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When Do Words Hurt? A Multiprocess View of the Effects of Verbalization on Visual Memory

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Verbal overshadowing reflects the impairment in memory performance following verbalization of nonverbal stimuli. However, it is not clear whether the same mechanisms are responsible for verbal overshadowing effects observed with different stimuli and task demands. In the present article, we propose a multiprocess view that reconciles the main theoretical explanations of verbal overshadowing deriving from the use of different paradigms. Within a single paradigm, we manipulated both the nature of verbalization at encoding (nameability of the stimuli) and postencoding (verbal descriptions), as well as the nature (image transformation or recognition) and, by implication, the demands of the final memory task (global or featural). Results from 3 experiments replicated the negative effects of encoding and postencoding verbalization in imagery and recognition tasks, respectively. However, they also showed that the demands of the final memory task can modulate or even reverse verbal overshadowing effects due to both postencoding verbalization and naming during encoding.

Keywords: verbal overshadowing, recognition, global/featural processing, naming, verbal encoding

Putting thoughts into words can be very difficult for certain nonverbal stimuli, and cognitive psychologists have found that there are some costs to verbalizing such experiences. There is now a substantial body of research to show that verbalization can impair performance on a range of nonverbal tasks. This phenomenon has broadly been termed *verbal overshadowing* and has been found to apply to memory for faces and colors (Schooler & Engstler-Schooler, 1990), maps (Fiore & Schooler, 2002), mushrooms (Melcher & Schooler, 2004), voices (e.g., Perfect, Hunt, & Harris, 2002), wines (Melcher & Schooler, 1996), analogies (Lane & Schooler, 2004), and visual imagery (e.g., Brandimonte, Schooler, & Gabbino, 1997). However, it is not clear whether the same mechanisms are responsible for the detrimental effects of verbalization observed across these disparate domains. In the present research, we begin to address this issue by bridging the gap between the negative effects of verbalization previously reported in the visual recognition and imagery domains.

Methodological Issues

Verbal overshadowing has predominantly been assessed using tasks involving memory retrieval, in particular, face recognition, and visual imagery tasks. However, researchers in these domains have used very different methodologies.

In the standard verbal overshadowing paradigm used in the face recognition domain, participants view a target face and are then instructed to describe that face in detail from memory or engage in a no-description task, typically for a period of 5 min. Recognition accuracy is then tested in a lineup procedure where the target is viewed alongside similar distractors. Verbal overshadowing is evident when recognition is poorer in the description than in the no-description condition (e.g., Schooler & Engstler-Schooler, 1990), and a meta-analysis of studies using this paradigm has shown a reliable, though small, negative effect of verbalization on face recognition (Meissner & Brigham, 2001). Importantly, in these studies, verbalization is elicited from memory *postencoding* of the face, entails a *detailed description*, and *recognition* of the target is tested in a lineup procedure. This methodology is different from that used in the imagery domain.

In the prototypical imagery experiment, participants study a series of visual forms and, during encoding, are encouraged or

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discouraged from *naming* those forms. Naming, unlike a detailed description, involves applying a single verbal concept to the visual form. Participants are then required to retrieve and manipulate an image of each form. For example, the task may involve mentally rotating each form 90° anticlockwise to discover two letters (e.g., rotating the top left-most form in Figure 1 shows that it is made up of the two letters *T* and *L*; Brandimonte, Hitch, & Bishop, 1992a, 1992b). The consistent finding is that imagery performance is poorer when verbalization is encouraged at encoding (i.e., when naming is present) compared with when it is discouraged (i.e., when naming is absent).

Several methods have been used to manipulate the presence or absence of naming during encoding, and naming can be covert or overt in nature. Some studies use visual forms that are easy versus hard to name. Easy-to-name forms are known to prompt spontaneous covert naming during encoding and hence are associated with poor imagery performance. Hard-to-name forms do not spontaneously prompt covert naming and therefore should not be subject to interference from verbalization, that is, unless naming is encouraged in some way. For example, presenting hard-to-name forms alongside experimenter-generated labels also leads to poorer imagery performance (e.g., Brandimonte & Collina, 2008). In other studies, easy-to-name forms are encoded with or without articulatory suppression (i.e., repeating an irrelevant sound, e.g., la, la). Articulatory suppression impedes participants from engaging in covert spontaneous naming when learning easy-to-name forms and hence is found to improve subsequent imagery performance (e.g., Brandimonte et al., 1992b). Critically, in the imagery paradigm, verbalization occurs *during encoding*, entails *naming*—whether covert or overt—of the visual forms, and *retrieval* of the target is tested using an image manipulation task.

Thus, in both the face recognition and imagery domains, the term *verbal overshadowing* has been used to describe a detriment in memory performance due to an act of verbalization. However,

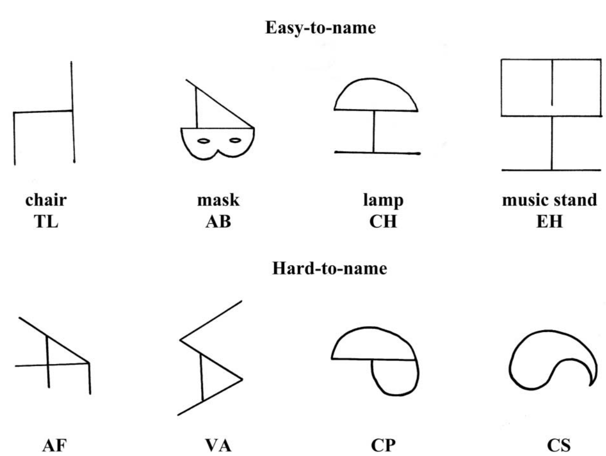

Figure 1. The easy-to-name forms (along with their commonly agreed names) and the hard-to-name forms used in the present experiments. The correct letter responses are displayed beneath each form. Adapted from "Verbal Recoding of Visual Stimuli Impairs Mental Image Transformations," by M. A. Brandimonte, G. J. Hitch, & D. V. M. Bishop, 1992b, *Memory & Cognition*, *20*, p. 450, Figure 2. Copyright 1992 by the Psychonomic Society, Inc. Adapted with kind permission from Springer Science and Business Media.

the paradigms used differ in terms of the timing and nature of the verbalization task (a description postencoding vs. naming during encoding) and the nature of the final memory test (face recognition vs. image manipulation). We do not know whether the detrimental effects of verbalization in these two paradigms are driven by the same mechanism. A careful reading of the literature in fact suggests that postencoding description and naming manipulations likely influence memory performance in qualitatively different ways.

Comparing Effects of Verbalization in Imagery and Face Recognition Domains

It was originally proposed that words hurt when there is a mismatch between the nonverbal knowledge required for successful completion of the "task in hand" and the verbal knowledge associated with describing or naming a stimulus. This general principle was termed the *modality mismatch assumption* (Schooler & Engstler-Schooler, 1990; Schooler, Fiore, & Brandimonte, 1997) and draws upon the well-known transfer-appropriate processing framework, the premise of which is that performance on memory tests benefits more when encoding operations overlap maximally with the retrieval demands of a particular test (e.g., Morris, Bransford, & Franks, 1977). Several different accounts have since been put forward to explain how a mismatch between verbalization and the nonverbal demands of the memory test may arise. We briefly consider these here as they apply to the face recognition and imagery domains, respectively.

In the face recognition domain, it is generally accepted that a mismatch between verbal and nonverbal knowledge is evident because it is difficult to capture in words information about a face (e.g., Ellis, Shepherd, & Davies, 1980; Schooler et al., 1997). Descriptions tend to emphasize the individual features of the face. In contrast, the subtle information concerning the spacing and relationships between facial features cannot be adequately described. In the face recognition domain, three separate accounts have been proposed to account for how this mismatch between verbal and nonverbal knowledge may arise.

First, a postencoding description may influence a participant's response criterion during the recognition task. Clare and Lewandowsky (2004) showed that participants who had previously described the target face, compared with those providing no description, were more likely to say that the target was "not present" in a recognition lineup (i.e., they adopted a more conservative response bias). The reason for this is not clear, but it has been suggested that because participants find describing a face difficult, this leads them to infer more generally that their memory for the face is poor, and so they become reluctant to choose from the lineup (Clare & Lewandowsky, 2004). This account, however, does not explain why describing a face can still interfere with recognition when participants are forced to choose someone from the lineup.

Second, describing a face postencoding may lead to an inaccurate or imprecise description of the contents of the original memory. This new verbally biased representation successfully competes with the original visual memory and is inappropriately relied on at test, an account known as *retrieval-based interference* (Schooler & Engstler-Schooler, 1990; see also Meissner, Brigham, & Kelley, 2001). In this case, verbal overshadowing should be apparent when the contents of the description do not sufficiently aid memory; that is, poor quality descriptions should be correlated with poor memory performance. Indeed, some studies have revealed descriptions that contain more incorrect details to be associated with less accurate recognition performance (e.g., Finger & Pezdek, 1999; Meissner et al., 2001; see also a meta-analysis by Meissner, Sporer, & Susa, 2008). However, such a correlation has not always been observed, and these situations prove problematic for a retrieval-based interference account (e.g., Brown & Lloyd-Jones, 2003; Fallshore & Schooler, 1995; Schooler & Engstler-Schooler, 1990).

Finally, describing a face postencoding may shift the participant from using nonverbal processing previously applied to encode the face, to verbal processing. Verbal processing is then inappropriately applied at retrieval and impairs performance: *a transfer-inappropriate processing shift account* (e.g., Schooler, 2002). This shift in processing style is proposed to be relatively general, and it successfully explains those instances in which the negative effects of postencoding descriptions have been found to extend beyond the particular face that is described (e.g., Brown & Lloyd-Jones, 2002, 2003; Dodson, Johnson, & Schooler, 1997; Lloyd-Jones & Brown, 2008). More specifically, this transfer-inappropriate processing shift account has historically assumed verbal descriptions and featural processing to be closely related, if not eliciting synonymous processes (Chin & Schooler, 2008; Schooler, 2002). On this account, descriptions that emphasize facial features result in a shift to featural processing at the expense of global/configural processing, and it is the latter type of processing that is best suited to face recognition (Diamond & Carey, 1986). In support of this, it has been shown that postencoding descriptions more generally impair performance on tasks that predominantly rely on global/configural knowledge, but not tasks that rely on featural/analytic knowledge. Postencoding descriptions have been found to impair recognition of own-race but not other-race faces (Fallshore & Schooler, 1995), the ability to estimate straight-line distances but not route distances between landmarks on a map (Fiore & Schooler, 2002), and the ability to successfully solve insight but not logic problems (Schooler, Ohlsson, & Brooks, 1993).

In summary, the findings concerning postencoding descriptions have led to the assumption that nonverbal tasks negatively affected by verbalization are those that require global/configural knowledge for successful performance. This is likely because a description emphasizes feature-based information at the expense of global/configural information that is more difficult to describe. This may lead to impaired performance because (a) the participant inappropriately relies on an imprecise or inaccurate verbal representation or (b) because the act of describing encourages a shift to a featural processing style that reduces the participant's ability to adequately access global/configural information (e.g., Chin & Schooler, 2008; Schooler, 2002). Findings from the visual imagery domain, however, give rise to a different conclusion. Here, verbalization takes the form of naming during encoding, and we find evidence that verbalization can impair nonverbal tasks that predominantly rely on featural knowledge.

Similar to faces, multipart images are assumed to contain both featural and global information (i.e., information about the spatial relations among features); however, contrary to tasks such as face recognition that benefit most from global knowledge, image manipulation tasks likely rely on featural knowledge (cf. Brandimonte & Collina, 2008; Kosslyn, 1994; Lobmaier & Mast, 2008). Initially, images are formed by bringing a global image to mind. This image lacks high-resolution featural details, and elaboration must occur to activate the exact features of the image required for successful image manipulation (Kosslyn, 1994). Thus, applying global/configural knowledge should not help image transformation, whereas applying featural knowledge should. On the basis of these assumptions, face recognition and image transformation tasks rely on different types of knowledge for successful performance. Further, unlike a postencoding description that requires breaking a nonverbal item into its individual verbal pieces, naming likely requires participants to chunk information about a visual representation into a single verbal concept that is then applied globally to the whole of the image. On the basis of the modality mismatch assumption, it follows that as the image transformation task relies on featural knowledge, the act of naming may exert its negative effect by emphasizing global knowledge at the expense of the specific features of the image.

Brandimonte and Collina (2008) presented evidence that naming results in a shift from the application of featural to global information. In their experiment, participants first learned a series of hard-to-name visual forms, and later (i.e., postencoding) they were asked to self-generate a name for each form. Following this, they took part in a memory task in which they were required to retrieve each visual form and to mentally rotate it 90° anticlockwise to discover its two constituent letters. Naming led to poor performance on this mental rotation task. However, the negative effect of naming was attenuated when prior to mental rotation, participants were re-presented with their self-generated names. Importantly, self-generated names only acted as effective retrieval cues when the name accurately referred to parts of the stimulus. Names that were unrelated common nouns, proper nouns, or nonwords did not facilitate retrieval. The presence of a relationship between the quality of the name used as a retrieval cue and subsequent imagery performance is consistent with a retrieval-based interference account of verbal overshadowing. Here, naming the forms led to the formation and reliance on a new memory representation relating to the name. This global representation lacked reference to the specific features of the stimulus necessary for successful completion of the image transformation task. Cuing retrieval by providing a name relating to a featural aspect of the stimulus then worked by reinstating access to the original featural representation in memory. In sum, these results indicate that within the imagery domain, a mismatch between nonverbal and verbal knowledge arises as naming results in an inappropriate reliance on global representations, at the expense of featural representations, that are more suited to the imagery task (Brandimonte & Collina, 2008).

Thus, within the recognition and imagery domains, a different role for verbalization is suggested: A postencoding description emphasizes featural rather than global information and hence impairs face recognition performance, a global task. Naming during encoding emphasizes global rather than featural information and hence impairs image manipulation performance, a featural task. Thus, it seems that verbalization, depending on its precise nature (i.e., postencoding description or naming during encoding), determines the use of qualitatively different types of visuospatial information (featural or global). Critically, however, the dominant theoretical accounts presented within both domains assume that (a) verbalization in some way influences the balance of global or featural information available to the participant at the time of the memory test and (b) that memory will be impaired when there is a mismatch between the information emphasized by verbalization and that required by the retrieval task. Taken together, these findings suggest that it may be appropriate to adopt a novel multiprocess view in terms of how verbalization exerts its affect on memory. Under this view, qualitatively different visual aspects of a stimulus (global/featural) will be susceptible to different forms of verbalization (e.g., postencoding description/naming during encoding), and the presence (or absence) of verbal overshadowing will depend on the extent to which verbalization induces operations that effectively mismatch (or match) the demands of the final memory test (i.e., imagery or recognition).

The Present Experiments

We set out to demonstrate within a single paradigm that the negative effects of verbalization on memory performance previously found in paradigms that have used different manipulations of verbalization, different stimuli, and different memory tests (i.e., postencoding description in face recognition and naming during encoding in image transformation) are in fact produced in qualitatively different ways. We used classical recognition and imagery paradigms within which we manipulated verbalization in two ways. First, we manipulated the presence or absence of covert spontaneous naming during encoding by using visual forms known to be easy or hard to name (i.e., naming or no naming during encoding) (cf. Brandimonte et al., 1992b). Second, we asked participants postencoding to provide a detailed featural description of the previously encoded forms or engage in a filler activity (i.e., postencoding description or no description). The final memory task was manipulated to emphasize the use of either featural or global visual information. In Experiment 1, we used an image transformation task known to require featural processing (cf. Brandimonte & Collina, 2008). In Experiment 2, we used a featural recognition task in which the distractors differed from the target on a single feature. In Experiment 3, we used a global recognition task in which the specific features of the stimulus were now task irrelevant, and instead the distractors differed from the target in terms of a global property: overall size.

We expected to demonstrate that naming during encoding and postencoding description exerts independent effects on memory performance. Specifically, we predicted that naming during encoding (that encourages global analysis) impairs performance on feature-based memory tasks (Experiments 1 and 2) and that a postencoding description (which encourages featural analysis) impairs performance on a global-based memory task (Experiment 3). Further, we propose that negative effects of verbalization will occur (or not) when the verbalization undertaken closest in time to retrieval encourages the use of operations (i.e., global or featural) that mismatch (or match) those required by the memory task (i.e., featural or global). Thus, we predicted that the presence or absence of a postencoding description would modulate the detrimental effects on memory performance of naming during encoding.

Experiment 1

Participants learned easy-to-name or hard-to-name forms. Immediately after learning, they provided a featural description of each form or engaged in a no-description task. The description task was designed in accordance with procedures adopted in the standard face recognition paradigm: It occurred postencoding of the form and required participants to describe in detail all the forms from memory. Memory was then tested using an image manipulation task, assumed to demand featural operations for successful performance. Consistent with prior research in the imagery domain, negative effects of naming were expected to be apparent for easy-to-name forms. That is, with no postencoding description, imagery performance should be worse for easy- compared with hard-to-name forms (e.g., Brandimonte et al., 1992b, 1997). Importantly, previous research has shown that imagery performance for easy-to-name forms can be improved by providing appropriate cues at retrieval (e.g., re-presenting the color of the shape; Brandimonte et al., 1997). This indicates that even when spontaneous covert naming takes place during encoding (and hence global analysis is encouraged), high-resolution featural information about the form is still encoded and can be accessed when appropriate retrieval conditions are put in place. Thus, the negative effects of naming during encoding are not permanent and can be reversed. On this basis, we expect that adding a *postencoding* description will serve to reinstate the application of featural operations useful for the imagery task. Thus, our novel prediction was that the negative effects of naming should be reversed for easy-to-name forms when adding a postencoding description.

Method

Participants. For all experiments, students from Suor Orsola Benincasa University, Naples, took part as volunteers. Eighty participants (mean age = 23.8 years; 79 women and 1 man) were randomly assigned to the experimental conditions in a 2 (nameability: hard vs. easy) × 2 (postencoding description: description vs. no description) between-subjects factorial design (20 participants per condition).

Procedure and materials. The procedure and materials for the image rotation task were adapted from Brandimonte et al. (1992b). Four hard-to-name and four easy-to-name visual forms were used. Brandimonte et al. (1992b) had previously established the nameability of these forms by asking an independent sample of participants to name a pool of figures. Figures were then selected on the basis of a nameability agreement test, which allowed the selection of easy-to-name (higher than 50% agreement on a name) and hard-to-name stimuli (less than 20% agreement on a name). To minimize differences between stimuli other than nameability, figures were further selected on the basis that their most common names were comparable in terms of imageability and frequency of occurrence as assessed using the Bortolini, Tagliavini, and Zampolli (1972) norms for the Italian language. Each of the forms, when rotated 90° counterclockwise, revealed two capital letters that were always joined together and could occasionally share one side (see Figure 1). Within each set, two of the forms contained curved lines and two were made up of straight lines. The forms were shown on separate 10 × 10 cm cards.

Learning phase. The four visual forms were placed face down in a row in front of the participant. The participants were told that they would be required to memorize each of the forms presented to them, exactly in the order of presentation, so that they could form an accurate visual image of each. The first form was then turned face up and shown to the participant for 5 s before being placed face down again and the second form in the row shown. This was repeated until all the four forms had been presented a total of three times (60 s in total). Participants were not told about the subsequent image transformation task to prevent them from rotating the forms during the learning phase. They were also not told about the impending description task. After learning, all participants reported that they could remember the forms in the order in which they were learned with 100% accuracy. The order of the four forms was counterbalanced across participants.

Postencoding phase. Immediately following the learning phase, participants were asked either to provide a description of each of the four forms from memory or to engage in a control task. Participants in the *description* condition were required to generate a mental image of the first form before describing the form vocally, in as much detail as possible. There was a time limit of 40 s for the descriptions based on the longest time taken to describe a form by independent participants in a pilot study.[1] The task was repeated for the other three forms, in the order in which they were learned. Participants in the *no-description* condition engaged in a rhythm repetition task that involved repeating four different clapping patterns each for 40 s. We chose a nonverbal pattern-clapping task as a control, as it does not involve verbal processing. Other tasks that involve verbalization have been found to elicit negative effects on recognition similar to those elicited by the postencoding description manipulation (e.g., describing another face; Brown & Lloyd-Jones, 2003; or working on cryptic crosswords; Lewis, 2006).

Image transformation task. Immediately following the postencoding phase, participants undertook the image rotation task. They were asked to generate a mental image of the first form in the learned series, to mentally rotate it 90° counterclockwise, and to identify the two constituent letters making up the original shape. Participants verbally reported the two letters to the experimenter. This procedure was repeated for the remaining three forms. There was no time limit for this task. Thus, the dependent variable was accuracy in the mental imagery task, and maximum performance was the correct report of eight letters.

Postencoding description quality. Two judges independently coded the quality of the postencoding descriptions on a 4-point scale. Participants' descriptions were mostly based on the geometric aspects of the stimulus, and the judges were told to score the verbalizations according to whether they included details that matched the shape in terms of lines, shapes of lines, their spatial relationship, and metrics. Higher scores indicated a higher number of details present in the verbalizations. For analysis, the mean of the two judges' scores was taken for each description. The correlation between the two judges scores was high ($r = .89$).

Results and Discussion

Table 1 shows the mean proportion of letters correctly identified in mental imagery by participants in each of the four conditions. By-participant (F_1) and by-items (F_2) analyses were undertaken. By-items analyses were carried out to confirm the robustness of effects across all items. A two-way analysis of variance (ANOVA) on proportion correct scores showed an effect of nameability, $F_1(1, 76) = 34.36$, $p < .001$, $MSE = .02$, $\eta_p^2 = .31$; $F_2(1, 6) = 9.17$, $p < .05$, $MSE = .02$, $\eta_p^2 = .60$; an effect of postencoding description, $F_1(1, 76) = 22.58$, $p < .001$, $MSE = .02$, $\eta_p^2 = .23$; $F_2(1, 6) = 24.46$, $p < .005$, $MSE = .004$, $\eta_p^2 = .80$; and an interaction between nameability and postencoding description, $F_1(1, 76) = 28.21$, $p < .001$, $MSE = .02$, $\eta_p^2 = .27$; $F_2(1, 6) = 30.55$, $p = .001$, $MSE = .004$, $\eta_p^2 = .84$. A negative effect of nameability was observed in the no-description condition: Imagery performance was worse for easy- than hard-to-name forms, $F_1(1, 38) = 45.54$, $p < .001$, $\eta_p^2 = .54$; $F_2(1, 6) = 20.53$, $p < .005$, $\eta_p^2 = .77$. In the postencoding description condition, no differences in performance were observed for easy- versus hard-to-name forms, $F_1(1, 38) = .24$, *ns*; $F_2(1, 6) = .09$, *ns*; participants' performance was similarly high. This reflects the fact that for easy-to-name forms, adding a postencoding description improved imagery performance compared with the no-description condition, $F_1(1, 38) = 36.01$, $p < .001$, $\eta_p^2 = .49$; $F_2(1, 3) = 28.40$, $p < .05$, $\eta_p^2 = .90$. In contrast, for hard-to-name forms, adding a description (compared with no description) had no effect, $F_1(1, 38) = .26$, *ns*; $F_2(1, 3) = 2.45$, *ns*; performance was high independent of the presence or absence of description.

An additional analysis assessed the relationship between the quality of the postencoding descriptions and imagery performance. In the postencoding condition, each participant provided four pairs of scores, one pair per item. Each pair consisted of the description quality score (a score of 1–4) for the item and the memory accuracy score that was later achieved when participants had retrieved and mentally rotated that same item at test (i.e., whether following mental rotation of the visual form participants had discovered zero, one, or two of its constituent letters). For each participant, a Spearman rank correlation was then applied across the four pairs of scores to derive a single score to indicate how well imagery performance and description quality correlated across the four items.[2] The correlational score for each participant was converted into Fisher's *Zr*, and a group mean was obtained across participants within the easy-to-name and hard-to-name conditions. Note, for reporting, we converted Fisher's *Zr* into *r* (using the transformation table given by Howell, 1997, p. 682). For the easy-to-name items, the mean description quality–memory accuracy correlation was $r = .13$ (N17), which was not significantly different from zero, $t(16) = .68$, *ns*. For the hard-to-name condi-

[1] In the standard face recognition paradigm, participants are typically given 5 min to describe a single face (e.g., Schooler & Engstler-Schooler, 1990). Thus, the description time of 40 s per form used here may seem short. The line drawings used here are likely to be less complex to describe than face stimuli. In a separate pilot study using a group of independent participants, 40 s was the longest time taken to describe a single form, and across the three experiments, only 1.87% of descriptions elicited used the whole 40 s to provide a description. We further note that verbal overshadowing effects have been found for other less complex stimuli when using short descriptions. Schooler and Engstler-Schooler (1990) found verbal overshadowing of color recognition when participants spent 30 s describing a previously seen color patch.

[2] Participants were dropped from the correlational analysis of description quality and memory performance when there was no variability in scores on the imagery task (i.e., a participant obtained the maximum accuracy score for each of the four forms). In this case, Spearman's rho cannot be calculated. On this basis, we were unable to carry out correlational analyses between description quality and memory performance for both the featural recognition test (Experiment 2) and the global recognition test (Experiment 3). This was due to approximately half the participants in each experiment showing no variability in accuracy scores across the four test items (note, in these experiments, accuracy scores were either 0 or 1).

Table 1
Mean Proportion of Correct Answers (With 95% Confidence Intervals [CI]) as a Function of Nameability and Postencoding Description for Each of the Three Experiments

Variable	No description: Proportion correct	95% CI	Description: Proportion correct	95% CI
Experiment 1: Image transformation				
Easy to name	.39	[.33, .46]	.73	[.66, .80]
Hard to name	.77	[.70, .84]	.75	[.68, .82]
Experiment 2: Feature recognition				
Easy to name	.56	[.47, .65]	.85	[.76, .94]
Hard to name	.90	[.81, .99]	.86	[.77, .95]
Experiment 3: Global recognition				
Easy to name	.75	[.64, .86]	.30	[.19, .41]
Hard to name	.38	[.27, .48]	.31	[.20, .42]

tion, the mean description quality–memory accuracy correlation was $r = -.07$ (N19), which was also not significantly different from zero, $t(18) = -.38$, *ns*.

A negative effect of naming during encoding (i.e., worse performance for easy vs. hard-to-name forms) was observed in the no-description condition. This replicates previous results in the imagery literature (e.g., Brandimonte et al., 1992b, 1997). It is notable that engaging in a different form of verbalization, a postencoding description, benefited performance by removing the negative effects of naming on the feature-based image manipulation task.

One interpretation of the results is that postencoding description participants benefited from spending more time visually rehearsing the stimuli as they were instructed to form a mental image prior to describing each figure. However, if this explanation were correct, then a uniform benefit of a postencoding description (compared with no description) should have been observed across easy- and hard-to-name stimuli, and this was not the case.

We propose that spontaneous naming during encoding encourages the formation of a global representation relating to the name that lacks reference to the specific features of the stimulus and is inadequate for an image transformation task requiring featural processing (cf. Brandimonte & Collina, 2008). High-resolution featural information however, is still encoded, but naming has led to this becoming less accessible. Engaging in a postencoding description triggers the activation of featural representations that are necessary to successfully complete the image transformation task. In this way, naming during encoding and postencoding description was found to exert separate and different effects on task performance.

It might be argued that the distinction between global/featural operations is not the only possible explanation of the present results. Indeed, there may be other differences between items that might have affected performance (e.g., familiarity, complexity, symmetry, attractiveness). However, such an argument is mitigated by results from preliminary studies conducted to select suitable stimuli. The forms were selected on the basis that their most common names were comparable in terms of imageability and frequency of occurrence, whereas the nameability agreement test allowed their clear division on the basis of being easy to name (higher than 50% agreement on a name) or hard to name (less than 20% agreement on a name). Further support for the role of nameability is provided by the fact that the explicit naming of hard-to-name forms (e.g., by providing labels during encoding) has been shown to interfere with participants' ability to perform the same image rotation task as that used here (Brandimonte & Collina, 2008; Brandimonte et al., 1992b). In these cases, the presence of naming was not reliant on the assumed easy nameability of some forms, but instead was determined by directly manipulating the presence/absence of verbal labels associated with hard-to-name forms. Thus, prior research strongly suggests that it is the act of naming that leads to poorer performance in this image manipulation task. We are therefore confident that it is the presence (for easy-to-name forms) versus absence (for hard-to-name forms) of spontaneous covert naming rather than other differences between stimulus sets that is primarily responsible for the differential effects of a postencoding description on imagery performance associated with easy- versus hard-to-name forms.

Finally, previous research has suggested that a postencoding description acts to influence memory performance by (a) eliciting a new verbally biased representation that competes with the original visual representation in memory (a retrieval-based interference account) or (b) encouraging the use of a featural processing style (a transfer-inappropriate processing shift account). A central prediction of a retrieval-based interference account is that poorer quality descriptions should be associated with poorer memory performance. In contrast, the transfer-inappropriate processing shift account, which proposes a more general form of interference, would not necessitate such a relationship. In the present experiment, we did not find a correlation between the quality of postencoding descriptions and subsequent imagery performance for either easy-to-name or hard-to-name forms. Although it is difficult to argue from a null result, this does add to a previous base of studies that have similarly revealed no systematic relationship between a postencoding description and visual memory performance (e.g., Brown & Lloyd-Jones, 2003; Fallshore & Schooler, 1995), and is less consistent with a retrieval-based interference explanation of the effects of a postencoding description.

Experiment 2

In Experiment 2, we examined whether the effects of naming and postencoding description observed in Experiment 1 generalize to a different kind of memory task, recognition memory. Previous work by Pelizzon, Brandimonte, and Favretto (1999) using visual forms found naming during encoding to differentially affect performance on an image transformation and recognition task. For both tasks, participants learned easy-to-name forms. These were line drawings of six nameable objects. They were drawn in such a way that subtracting a specific part of the form revealed a new easily nameable object. For example, for a drawing of a skipping rope, when the rope is subtracted, the handles look like two ice cream cones (see also Brandimonte et al., 1992a). Participants learned these forms while they engaged or not in articulatory suppression. Articulatory suppression was assumed to prevent spontaneous covert naming of the nameable forms. In the image transformation test, participants were asked to generate a mental image of one of the forms (e.g., the skipping rope). They were then shown a picture of the part of the form that had to be subtracted (i.e., the rope). They then attempted to subtract this part to discover the new easily nameable object and orally reported the name of this object to the experimenter (i.e., in this case, the correct response would be ice cream cones). Here, imagery performance was *better* with than without articulatory suppression, implying that naming during encoding *impairs* performance. This replicates previous research in the imagery domain (e.g., Brandimonte et al., 1992a, 1992b). In the recognition test, the experimenter orally provided participants with the solution to the subtraction task, that is, the name of the new object (e.g., ice cream cones). They were then required to choose the part of the original form that represented this solution from a lineup including the target and three other distractors. Here, recognition performance was *poorer* with than without articulatory suppression, implying that naming during encoding *benefits* performance. Thus, the authors concluded that effects of verbalization on image transformation and recognition tasks may be dissociable. However, it is not clear whether the two memory tasks required the same type of mental operations for successful performance. Recent research indicates that the image discovery task requires access to part-based featural representations (Brandimonte & Collina, 2008). Similarly, in this case, the recognition task required participants to recognize a picture corresponding to part of the original image. However, the issue is complicated, as immediately prior to the recognition task, a verbal cue was provided, that is, the name of the part to be recognized. In contrast, in the imagery task, a visual cue was provided, that is, a picture of the part of the form to be subtracted from the image. Therefore, across tasks, the presence of naming during encoding may have been confounded with encoding/test similarity. For the recognition test, where naming during encoding improved performance, there was a greater match between encoding and test conditions: Here, naming was encouraged both during encoding (i.e., covert spontaneous naming in the no-articulatory-suppression condition) and at test (i.e., via the name given orally by the experimenter). For the imagery test, where naming during encoding impaired performance, there was a mismatch between encoding and test conditions: Here, naming was encouraged during encoding (i.e., in the no-articulatory-suppression condition), but not at test (i.e., instead, a visual cue was presented). Such an analysis of their data fits with our proposal that negative effects on memory performance occur when verbalization encourages the use of operations that mismatch those required by the memory task.

We devised a recognition test similar in its demands to the image transformation task used in Experiment 1. First, unlike Pelizzon et al. (1999), we did not encourage naming of items in the recognition test. Second, successful performance was assumed to rely on the use of featural operations. We again used hard-to-name and easy-to-name stimuli. The inclusion of hard-to-name forms is important, as previous research has shown that these are processed on a featural basis and should elicit good performance on a feature-based memory task (Brandimonte & Collina, 2008). We expected to replicate the results of Experiment 1: Performance should be poorer for easy- versus hard-to-name forms in the no-description condition, as easy-to-name forms elicit global analysis at encoding less useful for a feature-based recognition task. However, adding a *postencoding description*, which encourages the use of featural analysis, was expected to remove the negative effect of naming and so improve performance for easy-to-name forms.

Method

Participants. Eighty participants (mean age = 22.5 years; four men and 76 women) were randomly assigned to the experimental conditions in a 2 (nameability: hard vs. easy) × 2 (postencoding description: description vs. no description) between-subjects factorial design (20 participants per condition). None had taken part in Experiment 1.

Materials and procedure. The procedure for the learning and postencoding phases was the same as in Experiment 1. However, participants completed a four-alternative forced-choice (4-AFC) recognition test after the postencoding phase. Participants generated a mental image of the first learned form and then attempted to choose this target from a lineup including three distractors. Participants verbally reported their recognition decision by saying the number (1–4) that indicated the target's left-to-right position. Each distractor differed from the target in only one characteristic, either by a line or by a metric characteristic (see Figure 2 for an example).[3] The position of the target among distractors was randomized. This procedure was repeated for the other three targets in the learned series. Thus, the dependent variable was the number of forms correctly identified in a series of 4-AFC recognition tasks (maximum = 4).

We should notice that there is a difficulty in devising featural distractors, in that changing an individual feature may alter the global/configural appearance of a visual form. To address this issue, eight independent judges rated how similar, on a scale ranging from 0 (*very different*) to 6 (*very similar*), each of the four targets was to each of its three corresponding distractors in terms of (a) features and (b) overall global shape. Target–distractor pairs (12 in total) were rated as being significantly more dissimilar in their features than in their global shape across both easy-to-name

[3] Our choice of distractors may have made the target stand out in each lineup: It is the only item that differs from all the others by a single feature. If this is the case, then the targets should be perceived as more similar to their corresponding distractors than the distractors are to each other. Eight independent judges rated the similarity of all possible target–distractor pairs (12 in total) and all possible distractor–distractor pairs (12 in total) on a scale ranging from 0 (*very different*) to 6 (*very similar*). No difference in similarity ratings was found between target–distractor pairs and distractor–distractor pairs for either easy-to-name (a mean rating of 3.55 vs. 3.55; $U = 71.5$, *ns*) or hard-to-name forms (a mean rating of 3.28 vs. 3.22; $U = 66.5$, *ns*).

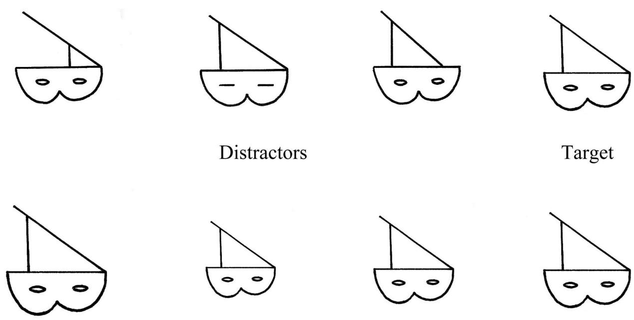

Figure 2. Top: An example of a four-alternative forced-choice (4-AFC) featural recognition test for an easy-to-name target form. Each distractor differed from the target in only one characteristic. The target is the right-most form. Bottom: An example of a 4-AFC global recognition test. Each distractor differed from the target in relative size. The target is the right-most form.

forms (a mean rating of 2.82 vs. 4.24; $z = -3.07$, $p < .005$) and hard-to-name forms (a mean rating of 2.73 vs. 4.35; $z = -3.07$, $p < .005$). Similarity ratings did not differ between easy- and hard-to-name forms in terms of either features ($U = 53.5$, *ns*) or global shape ($U = 65.0$, *ns*). Thus, we are confident that for both easy- and hard-to-name forms, the participants were required to discriminate items based predominantly on their features.

Results and Discussion

Table 1 shows the mean proportion of targets correctly identified in the recognition task by participants in each of the four conditions. A two-way ANOVA by participants and by items on proportion correct scores showed an effect of nameability, $F_1(1, 76) = 15.42$, $p < .001$, $MSE = .04$, $\eta_p^2 = .17$; $F_2(1, 6) = 5.89$, $p = .05$, $MSE = .005$, $\eta_p^2 = .50$; an effect of postencoding description, $F_1(1, 76) = 7.87$, $p = < .01$, $MSE = .04$, $\eta_p^2 = .09$; $F_2(1, 6) = 10.94$, $p < .05$, $MSE = .001$, $\eta_p^2 = .65$; and an interaction between nameability and postencoding description, $F_1(1, 76) = 13.30$, $p < .001$, $MSE = .04$, $\eta_p^2 = .15$; $F_2(1, 6) = 22.09$, $p < .005$, $MSE = .001$, $\eta_p^2 = .79$. A negative effect of nameability was observed in the no-description condition: Recognition performance was worse for easy- than hard-to-name forms, $F_1(1, 38) = 24.26$, $p < .001$, $\eta_p^2 = .39$; $F_2(1, 6) = 15.73$, $p < .01$, $\eta_p^2 = .72$. In the postencoding description condition, no differences in performance were observed for easy- versus hard-to-name forms, $F_1(1, 38) = .05$, *ns*; $F_2(1, 6) < .001$, *ns*: Participants' performance was similarly high. This reflects the fact that adding a postencoding description improved recognition performance for easy-to-name forms compared with the no-description condition, $F_1(1, 38) = 15.44$, $p < .001$, $\eta_p^2 = .29$; $F_2(1, 3) = 17.44$, $p < .05$, $\eta_p^2 = .85$. For hard-to-name forms, adding a postencoding description (compared with no description) had no effect, $F_1(1, 38) = .54$, *ns*; $F_2(1, 3) = 6.00$, *ns*; performance was high independent of the presence or absence of description.

The negative effects of naming during encoding were moderated by the presence or absence of a postencoding description. Furthermore, naming during encoding was found to impair, whereas a postencoding description was found to benefit featural recognition, thus confirming that naming during encoding and postencoding description exerts separate effects on task performance. Together with Experiment 1, these results imply that both types of verbalization exert similar effects on imagery and recognition when the demands of these tasks are featural in nature.

The results obtained here appear to be inconsistent with those of Pelizzon et al. (1999), who found that naming during encoding benefited recognition performance. Their procedure encouraged naming both during encoding and at recognition. Thus, differences in the extent to which operations elicited at encoding matched those required at test may account for why naming helped performance in their study, but impaired performance here. We propose that effects of verbalization are determined by the extent to which operations elicited by verbalization match/mismatch those demanded by the memory test.

Experiment 3

Results from Experiments 1 and 2 showed that naming during encoding impairs performance, whereas a postencoding description benefited performance on feature-based tasks. Here, we expect the opposite pattern of results to occur when the specific features of the original stimulus are made to be task irrelevant. We devised a recognition test in which participants were required to identify a previously learned visual form from a set of distractors that differed from the target only in terms of a global property, their size.

There is evidence that invariant visual features of an object are coded independently of variant metric properties, such as size. For example, Biederman and Cooper (1992) found that participants exhibited a similar amount of priming, as measured by the speed with which they named previously seen versus unseen objects, regardless of whether the previously seen objects had been presented at the same or a different size. They argued that this indicates that representations containing size-invariant visual features of the object are coded independently of size. Further, work in the face recognition domain suggests that although featural information about a face is retained largely within the higher spatial frequencies, configural/global information is more prominent within the lower spatial frequencies (Costen, Parker, & Craw, 1996; see also Hills & Lewis, 2008, for a discussion). On this basis, lower order, compared with higher order frequencies, should better retain accurate information of large-scale distances, such as the distances between the contours of the overall shape of the face or object. In the object recognition test devised here, an increase (or decrease) in object size implies that all component features of the object increase (or decrease) proportionally, thus the specific visual invariant features of the object become task irrelevant; that is, they are not helpful for discriminating the stimuli. Instead, judgment must be made on the basis of the precise global properties of the stimulus. In this case, in order to choose the correct stimulus in the recognition test, participants must accurately judge the large-scale distances between the relevant outline contours of the shape.

To verify that featural information is task irrelevant, we include the use of hard-to-name stimuli. These are processed on a featural basis and should therefore elicit poor performance on a global-based memory task (Brandimonte & Collina, 2008). In contrast, if naming reduces access to featural information and makes global information about the stimulus more salient in memory, then naming should facilitate performance on a global-based task. In addition, as postencoding descriptions are found to impair memory tasks requiring global information (e.g., own-race face recognition), we predict that descriptions that encourage featural analysis should impair performance, as the specific features of the original stimulus are now task irrelevant. Thus, we predict that the negative effect of naming and the beneficial effect of a postencoding description previously observed in Experiments 1 and 2 when we were using feature-based memory tasks should both be reversed now that we have implemented a global-based memory task.

Method

Participants. Eighty participants (mean age = 24.6 years; three men and 77 women) were randomly assigned to the experimental conditions in a 2 (nameability: hard vs. easy) × 2 (postencoding description: description vs. no description) between-subjects factorial design (20 participants per condition). None had taken part in Experiments 1 or 2.

Materials and procedure. The procedure and stimuli were the same as in Experiment 2. However, in the 4-AFC recognition test, the distractors were identical in all visual properties to the target, except for one global property: size (see Figure 2 for an example). For each of the four targets, three distractors were created. Distractors were resized to be within 75% and 125% of the original size of the target using an image size tool provided by a photo editing package. For all participants, in three out of four of the recognition tests, the target appeared as one of the middle two sizes. In the remaining test, the target was either the smallest or the largest in size.[4] The position of the target among distractors was random. Thus, the dependent variable was the number of forms correctly identified in the 4-AFC recognition task (maximum = 4).

Results and Discussion

Table 1 shows the mean proportion of targets correctly identified in the recognition task by participants in each of the four conditions. A two-way ANOVA by participants and by items on proportion correct scores showed an effect of nameability, $F_1(1, 76) = 11.10$, $p = .001$, $MSE = .06$, $\eta_p^2 = .13$; $F_2(1, 6) = 12.62$, $p < .05$, $MSE = .003$, $\eta_p^2 = .68$; an effect of postencoding description, $F_1(1, 76) = 22.19$, $p < .001$, $MSE = .06$, $\eta_p^2 = .23$; $F_2(1, 6) = 37.27$, $p = .001$, $MSE = .002$, $\eta_p^2 = .86$; and an interaction between nameability and postencoding description, $F_1(1, 76) = 12.69$, $p = .001$, $MSE = .06$, $\eta_p^2 = .14$; $F_2(1, 6) = 21.63$, $p < .005$, $MSE = .002$, $\eta_p^2 = .78$. A positive effect of nameability was now observed in the no-description condition: Recognition performance was better for easy-to-name than hard-to-name forms, $F_1(1, 38) = 25.91$, $p < .001$, $\eta_p^2 = .40$; $F_2(1, 6) = 33.14$, $p = .001$, $\eta_p^2 = .85$. In the postencoding description condition, no differences in recognition performance were observed for easy- versus hard-to-name forms, $F_1(1, 38) = .02$, *ns*; $F_2(1, 6) = .03$, *ns*; participants' performance was similarly low. Adding a postencoding description impaired recognition performance for easy-to-name forms compared with the no-description condition, $F_1(1, 38) = 42.16$, $p < .001$, $\eta_p^2 = .52$; $F_2(1, 3) = 152.11$, $p = .001$, $\eta_p^2 = .98$. In contrast, adding a postencoding description had no effect when the forms were hard to name, $F_1(1, 38) = .56$, *ns*; $F_2(1, 3) = .65$, *ns*; participants' performance was low independent of the presence or absence of a postencoding description.

The pattern of results meets with the theoretical predictions that (a) drove the inclusion of hard-to-name visual forms and (b) are consistent with previous findings using postencoding descriptions. First, hard-to-name forms are known to elicit featural processing, and we found poor performance for these stimuli on a memory task in which the features of the stimuli were task irrelevant. Second, postencoding descriptions, which encourage featural analysis, are found to impair performance on global recognition tasks (e.g., own-race face recognition), and there was poor performance for the forms that were described postencoding. We, therefore, argue that global analysis was best suited to the present recognition task and that conditions that encouraged featural analysis served to impair performance. In contrast, we expected naming during encoding to improve performance, as access to global information, rather than featural information, was more useful for the task of recognizing the correct object size. Consistent with this, easy-to-name stimuli (i.e., in the no-description condition) did show a significantly higher level of performance on this task compared with hard-to-name stimuli.

The effects of naming during encoding and postencoding description were again found to interact, indicating that both types of verbalization exert independent effects on memory performance. However, we acknowledge that both postencoding description conditions performed at a level not significantly different to chance (i.e., .25), and so the lack of effect of nameability found here could possibly be due to floor effects. This does not detract from the fact that recognition performance was impaired in the description compared with the no-description condition when stimuli were easy, but not hard to name. Thus, we found the negative effect on memory performance of a postencoding description to be moderated by the presence or absence of naming during encoding.

General Discussion

Within a single paradigm, we manipulated the nature of verbalization at encoding (nameability of the stimuli) and postencoding (description), as well as the nature (image transformation or recognition) and, by implication, demands of the final memory task (i.e., global or featural). In Experiment 1, we found imagery performance was worse for easy-to-name than hard-to-name forms. Researchers have previously interpreted this finding as showing an effect of verbal overshadowing on imagery perfor-

[4] A possible explanation for our results is that verbalization (i.e., naming or description) affected participants' likelihood of detecting the bias in the recognition tests toward the target appearing as one of the middle two sizes. If this was the case, we would expect accuracy to be predominantly associated with recognition tests in which the targets appeared as one of the middle two sizes. We carried out analyses to assess recognition accuracy for the four recognition tests separately undertaken by participants in the easy- and hard-to-name conditions. For easy-to-name forms, a 4 (recognition test) × 2 (postencoding description) ANOVA showed that participants' performance did not significantly differ across recognition tests (mean proportion of correct responses was .65, .47, .55, and .45, for each lineup, respectively), $F(3, 114) = 1.59$, *ns*, and that performance across tests was not differentially influenced by the presence/absence of a postencoding description, $F(3, 114) = .28$, *ns*. This was similarly the case for hard-to-name forms: There was no main effect of recognition test (mean proportion of correct responses was .30, .42, .32, and .32, for each lineup, respectively), $F(3, 114) = .58$, *ns*, and no Recognition Test × Postencoding Description interaction, $F(3, 114) = 1.13$, *ns*.

mance (e.g., Brandimonte et al., 1992b, 1997). Adding a postencoding description improved performance for easy-to-name forms, removing the negative effect of naming. Experiment 2 extended this pattern of results to a featural recognition task. Thus, although naming during encoding impairs performance on feature-based memory tasks, a postencoding description instead benefits performance. In Experiment 3, we changed the demands of the final memory task to require global analysis and found the opposite results. Easy-to-name forms yielded better recognition memory than hard-to-name forms, showing that naming during encoding facilitated performance in a recognition task that emphasized memory for global features. In contrast, adding a postencoding description impaired performance for easy-to-name forms. This latter finding is a conceptual replication of the verbal overshadowing effect previously reported in the recognition domain. Thus for the first time, within a single paradigm, we have replicated the standard verbal overshadowing effects (i.e., negative effects of verbalization) found in both imagery and recognition domains. Importantly, we have shown that naming during encoding and postencoding description exerts separate effects on task performance.

Naming During Encoding, Postencoding Description, and the Demands of the Final Memory Task

The present findings show that even though naming during encoding and postencoding description both involve verbalizations, they influence memory performance in qualitatively different ways. Verbalization, depending on its form, can increase the salience of either featural aspects (in the case of a postencoding description) or global aspects (in the case of naming during encoding) of the stimulus in memory. Further, our results provide strong evidence that these specific effects of verbalization are independent of the particular paradigm that is used (i.e., similar results were obtained across both featural imagery and recognition tasks in Experiments 1 and 2). These results imply that the effects of verbalization are not dependent on the type of memory test per se (i.e., imagery or recognition) but on the specific demands made by the memory test (global vs. featural).

Importantly, these findings are the first to identify a role for verbalization in influencing the use of *different types* of visuospatial information (featural or global) when applied to the same memory task (i.e., visual recognition or visual imagery) and using the same stimuli. Moreover, we have shown that despite resulting from qualitatively different mechanisms, the findings that have arisen from these two different types of verbalization can be explained using a single general principle: Detrimental effects of verbalization occur (do not occur or can be reversed) when verbalization induces operations (global or featural) that mismatch (or match) the demands (i.e., featural or global) of the final memory test. Hard-to-name forms already invite featural processing and so yielded high performance in the feature-based tasks, but low performance in the global-based task. Adding a postencoding description that also invokes featural processing therefore did not further affect performance for hard-to-name shapes: Performance remained high on the feature-based test and low on the global-based test. Easy-to-name forms invite more global processing and hence yielded low performance in the feature-based tasks. In this case, adding a postencoding description that invokes featural processing better matched the demands of the final memory test, and so led to an increase in performance. In contrast, as easy-to-name forms invite more global processing, they yielded high performance in the global-based task. Here, adding a postencoding description that invokes featural processing mismatched the demands of the final memory test and led to a reduction in performance. These findings fit previous research that has similarly highlighted the importance of the match between encoding and retrieval operations for determining subsequent retrieval performance (e.g., transfer-appropriate processing, Morris, Bransford, & Franks, 1977; or material appropriate processing, Einstein, McDaniel, Owen, & Cote, 1990; Thomas & McDaniel, 2007).

Although we have been successful in directly comparing the methods for eliciting verbalization previously applied within the imagery and recognition domains (i.e., covert naming during encoding and postencoding description), it is not yet clear whether the difference between these two types of verbalization is attributable to the nature of verbalization (naming vs. description) or its timing (during or postencoding). Nevertheless, previous research indirectly speaks to this issue. For example, when using hard-to-name shapes, both self-generating names postencoding and providing experimenter-generated labels at the time of encoding have been shown to impair subsequent imagery performance (e.g., Brandimonte & Collina, 2008). Thus, it seems likely that the effects of naming observed in the present experiments are due to the act of naming rather than more broadly to its placement during encoding. With regards to a postencoding description, if we assume a description emphasizes featural information about the stimulus, then the act of describing in general (whether during encoding or postencoding) may prove useful for subsequent performance on feature-based tasks, but be less useful for global-based tasks. Indeed, work by Nakabayashi, Burton, Brandimonte, and Lloyd-Jones (2012) has shown that overtly describing a series of objects (i.e., buildings) during their encoding to benefit their subsequent discrimination from among previously unseen objects in an old/new recognition task. In comparison, describing faces did not help subsequent recognition. It was suggested that in the context of this procedure, objects compared with faces were more readily discriminated on the basis of their basic features. On this assumption, it is plausible that object recognition would benefit from a description task during encoding that emphasized featural information.

Processing Versus Representational Accounts

Past research has provided evidence to show that a mismatch between verbal and nonverbal knowledge may apply due to different mechanisms. Verbalization may result in a shift between different processing styles (i.e., a transfer-inappropriate processing shift account; Brown & Lloyd-Jones, 2002, 2003; Schooler, 2002; for a review, see Chin & Schooler, 2008), visual representations (i.e., a retrieval-based interference account; e.g., Brandimonte & Collina, 2008; Meissner et al., 2001; Schooler & Engstler-Schooler, 1990), or response bias criterions (Clare & Lewandowsky, 2004). Due to the nature of the recognition memory tests we used, a shift in response criterion account cannot apply: Participants were forced to identify the target form from the recognition test, and this removed the opportunity to observe changes in response bias (cf. Chin & Schooler, 2008). Instead, there is evidence that accounts involving shifts in representations or processes may both apply.

Some researchers have suggested that accounts focusing on visual representations, on the one hand, and visual processing, on the other, may both be relevant, but under different circumstances (see Meissner et al., 2008; Walker, Blake, & Bremner, 2008). Critically, our results indicate that verbal overshadowing effects that can be explained through either representational or processing accounts may be derived from within the same paradigm. The effects of naming during encoding are consistent with an account whereby naming leads to conflicting representations that emphasize different aspects of the stimulus, in this case, global over featural information. The negative effects due to naming on feature-based tasks were removed by adding a postencoding description. These results do not fit with a transfer-inappropriate processing account: If verbalization per se results in a shift in processing style, then naming during encoding should have influenced how items were perceived during encoding. It is clear, however, that naming did not prevent a representation that contained high-level featural information from being originally encoded. Instead, we propose that during encoding, the covert spontaneous naming of easy-to-name shapes led to the formation of a new global visual representation. Importantly, this does not preclude the encoding of high-level feature information. Instead, this featural information becomes less accessible due to participants' reliance on the alternative newly formed global representation in memory.

In contrast, the effects of a postencoding description are not consistent with a retrieval-based interference account. On this account, a new verbally biased memory representation would be formed, the quality of which should be related to memory performance. Even though a postencoding description may parse the visual form into its relevant parts, it should nonetheless fail to adequately capture the high-spatial resolution detail necessary for successful completion of a feature-based memory task (see Brandimonte & Collina, 2008, for a discussion). On this basis, we would have expected that adding a postencoding description would impair performance for both hard-to-name and easy-to-name forms on the feature-based tasks. However, this was not the case: For hard-to-name forms, memory performance remained just as high with or without the addition of the postencoding description task, and for easy-to-name forms, where performance in the no-description condition was initially low, adding a postencoding description actually improved performance. Further, when testing directly for a relationship between description quality and memory performance in Experiment 1, no such relationship was found. In addition, more generally, we may have expected group differences in description quality to be reflected in participants' memory performance. Across the three experiments, we found that hard-to-name forms consistently elicited poorer quality descriptions than easy-to-name forms (i.e., descriptions were judged to contain fewer specific details that match the stimulus[5]). However, memory performance was not found to differ between participants describing easy-to-name versus hard-to-name forms in any of the experiments. Taken together, these findings are less consistent with a retrieval-based interference account that posits a relationship between the quality of the contents of the description and memory performance.

Much previous research has focused on the face recognition domain, in which eliciting a postencoding description has been strongly associated with featural processing (e.g., Chin & Schooler, 2008; Schooler, 2002). Our findings similarly support the role of postencoding descriptions in emphasizing featural information, despite having specified a different role for naming during encoding. We argue that a postencoding description facilitates access at test to a high-resolution featural representation. Engaging in a postencoding description encouraged participants to apply a featural style of processing. This revived specific features of the easy-to-name forms that had been originally encoded in memory but that had become less accessible due to the emphasis placed on global analysis encouraged by naming during encoding. This led to improved performance on the feature-based tasks, but interfered with performance on the global-based task. Given our assumption that postencoding descriptions encourage a shift from a global to a featural processing style, we envisage a potential boundary condition will apply to this effect. In the present experiments, participants undertook the postencoding description immediately prior to the final memory test, but it is likely that an emphasis on featural processing will subside with time or due to other intervening activities; thus, the effects of a postencoding description observed here may be short lived (cf. Chin & Schooler, 2008; Lloyd-Jones & Brown, 2008).

Finally, we note that recent data by Nakabayashi et al. (2012) within the recognition domain has given rise to an alternative view of the transfer-inappropriate processing shift account. They suggest that a postencoding description encouraged a shift from visual to semantic processing that then carried on to their recognition test. Although this account may be appropriate for the recognition data presented by Nakabayashi et al. (2012), our data do not comply. A postencoding description benefited visual memory on both imagery and recognition tasks that required veridical access to visual representations stored in memory (i.e., Experiments 1 and 2). This benefit would not be expected if verbalization had emphasized the use of semantic processing at test.

In light of the different theoretical explanations and findings found within the literature, our data makes an important contribution in that it clarifies the premise that verbal overshadowing is unlikely to consist of a single unified phenomenon; instead, there may be multiple types of verbal overshadowing. First, by including both naming during encoding and postencoding description within the same paradigm, we have obtained convincing evidence that verbalization, depending on its precise nature, can influence access to global or featural visual information in memory. Second, our data implies that this may take place through either a shift in the application of different visual representations or a shift in the application of different visual processing styles. The present results are important as they imply that continued attempts at un-

[5] Across all three experiments, hard-to-name, compared with easy-to-name, forms scored significantly lower on the description quality measure: Experiment 1 (image transformation), a mean rating for easy-to-name forms of 2.18 (SD = .81) and hard-to-name forms of 1.36 (SD = .60), $t(38) = 3.67$, $p = .001$. Experiment 2 (featural recognition), a mean rating for easy-to-name forms of 1.40 (SD = .59) and hard-to-name forms of .52 (SD = .57), $t(38) = 4.76$, $p < .001$. Experiment 3 (global recognition), a mean rating for easy-to-name forms of 1.12 (SD = 1.02) and hard-to-name forms of .34 (SD = .35), $t(38) = 3.24$, $p < .005$.

derstanding verbal overshadowing as caused by either retrieval-based interference or a transfer-inappropriate processing shift may be misleading. Rather, our results indicate that in order to bridge the gap between the different results arising in the literature, it is time to move beyond these lower level explanations toward a higher level multiprocess view that incorporates the global/featural aspects of the relationship between language and thought.

A Multiprocess View of the Effects of Verbalization on Visual Memory

Verbalization has sometimes been found to hinder, have no effect on, or aid memory performance. Previous work has provided evidence for verbalization influencing visual recognition in a flexible manner, depending on task constraints. For example, Lupyan (2008) found that explicitly naming familiar objects impaired participants' later ability to recognize objects typical of the category more so than atypical objects. Thus, the effects of naming on memory performance may depend on the nature of the memory task and factors such as the nameability, familiarity, and typicality of the stimuli. Extending earlier work by Wickham and Swift (2006), Nakabayashi et al. (2012) in two experiments asked participants to encode many stimuli, faces or buildings (depending on the experiment), while they engaged in articulatory suppression or overtly described the stimuli as they appeared. Articulatory suppression interfered with the subsequent recognition of faces, but not buildings, implying that covert spontaneous verbalization was helping later memory for faces, but not buildings. In contrast, overt descriptions benefited the recognition of buildings, but not faces. Two further experiments showed that providing a postencoding description impaired recognition of previously seen unfamiliar, but not familiar, faces and buildings. Thus, across four experiments, verbalization was shown to exert different effects on memory performance, depending on its timing (during encoding or postencoding) and nature (covert or overt descriptions), and these effects were modulated by the nature of the stimuli (faces or objects that were familiar or unfamiliar) and, by implication, the constraints of the recognition task.

Our results are important in consolidating and extending these conclusions. They support the view that verbalization can influence memory performance in a flexible way. We have demonstrated that different forms of verbalization (i.e., naming during encoding and postencoding description) act to influence memory performance in qualitatively different ways (i.e., by the application of global vs. featural operations). Nevertheless, despite the application of qualitatively different mechanisms, a common principle applies: A detrimental (or beneficial) outcome will arise when there is a mismatch (or match) between the operations demanded by verbalization (e.g., emphasizing featural or global information) and the final memory test (i.e., requiring global or featural analysis).

We have focused here on the distinction between featural/global visual information; however, previous research has shown that the featural/global distinction applies more broadly to visual and semantic information as well as to changes in decision criterion. For example, Förster, Liberman, and Shapira (2009) showed that priming participants to view an event as novel facilitated the use of global information on a subsequent unrelated task (e.g., identifying global vs. featural Navon letters), whereas priming them to view an event as familiar facilitated the use of featural information. Further, these effects extended to higher level semantic categorization and decision-making tasks, indicating that global versus featural perception may be implicated in higher level cognitive processing. Verbalization similarly influences performance across perceptual tasks (e.g., recognition and imagery) and higher level cognitive tasks (e.g., problem solving, Schooler et al., 1993; applying a decision criterion, Clare & Lewandowsky, 2004). It may be that verbalization systematically elicits a global or featural orientation and that this provides a higher level explanation that can encompass previously posited lower level explanations of how verbalization influences visual memory (e.g., representational and processing shift accounts). For example, we may conceptualize a framework whereby the featural/global distinction more broadly encompasses both visual and semantic information. Verbalization, depending on its form, may encourage a shift in emphasis between specific visual information versus prototypical or meaning-based information about a stimulus (e.g., Nakabayashi et al., 2012), or it may lead to a shift in emphasis between featural and global visual information (e.g., Brandimonte & Collina, 2008). It remains to be seen whether verbalization is one example of a general set of variables that can influence higher level cognition in this way or whether language in its various forms has a unique role in shaping cognition. Currently, our results indicate that it is the flexibility attributed to verbalization effects that is likely to play a key role in reconciling previous findings in the literature.

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