbalization and race of face was eliminated. This finding suggests that verbalization disrupts the use of configural information in a manner comparable to that hypothesized to occur as a result of inverting a face (e.g., Bartlett & Searcy, 1993) or as a result of viewing a face of a less familiar race (e.g., Rhodes et al., 1989).

Together, the present findings are consistent with a general model of face recognition that includes the following assumptions: (a) Face recognition generally involves the consideration of both verbalizable attributes corresponding to individual facial features and nonverbalizable attributes corresponding to the configural relationships between those features. (b) The relative degree to which these two types of information are used can vary as function of both task demands and participant experience (expertise). (c) Reliance on nonreportable configural information increases with expertise. (d) Reliance on configural information decreases when participants must recognize inverted faces or faces that they have previously verbalized. (e) Recognition performance can be disrupted if experimental manipulations cause participants to alter the ratio of configural and featural information on which they would have otherwise relied. Accordingly, under situations in which participants normally emphasize verbalizable–featural face characteristics (i.e., recognition of other-race faces for which they lack expertise), verbalization and inversion have no significant effect. However, under situations in which participants normally emphasize nonverbalizable–configural face characteristics (i.e., recognition of own-race faces for which they have expertise), both verbalization and inversion are disruptive.

The above-mentioned characterization of face recognition corresponds to the basic model promoted by Rhodes et al. (1989), Rhodes (1993), Diamond and Carey (1986), and Bartlett and Searcy (1993) in accounting for why inversion disproportionately impairs recognition of stimuli with which one is an expert. What is new here is the suggestion that prior verbalization of a face may similarly attenuate the use of configural information associated with perceptual expertise. In conceptualizing the impact of verbalization on the relative use of featural versus configural information, it may be useful to draw on the concept of transfer-appropriate processing.

A large body of research suggests that memory performance is optimized when the processes used at encoding are comparable to those used at test (e.g., Morris, Bransford, & Franks, 1977; Tulving & Thompson, 1973). In the present context, verbalization may be particularly disruptive because it causes participants to emphasize information during recognition (verbal–featural) that they do not normally consider during encoding. In other words, verbalization may cause *transfer-inappropriate processing* in which, during recognition, participants inappropriately emphasize the verbal–featural information that they considered during verbalization rather than the nonverbal–configural information typically emphasized during the encoding of own-race upright face. Under situations in which the default encoding involves a proportionately greater reliance on featural information (i.e., other-race faces), or recognition requires featural processing (i.e., when the recognition array is inverted), the featural processing encouraged by verbalization is no longer inappropriate, and consequently no interference is observed.

This notion of transfer-inappropriate processing may also help to account for the attenuated effects of verbalization over trials. Accordingly, if the disruptive effects of verbalization are due in part to a disparity between the information considered at encoding, verbalization, and test, then it seems quite plausible that over trials participants might learn to become more consistent in what they attend to. This account would also help to explain Schooler et al.'s (in press) observation that the negative effects of verbalization are attenuated, indeed reversed, when participants are re-presented with the target face after verbalization. Accordingly, reexposure to the target face may enable participants to emphasize both the featural information encouraged during verbalization and the configural information typically associated with upright own-race faces, thereby enabling participants to maximize their use of both types of information.

Alternative Interpretations

We have argued that the most straightforward interpretation of our results is that verbalization disrupts the nonreportable configural processing that is typically associated with the recognition of own-race, upright faces. Nevertheless, there are other possible interpretations. We briefly discuss these interpretations and argue why they seem less plausible.

It might be suggested that the interactions between verbalization and the other variables examined in this study were artifacts of the reduced performance of participants in the other-race and inverted-face conditions. However, in both Experiments 1 and 3, verbalization markedly impaired White participants' recognition of own-race faces while numerically improving recognition of other-race faces. The interpretation of this type of cross-over interaction is not confounded by the generally lower performance associated with one of the variables (see Loftus, 1978, for a further discussion of this issue). Moreover, Experiment 2 revealed qualitative differences between the processing of the own- and other-race faces that could not be accounted for by a simple performance reduction explanation. For example, verbalization participants' descriptions were predictive of their recognition of other-race but not own-race faces.

It might also be argued that the observed interaction between verbalization and race of face was the result of some variable besides expertise that distinguished these faces. For example, the interaction might be attributed to a greater homogeneity of the African American faces compared with the White faces. However, the fact that other populations show a similar advantage for own-race faces (e.g., Chance et al., 1975; Rhodes et al., 1989) suggests that the own-race effect is primarily due to the characteristics of the participants (i.e., their experience) and not the faces per se.

Ultimately, the present claim that verbalization disrupts the use of the configural information associated with perceptual expertise is admittedly based on indirect measures of both configural processing and expertise. It is thus possible that the impairment resulting from verbalization is not due to a decreased use of configural information but rather is due to some other process that is associated with cross-racial identification and inversion. It is also possible that verbalization may have other effects on face recognition in addition to decreasing the use of configural information. However, given the previous evidence that (a) verbal face descriptions are associated with a focus on featural aspects of a face (e.g., Wells & Turtle, 1987), (b) expertise is associated with a focus on configural relations (e.g., Diamond & Carey, 1986; Rhodes et al., 1989), and (c) inversion disrupts the use of configural information (e.g., Bartlett & Searcy, 1993; Young et al., 1987), it seems at present reasonable to suggest that configural information is, at a minimum, a likely component of the perceptual face expertise that is vulnerable to verbalization.

Relationship of the Present Findings to Other Two-Component Memory Distinctions

Although the present findings suggest that the effects of verbalization are associated with the configural–featural processing distinction, they do not rule out the involvement of other related distinctions. We briefly discuss two of these distinctions and their potential relevance to our findings.

Dual-code theories. The dual visual/verbal code approaches (e.g., Baddeley, 1986; Bartlett, Till, & Levy, 1980; Brandimonte, Hitch, & Bishop, 1992; Paivio, 1986) also have much in common with the configural–featural distinction when applied to face memory. Because the visual code is assumed to maintain a spatial analog, it presumably preserves configural information. In contrast, because the verbal code maintains propositions, it would be less likely to maintain the difficult-to-describe configural information. Although there is considerable evidence that memory benefits from the use of both codes (see Paivio, 1986), there is growing evidence that interference between the two codes can occur when one code includes more diagnostic information than the other (e.g., Bahrick & Boucher, 1969; Brandimonte, Hitch, & Bishop, 1992; Brandimonte, Schooler, & Gabbino, 1995; Nelson & Brooks, 1973). From the perspective of a dual-code approach, verbalization may bias participants to focus on the verbal code associated with their face memory and to ignore critical configural information that is exclusively represented in the visual code.

Although a direct connection between reliance on the visual code and expertise has not previously been established, it would certainly be consistent with studies examining the visual memory of experts. For example, Chase and Simon (1973) observed that chess experts are far superior to novices in their ability to remember the spatial position of chess pieces when they are in possible game configurations. This finding suggests that expertise may facilitate visual chunking. Indeed, the notion of visual chunking may offer a possible reason why expertise fosters the ability to attend to configural characteristics of the face. With sufficient experience with faces of a particular race, people may be able to visually chunk faces as a whole as opposed to a set of individual features.

Automaticity. The distinction between automatic and controlled processes may also bear on the present findings. There is now considerable research suggesting that when learning a new task, performance initially requires attentionally demanding "control" processes that are readily reported and can easily be "fragmentized" (Schneider, Dumais, & Shiffrin, 1984, p. 21). However, with sufficient practice, performance becomes automatized such that awareness of the processes involved is diminished (Jacoby, Ste-Marie, & Toth, 1993) and the component processes are more "wholistic" (Schneider et al., 1993, p. 21). It seems quite plausible that as expertise in recognizing a particular race of face develops so too does the use of automatic processes. Because automatic processes tend to be wholistic and unreportable, it follows that the increased automaticity hypothetically associated with face expertise might be disrupted by attempts to put the nonreportable into words. Indeed, recent findings by Dunning and Stern (1994) indicated that face recognition is more effective when participants report using nonreportable automatic processes (e.g., "I just recognized him, I cannot explain why") than when they report using more verbalizable and strategic processes (e.g., "I compared the photos to each other in order to narrow the choices"). The hypothesized verbal disruption of automatic face recognition processes would also be consistent with previous suggestions that attempting to apply control processes to automatized tasks can interfere with automatized processes (e.g., Eriksen, Webb, & Fournier, 1990; Kimble & Perlmuter, 1970; Langer & Imber, 1979).

Clearly, further research is needed to determine the role of the dual-code distinction and automaticity in mediating the effects of verbalization on configural and featural processing of faces. However, the present analysis suggests that these approaches may have much in common, particularly with respect to the manner in which they relate to the effects of verbalization on perceptual expertise.

Relationship Between Verbalization and Expertise

The present research also helps to clarify the relationship between individuals' relative verbal and nonverbal expertise in a domain and their vulnerability to verbalization. Accordingly, when verbal ability is commensurate with perceptual ability, then verbalization should not be disruptive. However, when language skill is lacking in comparison with perceptual skill, then verbalization may be quite disruptive. Evidence supporting this view comes from comparison of participants' relative proficiency of describing and recognizing own- versus other-race faces. In Experiments 1 and 3, no-verbalization participants showed the commonly observed advantage for recognizing own- as compared with other-race faces. Nevertheless, in Experiment 2, communication accuracy measures indicated that the verbal descriptions of other-race faces were at least as useful as descriptions associated with own-race faces. This discrepancy between verbal and perceptual expertise nicely accounts for why only own-race faces were disrupted by verbalization. Accordingly, for own-race faces, perceptual expertise (recognition ability) markedly exceeds verbal expertise (description ability); consequently, a de-emphasis on perceptual–nonverbal aspects is disruptive. However, for other-race faces, the discrepancy between perceptual and verbal expertise is less marked, and consequently a de-emphasis on the perceptual information is less disruptive.

A number of recent findings similarly suggest that verbalization effects are limited to situations in which perceptual expertise outflanks verbal expertise. For example, Melcher and Schooler (1995) found that verbalization impaired the wine recognition of nonprofessional drinkers (who had drinking experience but relatively little verbal wine knowledge) but had little effect on nondrinkers (individuals with relatively little perceptual or verbal expertise). This finding is consistent with our study in suggesting that verbalization is disruptive when perceptual expertise exceeds verbal expertise. Melcher and Schooler further found that wine professionals (individuals with marked perceptual and verbal expertise; cf. Lehrer, 1983; Soloman, 1990) also failed to show disruptive effects of verbalization. This finding suggests that disruption can also be avoided when both perceptual and verbal expertise are high. Further evidence for the importance of participants' relative verbal and perceptual expertise in mediating the effects of verbalization is suggested by Ryan and Schooler's (1995) finding that the largest deleterious effects of verbalization were associated with participants who scored above the median on various visual memory tasks (e.g., embedded figures and general face recognition tasks) but had a below average grade point average. Although grade point average is an admittedly indirect measure of verbal ability, this finding is consistent with the basic claim that verbalization disrupts performance when participants' perceptual expertise outflanks their verbal expertise.

The suggestion that the effects of verbalization may depend on the relative degree of relevant perceptual and verbal expertise leads to some interesting implications for the relationship between verbalization and learning. If perceptual and verbal skills develop at different rates, or are differentially required at different times in the learning process, then the effects of verbalization on performance may critically depend on when in the learning process an individual is tested. Such a process may help account for Lesgold and colleagues' observation (Lesgold, Feltovich, Glaser, & Wang, 1981; Lesgold et al., 1988) that with experience X-ray technicians show a temporary decrease in their ability to diagnose correctly lung abnormalities from X-rays. Lesgold et al. (1988) speculated that this downward curve might reflect differences between the faster "perceptual" learning and the slower "cognitive" learning such that "an emerging cognitive ability will have to contend with a stronger perceptual ability already in place" (Lesgold et al., 1988, p. 337). As radiology students acquire cognitive ability at reading X-rays, they may become more predisposed to verbalize their hypotheses, thereby overshadowing their better developed perceptual skill. However, as their cognitive skill develops, the mismatch between verbal and perceptual knowledge may diminish, thereby leading to the final upswing in the U-shaped learning curve. Such an analysis raises the intriguing possibility that although verbalization is initially disruptive for perceptual expertise, with practice it may become facilitative.

The present results provide only the beginning of an understanding of the relationship between the effects of verbalization and expertise. Indeed, more questions may have been raised than answered. In addition to those already mentioned, we might add the following: What other domains of expertise are susceptible to verbalization? Can verbalization influence the acquisition of expertise, and, if so, to what degree does it depend on the configural characteristics of the task? If there are costs to verbalizing expertise, are there also benefits, and, if so, what are they? Are there ways of encouraging verbalizations that are more consistent with the manner in which the expertise is represented and consequently are less disruptive?

Although many questions remain, our research suggests that both expertise and language are two-edged swords. Expertise enables one to reach levels of performance not otherwise possible, yet experts can be uniquely vulnerable to the disruptive effects of verbalization. Language provides a remarkable scaffolding on which much of cognition is built, yet language can hamper the successful execution of certain nonverbal skills. Appreciating this dual-edged quality of both expertise and language, may be the first step toward minimizing the down side of each.

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