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The Influence of Test-Set Similarity in Verbal Overshadowing

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SUMMARY

The verbal overshadowing effect is the phenomenon in which describing a previously seen face impairs its recognition (Schooler and Engstler-Schooler, 1990). The primary purpose of this research was to investigate how the similarity between a target and distractors influences verbal overshadowing. In order to manipulate test-set similarity, we blended the faces of different people by using morphing techniques. As a result, verbal overshadowing was found when test-set similarity was relatively high, while the effect was not evident when there was a lesser degree of similarity. The results suggest that replicating the emergence of the verbal overshadowing effect depends on test-set similarity. The implications of these findings for research and practice are discussed. Copyright © 2002 John Wiley & Sons, Ltd.

In criminal investigations, obtaining a thorough description of the perpetrator of a crime is often crucial to the investigation, because it is believed to assist officers in quickly identifying and apprehending a suspect (Meissner *et al.*, 2001). Do such descriptions really assist in the identification of a suspect? Recent research suggests, on the contrary, that such descriptions can disrupt subsequent identification performance. For example, Schooler and Engstler-Schooler (1990) initially showed participants a video of a bank robbery for 30 s, and subsequently directed half of the participants to describe the appearance of the robber and the other half to complete a filler activity. All the participants were then given a recognition test that included photos of the target face and seven distractor faces of similar appearance. The participants who had described the face were less accurate in choosing the target face than the participants who had not described it; that is, a verbal description impaired the subsequent identification of a target face. They termed this phenomenon *verbal overshadowing*.

Since Schooler and Engstler-Schooler (1990) discovered that verbalization disrupted subsequent face recognition, a number of studies have replicated their results (Ryan and Schooler, poster presentation at the annual meeting of the American Psychological Society, New York, 1995; Fallshore and Schooler, 1995; Schooler *et al.*, 1996; Westerman and Larsen, 1997; Dodson *et al.*, 1997; Finger and Pezdek, 1999; Meissner *et al.*, 2001). However, several other studies seeking to replicate this phenomenon have proven unsuccessful (Lindsay, personal communication, cited in Schooler *et al.*, 1990; Lovett

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et al., presentation at the annual meeting of the Psychonomic Society, St. Louis, 1992; Yu and Geiselman, 1993; Itoh, poster presentation at the 12th meeting of the Japanese Cognitive Science Society, Tokyo, 1994, poster presentation at the 13th meeting of the Japanese Cognitive Science Society, Tokyo, 1995, poster presentation at the 61st meeting of the Japanese Psychological Association, Hyogo, 1997; Meissner *et al.*, 2001; Memon *et al.*, 1999—unpublished manuscript cited in Meissner and Brigham, 2001; Tunniclif and Clark, 1999—unpublished raw data cited in Meissner and Brigham, 2001). Moreover, some studies have demonstrated that verbalization has positive rather than negative effects on face recognition (Chance and Goldstein, 1976; McKlelvie, 1976; Read, 1979; Mauldin and Laughery, 1981; Wogalter, 1991, 1996; Itoh, 1994, 1995). In summary, a number of studies have failed to replicate verbal overshadowing, whereas other studies have replicated it successfully. We ask why these discrepant results have occurred.

In the literature of recognition memory, it has been pointed out that recognition performance can be affected by the degree of similarity between the target and distractors; that is, test-set similarity (Tulving, 1981). This has already been demonstrated in many studies using non-verbal stimuli (e.g. Wyant *et al.*, 1972; Bower and Glass, 1976; Jörg and Hörmann, 1978; Weaver and Stanny, 1978; Nagae, 1980). In general, recognition performance is inversely related to the level of similarity of the test-set.

Given the impact of test-set similarity on memory performance, it would be plausible for this to be the cause of the inconsistency of replication in verbal overshadowing studies. Wells (1988) pointed out that the reliability of the identification of a suspect in a line-up might depend on the degree of similarity between the target and distractors. However, no previous research on verbal overshadowing has systematically investigated this problem. Indeed, none of the published reports includes samples of the stimuli used; they only describe the distractors as 'verbally similar faces'.

The main objective of this research was to investigate whether manipulating test-set similarity affected verbal overshadowing. If verbal overshadowing is based on the similarity between a target and distractors, this effect should be obtained either only when test-set similarity is relatively high, or only when it is relatively low. By contrast, if verbal overshadowing is not related to test-set similarity, then this effect should be obtained regardless of differences in the similarity of the test sets.

In order to examine this, we used a new technique for manipulating test-set similarity, that of blending or morphing the faces of different people (see Figure 1). The average face (Face A) was generated from the faces of eight males (Faces I1–I8) and was then morphed with each of the individual faces to create eight composite faces that were used as a target or as distractors. Test-set similarity was manipulated by varying the proportions of the average and individual faces; 80% composites are more similar to each other than are 40% composites, since they contain a larger proportion of a common component. In this study, we used one 60% composite (Face T) as the target, and either seven 80% composites (Faces DH1–DH7) as distractors in the high-similarity condition, or seven 40% composites (Faces DL1–DL7) as distractors in the low-similarity condition. The target was placed between the two types of distractor so that the participants could not use differences in texture as a cue in the recognition task.

Another purpose of this research was to examine whether the quality of verbalization influenced verbal overshadowing. Which is important for verbal overshadowing, the act of describing or what is described? Some previous research has demonstrated that verbal overshadowing occurred even when participants described a non-target, such as a parent's face (Dodson *et al.*, 1997) or the appearance of a car (Westerman and Larsen, 1997). These

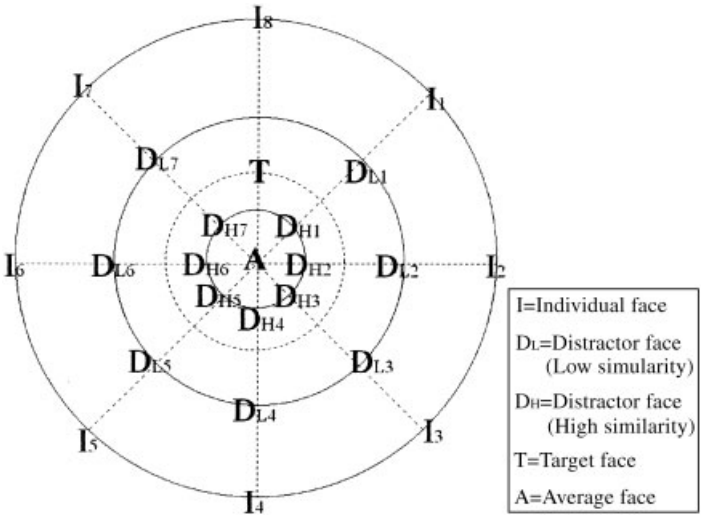

Figure 1. Schematic representation of the method used in this study to manipulate test-set similarity by blending an average face with an individual face in different proportions

results seem to indicate that the act of verbalization itself may be important for verbal overshadowing. To further examine this problem, we included another verbalization condition (impression condition), which differed from the standard verbalization condition (feature condition). Participants were asked to give their impressions of a face that they were shown, such as 'personality' or 'possible occupation'. If the act of making a description is important for verbal overshadowing, the same pattern of recognition performance should be seen for the impression and feature conditions. On the contrary, if what or how a participant describes a target is important, verbal overshadowing should be evident only in the feature condition.

METHOD

Participants and design

The participants were 167 undergraduates. A 2×3 between-subjects design was used to examine the influence of test-set similarity (high, low) and the effect of verbalization (feature, impression, control) on subsequent recognition performance.

Materials

The stimulus pictures are shown in Figure 2. The target and distractors were composite face images generated from the faces of eight Japanese males with a neutral expression. In order to manipulate the similarity of stimuli in the recognition test, a morphing technique was applied (cf. Rowland and Perrett, 1995). First, we created an average face image from these original eight faces by localizing 83 feature points on each image and then computing the average shape and grey-scale intensity information (for details on this technique, see Mukaida *et al.*, in press). Composite face images were then produced by

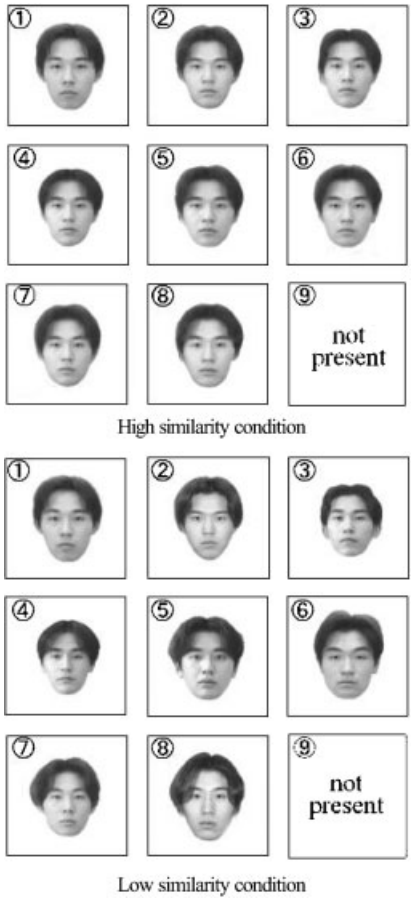

Figure 2. Target and distractors used in this research. The target was number 1 in each condition

blending each original face image and an average face, varying the proportion of two images to manipulate similarity. In this experiment, we used one '60% composite' image (i.e. 60% is from an average face and 40% is from an original face) as the target. In the high-similarity condition, seven 80% composites (i.e. 80% of the image is from an average face) were included as distractors and in the low-similarity condition, seven 40% composites were used as distractors. The 80% composites were more similar to each other than were the 40% composites because they shared a larger proportion from a common component (i.e. an average face). Since the blending methods make the skin texture of a composite image smoother than in the original pictures, we used a composite image as a target instead of an original face image in order to avoid making the difference of skin texture between the target and distractors a clue for recognition judgement. The similarity of the stimuli was established through a preliminary similarity-rating test, given to a different group of participants in the present research. Almost all the participants rated the features of each of the 80%-composite distractors as very similar to those of the target. Conversely, the features of each of the 40%-composite distractors were rated as very dissimilar to the target.

Procedure

The participants were tested in a group by using a five-page booklet. Page 1 was a cover sheet. Page 2 showed the target face used in the study. Page 3 was a response sheet with lines for the filler task. Page 4 was a response sheet, with lines for the description task in the verbalization condition, or for the listing task in the control condition. Page 5 showed the target and the seven distractors used in the recognition test. The participants were randomly assigned to one of six conditions: high or low similarity by feature, impression or control. All the participants were warned to turn the pages only when told to do so.

All the participants were told that they would be shown a face and should pay close attention to it. It was implied that they would later have to recognize the face from a lineup. They were then shown the target face for 10 s. The instructions for the participants in the verbalization conditions were identical to those of Meissner *et al.* (2001), in which participants were given a forced-recall instruction. A meta-analysis of verbal overshadowing (Meissner and Brigham, 2001) indicated that verbal overshadowing was more likely to occur when participants were given a forced recall instruction.

After viewing the face, they engaged in an unrelated filler task (crossword puzzles) for 5 min. Participants in the feature condition were then asked to describe physical features of the target face (e.g. big nose, thin lips) in as much detail as possible for 5 min, whereas participants in the impression condition were asked to give their impressions of the target face (e.g. personality traits and social stereotype). The control participants engaged in an unrelated verbal listing task for 5 min. The participants in the impression condition were given the following instructions:

> In the space below, please give your impressions of the face that you saw previously. Use the lines below to describe personality/occupation impressions (e.g. pleasant looking, a construction worker, etc.) you have about the face in as much detail as possible. Your description should enable someone else to identify the person from the description.

The following are a few random examples of actual impressions of the participants: diligent looking, intelligent looking, an undergraduate, a bank clerk, and so on.

Immediately following the description (or listing) task, all the participants were given a recognition test consisting of the target and seven distractors, and were asked to identify the target face. They were given as much time as they needed to choose the correct face. In addition, they were warned that the target might or might not be present, and were given the option of not selecting a face from the lineup. After making a choice, they were asked to indicate their confidence in their choice on a scale from 1 (guessing) to 9 (certain). The position of the target face was counterbalanced across participants.

RESULTS

Recognition accuracy

Table 1 lists the mean percentage of correct recognition and a combined recognition/confidence score as a function of test-set similarity and verbalization. This combined score, which ranges from 1 to 6, reflects the confidence and accuracy of the participants (Dodson *et al.*, 1997). The combined score was computed in the following manner (the indicated level of confidence is in parentheses): if participants made an *incorrect*

Table 1. Recognition and recognition weighted by the confidence scores

		Percentage correct Recognition	Recognition × confidence Scores
High similarity			
Feature	($n = 29$)	35	2.93 (1.53)
Impression	($n = 28$)	32	3.04 (1.48)
Control	($n = 26$)	69	4.42 (1.31)
Low similarity			
Feature	($n = 28$)	68	4.39 (1.86)
Impression	($n = 25$)	76	4.60 (1.74)
Control	($n = 27$)	82	4.85 (1.60)

Note: The S.D. is in parentheses.

judgement (miss or F.A.) score = 1 (confidence 7, 8, 9), score = 2 (confidence 4, 5, 6), score = 3 (confidence 1, 2, 3); if participants made a *correct* judgement (hit), score = 4 (confidence 1, 2, 3), score = 5 (confidence 4, 5, 6), score = 6 (confidence 7, 8, 9). Although the combination score and the proportion of correct recognition showed the same general pattern, as seen in Table 1, group differences were more apparent statistically with the combination score. Therefore, that measure was used in the following analyses.

First, we tested whether the type of verbalization (feature or impression) influenced recognition performance, using a two-way analysis of variance that examined test-set similarity (high or low similarity) and verbalization (feature or impression) as between-subjects factors. There was no main effect of verbalization ($F(1, 106) = 0.67$, n.s.) and no interaction ($F(1, 106) = 0.72$, n.s.). Therefore, the data from the feature and impression conditions were combined as the verbalization condition and compared with the control condition.

To investigate the effect of verbalization, a two-way analysis of variance examined test-set similarity (high or low similarity) and verbalization (verbalization or control) as between-subjects factors. The main effects of test-set similarity ($F(1, 159) = 11.09$, $p < 0.001$), verbalization ($F(1, 159) = 12.81$, $p < 0.001$), and their interaction ($F(1, 159) = 3.98$, $p < 0.048$) were significant. These results indicate that the effect of verbalization in the high-similarity condition ($F(1, 159) = 14.18$, $p < 0.001$) was not apparent in the low-similarity condition ($F(1, 159) = 0.89$, n.s.), and that the effect of test-set similarity in the verbalization condition ($F(1, 159) = 15.54$, $p < 0.001$) was not apparent in the control condition ($F(1, 159) = 1.26$, n.s.). These results show that verbal overshadowing was obtained in the high-similarity condition, but not in the low-similarity condition (Figure 3).

Description quality

Participants' descriptions were analysed to reveal whether the quality of the participants' description influenced recognition accuracy.

First, two independent coders examined each description for the number of correct, incorrect, and subjective details (cf. Finger and Pezdek, 1999; Meissner *et al.*, 2001). Subjective details were details describing ambiguous features or the target face's personality or potential occupation. The inter–rater reliability was sufficient (correct details, $r = 0.97$; incorrect details, $r = 0.88$; subjective details, $r = 0.96$). For each

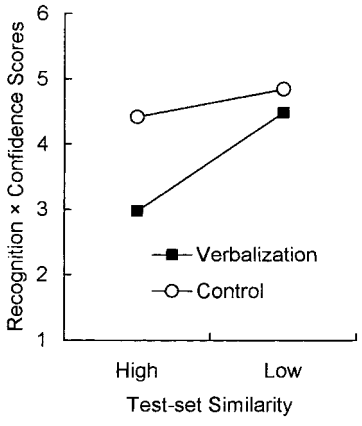

Figure 3. Recognition weighted by the confidence scores. The data from the feature and impression conditions were combined as the verbalization condition

participant, an estimate was obtained by averaging the coders' ratings within each category. Table 2 lists the number of correct, incorrect, and subjective details generated.

Table 3 shows the number of correct, incorrect, and subjective details as a function of the type of verbalization. We posited that the type of verbalization (feature or impression) would affect the quality of the subsequent description. A one-way ANOVA indicated that participants in the feature condition generated significantly more correct and incorrect details than participants in the impression condition, while participants in the impression condition generated significantly more subjective details than participants in the feature condition ($F(1, 108) = 42.54$, $p < 0.001$; $F(1, 108) = 17.24$, $p < 0.001$; $F(1, 108) = 47.22$, $p < 0.001$, respectively), confirming that manipulation of the type of verbalization significantly influenced the overall description quality.

Table 2. Mean correct, incorrect, and subjective details generated as a function of the recognition responses

	Correct		Incorrect		Subjective		Sum	
	n	*M*	*S.D.*	*M*	*S.D.*	*M*	*S.D.*	*M*
Hit	57	**3.23**	2.67	**0.62**	0.71	**3.74**	3.16	**7.59**
Miss	20	**2.40**	2.32	**0.45**	0.81	**3.98**	3.56	**6.83**
F.A.	33	**3.97**	3.00	**0.67**	0.92	**3.21**	2.97	**7.85**

Table 3. Mean correct, incorrect, and subjective details generated as a function of the type of verbalization

	Feature ($n = 57$)		Impression ($n = 53$)	
	M	*S.D.*	*M*	*S.D.*
Correct	**4.70**	2.42	**1.79**	2.25
Incorrect	**0.89**	0.83	**0.30**	0.62
Subjective	**1.95**	2.12	**5.42**	3.13
Sum	**7.54**		**7.52**	

A discriminant analysis was performed to determine whether the participants' descriptions (the number of correct, incorrect, or subjective details) were predictive of the accuracy in the recognition task (hit, miss, or F.A.). Two discriminant functions were calculated, but there was no significant associations were shown for the combination of both discriminant functions ($\chi^2(6) = 4.49$, n.s.). In addition, to test whether recognition accuracy was related to the participants' descriptions, a one-way ANOVA was conducted for each type of description. The results presented in Table 4 show that differences in recognition accuracy had no significant relationship with the number of correct, incorrect, or subjective details ($Fs(2, 107) = 2.12$, 0.50, and 0.43, respectively; all n.s.). In summary, these results do not indicate that the quality of the participants' descriptions influenced recognition accuracy.[1]

DISCUSSION

Our findings show that test-set similarity affects the verbal overshadowing effect. Verbal overshadowing occurred in the high-similarity condition, but not in the low-similarity condition. These results indicate that success or failure in replicating verbal overshadowing in previous studies may have resulted from differences in test-set similarity, since replication of verbal overshadowing is only successful when test-set similarity is relatively high. Related evidence of test-set similarity can be seen in studies by Itoh (1995, 1997). In 1995, Itoh demonstrated the positive effect of verbalization. In 1997, Itoh changed the test-set to enhance its similarity, and investigated whether the similarity of the test-set influenced the effect of verbalization. In this test-set, the hairstyle and facial outline of each distractor were altered to resemble those of the target using a composition technique. As a result, the positive effect that Itoh had demonstrated previously (Itoh, 1995), did not occur.

The present results also showed the same pattern of recognition performance for the impression and feature conditions. In addition, the quality of a participant's description did not influence recognition judgement. Therefore, for verbal overshadowing to occur, it seems to be crucial that participants make a description, but what they describe is not important. This result is consistent with previous studies that showed no relationship between description quality and recognition accuracy (Schooler and Engstler-Schooler, 1990; Fallshore and Schooler, 1995), though an inconsistent result has also been reported (Meissner *et al.*, 2001).

The present findings have some implications for theoretical accounts of verbal overshadowing. Previously, two major theoretical explanations have been proposed in the literature. One is the *recoding interference theory* that was originally proposed by Schooler and Engstler-Schooler (1990). This theory suggests that verbal overshadowing is due to the non-veridical verbal code of the target stimulus. The current results showed no relationship between description quality and recognition accuracy, and hence do not

[1]To determine whether the participants' descriptions have discriminative power, we provided new participants ($n = 110$) with the descriptions generated by the original participants, and ask them to pick out the target solely on the basis of the descriptions. As a result, the identification rate for the participants with the description generated by the original participants who had correctly recognized the target (14.9% correct; 10 out of 67 participants) was not significantly different from one for the participants with the description generated by the original participants who had incorrectly recognized (15.1% correct; 8 out of 53 participants), ($\chi^2(1) = 0.0006$, n.s.). This result supports the results of the discriminant analysis, and also indicates that most of the descriptions made by original participants were useless for discriminating the target from distractor.

support recoding interference theory. The other explanation is the *transfer inappropriate retrieval* (TIR) theory of Schooler *et al.* (1997). According to this hypothesis, the disruptive effect is caused when verbalization orients participants to rely on verbalizable facial feature information (cf. Diamond and Carey, 1986), which is less useful for recognition than non-verbalizable configural information. Since the results do not directly support the TIR theory, further research is needed to investigate the validity of these theoretical accounts.

From the standpoint of applied issues associated with verbal overshadowing, our findings suggest that test-set similarity is crucial when organizing line-ups in eyewitness testimony. In their attempt to elucidate the conditions for a proper line-up Wells *et al.* (1994) also showed that differences in the similarity of the persons in the line-up had a profound effect on the accuracy of the identification of the suspect. Our results provide further evidence for the importance of line-up similarity in eyewitness testimony.

Before applying these results, the limitations of this study should also be noted. For example, because we systematically manipulated the distractor similarity by using a computer morphing method, this manipulation may not reflect real-world line-up situations properly. In addition, because we used only one target picture and controlled only two levels of test-set similarity, the exploration of the precise boundary condition remains insufficient. Furthermore, because the target face presented in the recognition test was identical to one presented in the study phase, the participants might have used pictorial cues rather than structural cues from the target face in the recognition test, which makes this an inappropriate simulation of a real line-up situation.

As reviewed earlier, contrary to the verbal overshadowing effect, several studies have demonstrated a positive effect of verbalization (Chance and Goldstein, 1976; McKlelvie, 1976; Read, 1979; Mauldin and Laughery, 1981; Wogalter, 1991, 1996; Itoh, 1994, 1995). These studies should not be ignored for the purpose of a comprehensive understanding of 'the power of verbalization' for visual memory. For example, Kitagami (2000) showed that differences in test-set similarity led to verbalization having both positive and negative effects in picture recognition. This research suggests that the effect of verbalization is not always positive or negative for visual memory, and that the value of verbalization varies with experimental conditions. Therefore, in verbal overshadowing studies, it is not surprising that test-set similarity plays a boundary role determining when the verbal overshadowing effect emerges. In order to explain the inconsistencies among the results obtained in previous verbal overshadowing research, a full examination of the boundary conditions of the positive and negative effects of verbalization is needed.

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