Face Recognition: Effects of Study to Test Maintenance and Change of Photographic Mode and Pose

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SUMMARY

Facial recognition performance was examined as a function of changes in the target between initial exposure (study) and a subsequent recognition test. Photographic mode (colour vs. black and white) was changed in Experiments 1 and 2 and pose (front vs. profile) was changed in Experiment 2. The predictions of three information quantity models and of encoding specificity were contrasted. The information hypotheses predict that colour photographs will be better recognized when presented in colour than in black and white; the more specific predictions differ depending on the modes at study and test. Encoding specificity predicts recognition performance will be better when study and test modes are the same. The results of Experiment 1 showed that performance was highest when pictures remained in the same mode from study to test, and decreased when the mode was changed. Change of mode was particularly detrimental when the faces were studied in black and white and tested in colour. Experiment 2 showed a pattern of results also in accord with encoding specificity. The photographic mode and pose effects did not interact. Change of pose had a greater effect than change of photographic mode. Experiment 2 did not replicate the transformation asymmetry found in Experiment 1. The results indicate that for facial recognition memory, change lowers recognition, but the magnitude of the effect depends on the kind of change.

An important factor in criminal investigations and judicial testimony is the identification of suspects by witnesses. Following a crime the witness often attempts to identify the suspect by examining a series of 'mug shots'. One practical question is whether using colour photographs in the task produces better facial identification performance than black and white (B&W) mug shots. Viewing the face of a live assailant usually involves colour cues, and colour photographs at test may produce higher recognition than B&W because of a greater overlap of cues. Similarly, it might be assumed that the more information available about potential suspects at the test stage, the better recognition performance will be. In other words, identification accuracy is at least partly a function of information available at test.

Research has been reported that addressed some of these issues. Shepherd, Ellis and Davies (1982) exposed subjects to target faces that were presented either live, in colour video, in multiple colour photographs, or in multiple B&W photographs. Subjects were tested 2 weeks later with line-ups of live, video, colour photographs, or B&W photographs. Exposure to live presentations at study led to better overall identification

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performance than the other modes. There was no reliable effect of mode of line-up at test, nor a reliable interaction of study to test mode. However, the results did show a trend for a change of mode from exposure to test to result in lower confidence ratings, though this pattern was not so clearly shown for percentage correct scores. These results, in part, support those of Egan, Pittner and Goldstein (1977), who found that faces seen live at study are better recognized when presented live at test than faces presented as photographs at test.

Other related research has focused primarily on manipulating photographic media at test while holding study conditions constant. Sussman, Sugarman and Zavala (1972) showed subjects a film depicting an event in a department store, and upon its completion subjects were asked to remember one of the characters. The test consisted of a series of 33 individuals depicted either (1) in B&W video-tape sequences, (2) in colour slide pairs, or (3) in B&W slide pairs. The results indicated that B&W video sequences produced better identification performance than colour slides, and that these media were better compared to B&W slides. Sussman *et al.* (1972) concluded that adding information at test (e.g. the dimension of colour) aids identification.

However, results have also been reported showing no mode effects. Laughery, Alexander and Lane (1971) and Laughery (1972) examined whether recognition performance would be enhanced by the use of colour compared to B&W photographs at test. The results showed almost exactly the same performance in both photographic mode conditions.

Thus, previous results comparing colour vs. B&W photographs as the *test* media have been equivocal. These studies do not tell the whole story, however. As suggested by Shepherd *et al.* (1982), it should not be assumed that facial identification materials that produce good recognition performance in some situations will be best in all situations. Perhaps the choice of test materials should depend on the viewing conditions at study. Most facial recognition research provides optimal conditions where subjects can gain a good clear look at the target at study. Whether a witness to a crime gains a good clear look at a real-world assailant may depend on many variables (e.g. the lighting present at the crime scene, the witness's viewing perspective—among others).

The present research examines the effects of changes in target faces between initial exposure (study) and subsequent recognition (test). Specifically, the effects of change of photographic mode (colour vs. B&W) are examined in Experiments 1 and 2 and of pose (front vs. profile) in Experiment 2.

The outcome of this research also has theoretical interest. One theoretical orientation concerns the amount of information and the other encoding specificity. Three amounts of information hypotheses are generated, depending on the locus of information: the total amount of information hypothesis, the amount of information at test hypothesis, and the amount of information at study hypothesis. The *total amount of information* hypothesis predicts that the greater the amount of information at both study and test the better the identification performance. Specific to the present experiment, the hypothesis would predict that better facial identification performance would be produced by colour photographs than by B&W photographs. In addition, it would predict no difference between the two conditions where transformations occur between study and test (colour to B&W and B&W to colour), because the total amount of information available is the same for these two conditions. The two transformation conditions should lead to performance which is intermediate between the colour to colour and B&W to B&W conditions.

As mentioned earlier, an assumption in forensic identification procedures has been that more retrieval cues or information at test enhances performance. The *amount of information at test* hypothesis predicts colour photographs at test would result in better performance than B&W photographs regardless of the study conditions.

The *amount of information at study* hypothesis makes a different prediction. Greater information at study should provide more information to work with in the identification task. Therefore, colour photographs should be better than B&W at study, regardless of test conditions.

The predictions of the information hypotheses conflict with *encoding specificity*. Encoding specificity states that the retrievability of an event depends on how similar the contextual cues at test are to the contextual cues at study (Tulving and Osler, 1968; Thomson and Tulving, 1970). Specifically, it predicts that maintenance of the same photographic mode (colour to colour and B&W to B&W) should produce better facial recognition performance than if the mode is changed. Encoding specificity says nothing about the effects of the absolute or total amount of information available at study or at test; rather it concerns the amount of information common to study and test. Thus it would not predict a difference between the two maintenance conditions or between the two transformation conditions.

EXPERIMENT 1

This experiment examines the effects of amount of information (colour vs. B&W photographs) presented at study and test on facial recognition. It addresses the following empirical questions which also relate to several theoretical issues. Are colour photographs better than B&W photographs generally, or will a modal difference be apparent only at study or only at test (the amount of information hypotheses)? Does performance at test depend on the study condition (the encoding specificity prediction)? Does the direction of the change (colour to B&W vs. B&W to colour) make a difference?

Method

Subjects

Thirty-six Rice University undergraduates participated voluntarily for extra credit in a psychology course.

Apparatus

Slides were projected at a size of 3 feet (1 m) square against a white wall with a Kodak Carousel projector. At study, slides were presented consecutively at a 2 second onset to onset rate with a constant .75 second slide transit time (off-time) between presentations. Thus, at study the actual presentation duration was 1.25 seconds per slide. At test, slides were presented at a 5 second onset to onset rate with an actual presentation of 4.25 seconds per slide.

Materials and stimuli

The B&W and colour slides were facial photographs taken simultaneously by using two cameras mounted side by side, one with B&W film and one with colour film. This procedure produced virtually identical B&W and colour portraits.

The slides were 35 mm B&W and Ektachrome transparencies of 72 light-skinned male Caucasians. Portraits having distinct hair styles, facial hair, glasses, clothing, and facial gestures were not included. The age range was 17–23 years, and all slides showed frontal bust views. Thirty-six slides were randomly selected for the study sequence. Of these 36, half were presented in B&W and the other half in colour.

Seventy-two slides were shown in the test sequence. Half of the test slides were faces from the study set and the other 36 were distractors. Half of the distractors were B&W and half were colour. Eighteen of the 36 targets in the test sequence appeared in the same mode (B&W or colour) as in the study sequence. The other 18 targets appeared in a reversed mode; that is, changing at test to B&W when studied in colour, and vice-versa.

Procedure

Subjects participated in groups of two to six. The projector was placed in the rear of the laboratory room which projected light onto a white wall at the front. The room contained a lamp at the rear to provide light for marking the response sheet.

Subjects were instructed to give their attention to each of the faces shown in the study sequence. They were told that they would be asked to recognize these persons on a subsequent recognition test. Immediately following the study sequence subjects performed an anagram task which served as a distractor activity lasting about 20 minutes. Upon completion of this activity, response sheets for the facial recognition test were distributed. Subject were told to mark their response sheet according to whether they remembered seeing each person earlier in the study sequence. Specifically, they were instructed to give a yes or no answer for each test photograph and to indicate their confidence on a three point scale where 1 = guessed, 2 = probably, or 3 = certain.

Results

Responses were transformed by assigning a score of 6 to Y3's, 5 to Y2's, 4 to Y1's, 3 to N1's, 2 to N2's, and 1 to N3's. A higher score indicates a greater confidence that the pictures were seen in the study sequence.

A 2 × 2 within-subjects ANOVA was applied to the data with study mode (colour vs. B&W) and test mode (colour vs. B&W) as factors. The mean recognition confidence scores as a function of colour vs B&W photographs at study and test are shown in the top row of each cell in Table 1. Recognition performance was significantly better when subjects studied colour photographs than when they studied B&W photographs, $F(1, 35) = 23.50$, $MS_e = .274, p < .0001$. Performance was better when subjects were tested with B&W photographs than with colour photographs, $F(1, 35) = 29.73$ $MS_e = .249, p < .0001$. However, the ANOVA also showed a highly significant interaction of study and test photographic mode conditions, $F(1, 35) = 57.301, MS_e = .331, p < .0001$. There was approximately equal recogniton performance when the photographic mode for study and test was maintained (colour to colour compared with B&W to B&W), $t(35) = .25$ $p > .05$. However, recognition performance decreased when the mode was switched from study to test (colour to B&W compared with colour to colour, $t(35) = 2.05, p < .05$, or B&W to colour compared with B&W to B&W, $t(35) = 9.72, p < .0001$). Comparing the two change conditions, B&W to colour produces a greater performance decrement than colour to B&W, $t(35) = 7.31, p < .0001$.

Table 1. Mean recognition as a function of colour vs. B&W facial photographs presented at study and test

		Test	
		Colour	B&W
Study			
Colour	Confidence	4.38	4.11
	(Percentage)	(72.2)	(63.9)
	d'	1.134	.823
B&W	Confidence	3.23	4.41
	(Percentage)	(42.6)	(70.4)
	d'	.247	1.027
Distractors/FA	Confidence	3.02	2.96
	(Percentage)	(34.5)	(35.0)

Confidence ratings for the distractor slides are shown on the second row from the bottom of Table 1. The rather high rate of false alarms is probably due to the fast presentation rate at study, which may have made it difficult for subjects to distinguish the targets from the distractors. However, with the exception of one comparison all target conditions produced confidence scores significantly greater than the distractors. The comparison between the B&W to colour targets and the colour distractors was only marginally significant, $t(35) = 1.96, p < .06$. The colour and B&W distractors did not significantly differ.

Percentage of targets correctly identified was determined for each condition. The means are shown in parentheses in the second row of the cells in Table 1. An analysis of these scores showed a pattern of results similar to that found with the recognition confidence measure.

A signal detection analysis was employed to examine sensitivity as expressed by d' scores from each subject's percentage correct scores. The d' means are shown in the third row of each cell in Table 1. Again, the results showed the same pattern of effects.

An analysis of variance using person-faces as the random variable was also carried out with the confidence data. This is a more conservative test than using subjects as the random variable. Individual subject scores were collapsed producing a mean confidence for each face. These data produce the same confidence means shown in Table 1. The ANOVA yielded a similiar pattern of effects, although there was only a marginally significant main effect of study mode, $F(1, 32) = 3.79$, $MS_e = .423$, $p = .06$. The effect of test mode, $F(1, 32) = 4.37$, $MS_e = .423$, $p < .05$, and the mode and study-test interaction, $F(1, 32) = 11.18$, $MS_e = .423$, $p < .01$, were statistically significant.

Discussion

The results indicate that studying and testing in the same mode yields higher recognition performance than mode changes. This result generally conforms to the prediction of encoding specificity. However, encoding specificity does not have any prediction regarding the difference between the two transformation conditions. These conditions showed an asymmetric pattern; a change from B&W to colour produced lower recognition than a change from colour to B&W. This result gives some support to the *amount of information at study* hypothesis, which predicts that having greater information at study produces better recognition. Moreover, the results do not support the *amount of information at test* hypothesis because greater information at test did not lead to better recognition. The *total amount of information* hypothesis was also not supported, for three reasons. First, it predicts that B&W to B&W would be lower than colour to colour which was not found. Second, it predicts no difference between the two transformation conditions but the results yielded a transformation asymmetry effect. Third, it predicts that B&W to B&W would produce lower performance than both transformation conditions because in the latter more total information is available; but this result was not found.

EXPERIMENT 2

Experiment 2 also examined the effects of photographic mode at study and test. In addition, a second transformation involving front and profile poses was introduced. The mode and pose transformations differ. Changing mode involves the addition or deletion of colour, which may involve clarity or amount of detail information. A pose change involves a different viewing perspective, which may involve a different kind of information.

Some research on pose transformations has been published. Krouse (1981) found when pose position (three-quarter and front) remains constant from study to test there is better recognition than if the pose is changed. Baddeley and Woodhead (1983) found that reinstating the same pose at study that was presented at test produces the best performance, transformations of 45 degrees were the next best, and changes of 90 degrees yielded the poorest performance. Some research has not yielded an effect of pose (e.g. Davies, Ellis and Shepherd, 1978; Laughery *et al.*, 1971; Laughery, 1972).

This experiment extends previous research by manipulating pose and photographic mode simultaneously. Some faces were transformed two ways from study to test (pose and mode), some were transformed one way (pose or mode), and some did not change. As noted earlier, the information hypotheses make certain predictions about the outcome. If the front pose contains more usable information than the profile, an asymmetric pattern similar to that found for mode in Experiment 1 might occur. Encoding specificity predicts better recognition when pose is maintained compared to when it is changed.

The experiment also addresses the relative effects of the two dimensions of change. Does a change in pose have a greater effect on recognition that a change in mode? Further, do the change dimensions interact or are their effects additive?

There has been some evidence for an interaction of two simultaneous transformations. Patterson and Baddeley (1977) found the addition of glasses alone had little effect on recognition accuracy, but the addition of glasses plus a change in orientation was particularly detrimental to recognition. Bruce (1982) has shown that changes in expression and pose interact, with a particularly large decrease in recognition when both changes were made.

Method

Subjects

Thirty-two Rice University undergraduates participated voluntarily for extra credit in a psychology course.

Apparatus

The slides were projected at a size of 3 feet (1 m) square onto a white wall of a small classroom. At study, slides were presented consecutively at a 2 second onset to onset rate with a presentation duration of 1.25 seconds. At test, slides were presented at an 8 second onset to onset rate with an actual presentation duration of 7.25 seconds.

Materials and stimuli

The slides were 35 mm B&W and Ektachrome transparencies of males about 20 years old. Two judges selected the set of 64 faces from a larger group, avoiding those having distinct hair styles, facial hair, clothing, and facial gestures. The faces used in this experiment were different from those used in Experiment 1. The present set contained a range of light-skin and dark-skin Caucasians with and without eyeglasses. Half of the faces were randomly selected to be targets and half were distractors such that these characteristics were distributed across the targets and the distractor faces. The slides contained (1) front views with parting of the hair consistently on the left side (the right side of the head from an onlooking view), and (2) right side profile views (facing towards the left from an observer's point of view). One half were colour and one half were B&W. For each face there were four slides: colour front, colour profile, B&W front, and B&W profile. Of the 32 slides shown in the study sequence, half were presented in B&W and the other half in colour, and half of each mode were profile or front. These conditions also held for the targets and distractors at test. Every person-face appeared an equal number of times in all 16 study-to-test conditions across subjects.

Procedure

The experiment was conducted in a small classroom with one or two subjects in each experimental session.

The experimenter instructed subjects to give their attention to each of the faces shown in the study slide sequence. Subjects were told that they would later be asked to recognize these faces in a memory test. They were told to study how each of the person-faces looked, and to ignore the exact quality or pose of the photograph.

In the interval immediately following the study sequence, subjects performed an interpolated anagram task which took about 20 minutes. They were then given recognition response sheets, and the experimenter read instructions about marking the sheets. Subjects were asked to indicate whether they had seen the face in the study sequence by responding yes or no to each test photograph, and to indicate their confidence on the three point scale.

Results

Recognition confidence scores for the target photographs were derived as in Experiment 1. A $2 \times 2 \times 2 \times 2$ within-subjects ANOVA was carried out. The factors were colour vs. B&W and front vs. profile at study crossed with colour vs. B&W and front vs. profile at test. The mean confidence scores for these conditions are shown on the top rows of each cell in Table 2. The ANOVA showed two significant effects. There was an interaction of B&W vs. colour with study vs. test, $F(1, 31) = 7.91$, $MS_e = 1.245$, $p < .01$. These means, shown in Table 3, indicate that recognition performance is higher when the photographic mode was maintained rather than changed from study to test.

Table 2. Mean recognition as a function picture and pose mode at study and at test

			Test			
			Front		Profile	
			Colour	B&W	Colour	B&W
Study						
Front	Colour	Confidence	4.50	4.03	3.53	3.23
		(Percentage)	(78.1)	(64.1)	(46.9)	(40.6)
	B&W	Confidence	4.16	4.75	3.34	3.48
		(Percentage)	(65.6)	(82.8)	(46.9)	(46.9)
Profile	Colour	Confidence	3.41	3.42	4.25	4.08
		(Percentage)	(48.4)	(45.3)	(68.7)	(64.1)
	B&W	Confidence	3.22	3.66	4.31	4.44
		(Percentage)	(48.4)	(53.1)	(70.3)	(71.9)
Distractors/FA		Confidence	2.88	2.88	2.86	3.31
		(Percentage)	(37.1)	(33.6)	(33.6)	(44.9)

Table 3. Mean recognition of pictures as a function of B&W vs. colour facial photographs at study and test

		Test	
		Colour	B&W
Study			
Colour	Confidence	3.92	3.69
	(Percentage)	(60.5)	(53.3)
B&W	Confidence	3.76	4.08
	(Percentage)	(57.8)	(63.7)

Further comparisons show that recognition performance was approximately equal between the two photographic mode maintenance conditions (colour to colour compared with B&W to B&W), $t(31) = 1.20, p > .05$. Recognition performance did not significantly decrease when the mode was changed after studying colour portraits (colour to B&W compared with colour to colour), $t(31) = 1.66, p > .05$. However, there was a reliable decrease in recognition performance when the mode was changed after studying B&W portraits (B&W to colour compared with B&W to B&W), $t(31)$

Table 4. Mean recognition of pictures as a function of front vs. profile facial photographs at study and test

		Test	
		Front	Profile
Study			
Front	Confidence	4.36	3.40
	(Percentage)	(72.7)	(45.3)
Profile	Confidence	3.43	4.27
	(Percentage)	(48.8)	(68.7)

$= 2.61, p < .02$. A comparison between the two photographic mode transformation conditions failed to yield a difference, $t(31) = .56, p > .05$.

The analyses of the recognition confidence scores also showed an interaction of pose with study vs. test, $F(1, 31) = 113.74$, $MS_e = .916$, $p < .0001$. The means in Table 4 show that maintenance of the same pose from study to test produced better recognition than if pose was changed. There was no difference between the two pose maintenance conditions (front to front compared with profile to profile), $t(31) = .54, p > .05$. However, recognition performance decreased when the pose was switched from study to test (front to profile compared with front to front), $t(31) = 6.00, p < .0001$, or profile to front compared with profile to profile, $t(31) = 5.46, p < .0001$. The two pose transformation conditions did not differ, $t(31) = .18, p > .05$.

The confidence scores for the distractor photographs indicate that subjects produced a rather high rate of false alarms, as was also the case in Experiment 1. Again this finding may have been due to the fast rate of presentation of the target slides at study, which in turn led to a lowered ability to distinguish the distractors from the targets. In spite of this relatively high rate of false alarms, comparisons of the target condition means with the appropriate distractor means showed that in all but two cases the targets were better recognized than the distractors. The two exceptions were colour front to B&W profile, and B&W front to B&W profile. Examination of the means shown along the bottom row of Table 2 indicates that the B&W profile distractors produced more false alarms than the other distractor conditions (p's $< .01$).

The results were also analysed in respect to percentage correct scores. The percentage correct means are shown in parentheses along the second row of each cell in Tables 2, 3 and 4. The pattern of results was similar to the confidence measure outcome. Specifically, the ANOVA produced an interaction of B&W vs. colour with study vs. test, $F(1, 31) = 5.36$, $MS_e = 992.79$, $p < .03$, as well as an interaction of pose with study vs. test, $F(1, 31) = 76.47$, $MS_e = 934.82$, $p < .0001$.

No signal detection analysis was performed on these data because of the small number of slides per condition per subject.

Recognition performace was also examined to compare the effects of photographic mode and pose changes. Table 5 shows the data arranged in this manner. An ANOVA using the recognition confidence scores showed a main effect of changing mode, $F(1, 31) = 7.91$, $MS_e = .311$, $p < .01$, and a main effect of changing pose, $F(1, 31)$

Table 5. Mean recognition as a function of photographic mode change and pose change

		Photographic mode	
		Change	No change
Pose			
Change	Confidence (Percentage)	3.30 (45.3)	3.52 (48.8)
No change	Confidence (Percentage)	4.14 (66.0)	4.48 (75.4)
Distractors/FA	Confidence (Percentage)		2.98 (37.3)

= 113.74, $MS_e = .229$, $p < .001$. Percentage correct scores showed similar results: for pose, $F(1, 31) = 76.47$, $MS_e = 233.7$, $p < .001$, and for photographic mode, $F(1, 31) = 5.36$, $MS_e = 248.2$, $p < .05$. No significant interaction was found with either confidence or percent correct scores (p's > .20). Changing pose clearly has a greater effect than a changing mode. When the face portraits involved two simultaneous changes at test, confidence scores were significantly lower compared to no change, $t(31) = 9.80$, $p = .0001$. Also, changing only mode significantly decreased recognition confidence, $t(31) = 2.73$, $p < .05$, as did changing only pose, $t(31) = 7.22$, $p < .0001$.

The greater effect of changing pose can be seen in other analyses. When comparing the two conditions where only a single change occurs, the pose effect is greater, $t(31) = 4.50$, $p < .0001$. When comparing the two simultaneous change conditions with each of the single change conditions, there is a significant drop in performance when making two changes compared to changing only the mode, $t\ (31) = 8.03$, $p < .0001$. However, there was no significant difference when making two changes compared to changing only the pose, $t(31) = 1.58$, $p > .05$.

Comparisons of the condition means in Table 5 to the mean scores for the distractors indicated that all target conditions yielded recognition performance beyond that given for new/distractor faces (p's < .01).

Discussion

The pattern of results again generally conformed to the encoding specificity predictions. Study and test in the same pose led to better recognition than when the pose was changed. A similar pattern was noted for the photographic mode manipulation with one exception. In support of encoding specificity, when the facial photographs were studied in B&W, testing in B&W yielded higher performance than testing in colour. However, when the photographs were studied in colour there was no significant difference between testing in colour or in B&W, though there was a trend for colour at test being somewhat better. No difference was found between the two pose maintenance conditions or between the two pose change conditions. The results also indicate that a pose change produces a greater effect than a photographic mode change. The two types of change did not interact.

The B&W profile distractors elicited a higher false alarm rate than the other kinds of distractors. This might be due to a different, more liberal criterion, but more likely is due to an inability to distinguish between faces in a B&W profile.

The asymmetry between the two transformation conditions observed in Experiment 1 was not observed in Experiment 2. It might be tempting to rule out the asymmetric effect in Experiment 1 as a fluke, but there are other results in the literature that seem consistent with it (e.g. Davies, 1983; Davies and Flin, 1984; Krouse, 1981; Sorce and Campos, 1974). Experiment 1 and other research suggest some tendency for conditions where fewer facial cues are seen at study than at test to produce lower recognition performance than conditions where more facial cues are seen at study than at test.

Why might this tendency be the case? Protocol records from previous research (Wogalter, 1983, 1984) offer a suggestion. Subjects were exposed to successively presented complex pictorial scenes for which pairs of pictures differed by additions and deletions of objects and patterns. Subjects noticed more pattern changes when they were added at test than if they were deleted. The protocols revealed that subjects often preceded their responses for pictures containing additions with comments such as 'I don't remember seeing. . . before'. An analogous situation might be considered here. A transformation from fewer facial cues at study than at test is similar to the condition in which pictorial information is added at test which may be more apt to be noticed as different from the previously seen face picture. Conversely, a transformation from greater facial cues at study than at test is similar to the condition where pictorial information is deleted, which may be less apt to be noticed as different from the previously seen face picture. This meta-memory explanation suggests that subjects may reject faces with new facial information at test because they feel that they would have noticed certain facial details before if they had been present in the study series.

GENERAL DISCUSSION

The encoding specificity principle predicts that effective retrieval at test is dependent upon the cues encoded at study. More specifically, it predicts maintaining cues between study and test will lead to better performance than if the cues are changed. The results support this prediction, although in Experiment 1 the manipulation of B&W vs. colour photographs at study and test yielded an asymmetric pattern between the change conditions. Recognition performance decreased to a greater extent when B&W photographs were studied and colour photographs were presented at test compared to when colour photographs were studied and B&W photographs were tested. In Experiment 2 a different asymmetric result was noted. When B&W photographs were studied, performance was higher with B&W photographs at test than with colour photographs at test. However, when colour photographs were studied there was no difference between testing with colour or B&W photographs. Thus, in both experiments where mode was changed, a decrement in performance was seen when greater facial cues were present at test relative to study.

The results of Experiment 2 showed that the pose manipulation produces a more powerful effect than the mode manipulation. A pose change involves a change in viewing perspective where different facial cues are seen, while a photographic mode transformation may involve only a change of clarity of the same view of the face. The reason for the effect might be that there is a greater loss of facial information when the pose is transformed.

Experiment 2 was also intended to examine whether the mode manipulation would interact with the pose manipulation. The results indicated the effects are additive. If a stage view of human information processing is adopted, this finding would indicate that these two transformations are processed separately. Further, the results seem consistent with the notion that stimulus quality (e.g. B&W vs. colour) primarily affects the encoding stage of processing, while information derived from facial pose may have effects at later stages.

At this point drawing strong generalizations about these results to the forensic context would be inappropriate without further experimentation using more forensically similar procedures. It should be noted, however, that the present findings do conform with a well-documented principle in human memory, encoding specificity; a principle which appears to hold in a variety of contexts. For this reason some modest speculation about the implications of these results seems in order. If most witness–criminal encounters involve seeing the person in live colour, and from different perspectives, then it seems appropriate to use colour photographs and perhaps multiple poses. If situations occur where colour cues may not be available, such as night viewing, B&W photographs may in fact lead to better identification than colour. More generally, law enforcement agencies would be well advised to take into account the similarities and differences in circumstances surrounding the initial exposure to the face and the subsequent identification task.

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