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Facial and pictorial recognition as a function of massed versus distributed presentation and imaging instructions

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Facial and Pictorial Recognition as a Function of Massed versus

Distributed Presentation and Imaging Instructions

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Master of Arts

University of Richmond

1989

Dr. Michael S. Wogalter, Thesis Director

Abstract


Beneficial effects of distributed practice and rehearsal on recognition has been demonstrated in numerous memory studies for verbal stimuli and manual skills. However, no research has been reported using non-verbal, pictorial stimuli. In addition, few studies have examined the effects of pictorial rehearsal. The present research examines the effects of massed versus distributed practice and post-exposure imaging on pictorial memory. The first and third experiments used faces while the second used plant stimuli. In general, the results showed beneficial effects for post-presentation imaging. Presentation mode produced complex effects, but generally supported the superiority of distributed presentation. The

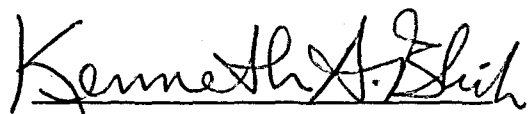
results of Experiment 3 also indicated that the effects of presentation mode and post-exposure task depend on whether the same or different view of the studied material is given at test and the kind of distractor task used. Implications for the improvement of visual-spatial memory using distributed presentation and post-exposure imaging are discussed.

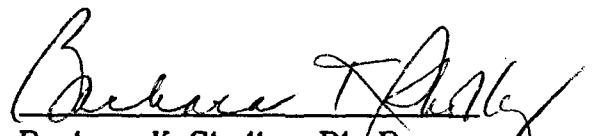
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Distributed Presentation and Imaging Instructions

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FACIAL AND PICTORIAL RECOGNITION AS A FUNCTION OF MASSED
VERSUS DISTRIBUTED PRESENTATION AND IMAGING
INSTRUCTIONS

By

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B. A. , Emory University, 1985

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This thesis is dedicated to my parents, Peggy and Allie Cayard. With all my love . . .

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Facial and Pictorial Recognition as a Function of Massed versus Distributed Presentation and Imaging Instructions

Facial memory is an important topic for research not only because it is essential for orderly, everyday social functioning but also because of its relevance to such specialized endeavors as eyewitness identification. Facial memory studies are valuable not only for their contributions to forensic psychology but also because such studies help researchers understand the ways recognition of complex visual stimuli might be improved. For example, police officers are typically shown pictures of wanted persons during roll call. Despite the fact that the "mug shots" are often several years old and that the officers usually see the person's face only once, they are nevertheless expected to recognize (and apprehend) the suspect on sight. How might such police officers improve their ability to recognize faces? Furthermore, how might convenience store cashiers (who are often targets for robberies) improve their ability to recognize robbers during lineups or in mugfiles? Lastly, how might we-- the general public-- enhance our ability to recognize missing children, whose pictures (usually several months or years old) are frequently printed on the sides of milk cartons and on mail inserts? This research would not only be useful for face identification but may also be useful for improving

other forms of visual memory (e. g. , recognition of poisonous plants, recognition of missile silos by aircraft pilots).

The present research primarily addresses procedures by which face memory might be improved during recognition. Unfortunately, all the studies that have examined the effects of face recognition training have failed to find improvement following training (e.g., Malpass, 1981; Penry, 1971) and, in one study, a detriment was actually shown following training (Woodhead, Baddeley, & Simmonds, 1979).

Other research, however, has shown that instructions to image faces facilitates recognition (e.g., Read, 1979; Graefe & Watkins, 1980).

Although imaging might not be considered a form of training per se, it could be a way of facilitating recognition memory. Referring to one of the scenarios presented above, the convenience store cashier could be instructed in advance that in the advent of a robbery, he or she should try to image the face of the assailant.

Another possible way to improve facial recognition might be through distributed practice. Previous research (e.g., Reith, Axelrod, Anderson Hathaway, Wood, & Fitzgerald, 1974) has demonstrated the superiority of distributed over massed practice for verbal stimuli. A similar effect might be found for face memory. For example, the convenience store cashier

could be instructed to try to view the assailant multiple times during the robbery. Together, distributed practice and imaging might provide for facilitated subsequent recognition. For example, the convenience store cashier could be instructed to try to look at the robber's face, look away and try to image it, look back at the face, look away and image again, and so on, as opposed to staring at the assailant continuously. By imaging and looking back several times, the employee might be able to piece together memorial gaps in memory before the assailant leaves. Such a self-correcting procedure should lead to superior recognition. The present research seeks to determine if, indeed, this procedure would be beneficial.

The following sections examine the procedures and results of studies that have examined the effects of imaging. This review will be followed by a discussion of research examining the effects of massed versus distributed presentation.

Previous Research

Effects of Imaging. To date, there has only been a handful of studies that have examined the effects of post-exposure imaging on subsequent face recognition. In general, the results of these experiments demonstrate that face recognition is facilitated. However, these studies have not shown this imaging effect to be strong. Read (1979) presented facial

slides to subjects in three experimental conditions: visual - rehearsal (analogous to imaging), verbal - rehearsal and a control group (engaged in an auditory vigilance task). He found that both types of rehearsal increased recognition accuracy and confidence ratings; moreover, they produced significant reductions in response latency scores. Additionally, a comparison of the visual - rehearsal and control conditions revealed that the visual rehearsal of an image was equivalent to the continued observation of that picture for the same period of time. Hence, this study provides support for the notion that rehearsal via imaging facilitates recognition.

Graefe and Watkins (1980) also have demonstrated the positive effects of imaging. They presented pairs of pictorial stimuli (faces, random shapes, outdoor scenes, simple line drawings) with a rehearsal interval following the stimulus presentation. Subjects were instructed to rehearse visually just one of the members of the stimulus pairs during the rehearsal interval. Subjects had been told to expect a recognition test on just the cued pictures, but they were instead tested for recognition of both the cued and uncued pictures. Graefe and Watkins found that recognition rates were highest for the cued pictures and that the uncued pictures received no benefit from the rehearsal interval. This experiment

demonstrates that people can exercise control over rehearsal strategies and that rehearsal benefits recognition.

In an experiment conducted by Wogalter (1987), subjects were shown a series of target slides then were asked to perform one of four tasks: 1) descriptor - checklist task, 2) descriptor - generation task, 3) covert imaging task, or 4) irrelevant task. Subjects in the descriptor - checklist condition were given a list of adjectives and marked those adjectives they thought applied to the target faces. Subjects in the descriptor - generate condition generated their own adjectives that they thought applicable to the target faces. The results showed that subjects in the checklist condition had inferior recognition rates compared to subjects in the descriptor - generate condition. Furthermore, subjects in the imaging condition had better recognition rates than subjects in the descriptor checklist condition but recognition was not reliably different from the irrelevant or descriptor - generate conditions. In the second experiment by Wogalter (1987), half of the subjects in the adjective - checklist and adjective - generate conditions were also asked to image the faces simultaneously. An interesting result emerged: although there was no main effect of imaging, it nevertheless interacted with description tasks. Imaging facilitated recognition for subjects in the adjective - generate

condition. However, imaging led to a decrement for the adjective - checklist condition. Wogalter argues that the detrimental effect of imaging for the adjective - checklist condition might be due to subjects imaging irrelevant stimuli. That is, subjects were exposed to terms which did not describe the target; imaging instructions acted to enhance the incorporation of inappropriate face cues into memory.

In a study conducted by Read, Hammersley, Cross-Calvert, and McFadzen (in press), it was found that if subjects rehearsed a face immediately after seeing it, identification accuracy was lower than that of the control group. However, if rehearsal was delayed for 10 minutes, performance was enhanced. Read et al. argue that if subjects rehearse immediately after being exposed to a face, they will encode specific details of the face. In contrast, subjects who rehearse the face at a later time do not have access to these specific details and therefore encode less specific, more global representations of the face. If the target face is altered slightly between study and test, recognition rates are higher for those subjects who encoded more globally.

The research discussed thus far virtually exhausts the reported literature on the effects of imaging on face recognition. There have been a handful of other studies that have involved post - exposure activities

that would seem to invoke the imaging process. They examined the effects of overt facial construction on recognition. Construction activity involves the production of a visual likeness. The underlying process of this overt activity may involve covert imaging, leading to improved recognition. However, the results of this research are conflicting.

Facilitation has been found in some studies and negative effects in others. For example, Mauldin and Laughery (1981), using the Identi-Kit, found that recognition was facilitated by intervening constructions. Conversely, Hall (1977) found that subjects who had worked with a sketch artist to produce facial sketches had lowered recognition in comparison with control groups. Wogalter, Laughery and Thompson (1987) found facilitated recognition in one study (using the Field Identification System) but not in another (using the Mac-a-Mug system). Further, Davies, Ellis, & Shepherd (1978) found no effect of Photofit facial constructions upon subsequent recognition rates.

In an effort to make sense of the conflicting results regarding construction effects upon face recognition, Wogalter et al. argue that sketch production, Mac-A-Mug, and Photofit all require subjects to be exposed to a lot of irrelevant pictorial detail that does not fit the target face. By being exposed to this, subjects somehow incorporate this

irrelevant detail into their memories and it is this inaccurate information that leads to no effect or inferior recognition. The FIS and Identi-kit lack large amounts of facial detail but, at the same time, they involve imaging, which leads to facilitation of recognition. This is hypothesized to be the reason why some construction procedures led to a detriment and others did not.

In spite of the relatively few studies that have shown facilitative effects of imaging on face memory, together they show that face imaging facilitates memory. But the effect seems to depend on what is imaged.

The Effects of Massed vs. Distributed Presentation. Another possible way to improve face recognition is to use distributed (or spaced) exposure. Most research on distributed practice has used either verbal stimuli (e.g., Feuge, 1976) or perceptual- motor stimuli (e.g., Lorge, 1930; Kimble & Shattel, 1952). The superiority of distributed over massed presentation has been demonstrated in various verbal learning applications, such as the learning of chapter summaries (Reder & Anderson, 1980), learning lectures interspersed with discussion periods (Di Vesta & Smith, 1979) or practice reviews (Gettinger, Bryant & Mayne, 1982), the learning of spelling lists (Reith, Axelrod, Anderson, Hathaway, Wood & Fitzgerald, 1974), and the learning of word meanings (Gargagliano, 1974; Dempster,

1987) and foreign vocabulary words (Feuge, 1976; Siegel & Misselt, 1984). While the distributed effect is often considered to be a general principle of the science of memory, the lack of research utilizing spatial stimuli signifies that more research in this area needs to be done.

The logic behind distributed exposure is this: if the subject images a target face once after one stimulus presentation and this aids subsequent recognition, then if the subject sees the stimulus several times and has several opportunities to image the face, then recognition rates should increase even more. In sum, distributed presentation may be a possible way to improve facial recognition.

Wright (1979) points out that there are basically two theories used to explain the spacing (or distributed practice) effect. The first is referred to as "encoding variability." According to this theory, stimuli can be encoded in various ways depending upon variations in the encoding process and differences in the cognitive/emotional state of the individual. In other words, the encoding of a stimulus is mediated by the encoder's cognitive/emotional state; if an individual encodes a stimulus in more than one state, the chances of the encoded material being recalled during similar states is therefore improved. Hence, if an individual sees a stimulus more than once, the chances are better that s/he will encode

under more than one cognitive/emotional state, thereby increasing the possibility of recall.

The second theory often used to explain the distributed effect is referred to as the "deficient processing theory." Basically, it postulates that if an individual stares at a stimulus for more than a few seconds, the individual's attention will begin to wander and the person will soon stop attending to the stimulus. However, if the same stimulus is shown several brief times (as opposed to one longer exposure), the individual will show an "orienting response" each time the stimulus is again presented. The net result is that the individual will attend to the stimulus for a longer time under distributed presentation conditions than under massed conditions, although the total amount of time the stimulus is actually shown is identical for both situations.

Knowledge of how distributed presentation functions would be of potential usefulness in forensic settings. For example, it could be incorporated into police training procedures. Should police officers be shown the faces of wanted persons once for an extended period of time, or should the police be shown the faces once a day for three days in a row? Distributed exposure might also be helpful for bank tellers, security people, convenience store employees, etc. because they are in jobs where

robberies are fairly frequent events. If such persons could improve their memories for faces, identification performance might be facilitated.

Referring to the scenario of the convenience store employee, if distributed presentation does facilitate recognition, then s/he would be advised to try to get multiple exposures of the face and image between the exposures.

Experiment 1

Experiment 1 uses facial stimuli and an experimental paradigm incorporating both imaging and distributed practice. Based on the studies (mentioned above) that found beneficial effects following distributed presentation of stimuli (e.g., Feuge, 1976; Reith et al., 1974; Siegel & Misselt, 1984), it is expected that distributed presentation will lead to better recognition rates than massed. Previous work on the effects of imaging (e. g., Graefe & Watkins, 1980; Read, 1979) suggest that instructions to image will promote better recognition than activities that distract from imaging. Furthermore, an interaction between presentation mode and post- exposure activity might be shown. The combination of distributed presentation and imaging might yield recognition rates higher than their linear or additive effects.

Method

Subjects. Seventy- two University of Richmond undergraduates

voluntarily participated for extra credit in introductory psychology courses. Subjects were tested in small groups. There were an unequal number of subjects in each cell: the massed - imaging condition had 19 subjects, the massed - distractor condition contained 17 subjects, and both the distributed - imaging condition and the distributed - distractor conditions contained 18 subjects.

Materials and Apparatus. The materials included 140 black- and-white 35mm slides of Caucasian men who were approximately twenty years old. The slides were photographs of frontal, full- face poses and represented a homogeneous group of males. The slides were taken from a larger pool and selection avoided faces with distinctive characteristics (e.g., scars, unusual hair styles, facial hair, clothing, and facial gestures). Of the 140 slides used, six were randomly selected to be targets and the remaining 134 served as distractors. The six target slides were shown in color at study but were shown in black- and- white in the recognition series.

A Sharp Educator Synch Tape machine (Model RD-670AV) connected to a Kodak Carousel Slide Projector was used to present the slides at particular intervals. The timing was programmed by encoding a series of electronic pulses onto a cassette tape which, when played, caused the

synch machine to send a signal to the projector to advance the slides.

Two tapes were made: one for the massed presentation condition and one for the distributed presentation condition. An additional tape was later made that triggered the synch machine to present the recognition slides at 8 second intervals.

The recognition response sheet consisted of 140 numbered blanks. The sheet also contained a set of brief instructions which told subjects how they were to mark their responses. More specifically, the instructions told subjects to mark a "Y" to signify that a face was previously presented or an "N" to indicate that it was not. They were also told to signify their degree of certainty by writing a "1", "2", or "3" following the "Y" or "N". The confidence ratings 1, 2, or 3 indicated (1) guessed, (2) probably correct, or (3) certain that the answer was correct, respectively.

Design and Procedure. The experiment was a 2 X 2 between-subjects design. One factor was presentation condition (massed vs. distributed), and the other factor was intervening task (imaging vs. distractor task). Subjects were randomly assigned to one of four conditions: massed presentation - imaging, massed presentation - distractor task, distributed presentation - imaging, and distributed presentation - distractor task. Each subject was shown 6 target faces.

Each target face was shown for 6 seconds. The total on- time for all targets equaled 36 seconds. Each of the 6 target faces was associated with an off- time of 30 seconds. The total off- time was 180 seconds.

What differs between the conditions is how the on- and off-times are presented. The specifics of each condition follow:

(1) For the massed presentation - imaging condition, subjects viewed each of the six targets continuously for six seconds each, with 30 seconds intervening before the next facial picture. During the interval between presentations subjects were instructed to try to hold an image of the face by "seeing" or visualizing the face in front of them or in their mind. They were told to keep trying to visualize the face during the entire 30 second period following the presentation of the face.

(2) For the massed presentation - distractor task condition, subjects viewed each of the six targets continuously for six seconds each, with 30 seconds of distractor activity between presentations. During the interval between presentations subjects were to perform a letter- circling task. These subjects were told that the experiment also dealt with the measurement of speeded perceptual scanning. After each face presentation, they were told to turn to the next page in their booklets. Each of the six sheets contained a large array of letters and on each page

two different letters were printed on the top. Subjects were to circle all the other instances of the two letters starting from the top of the page. For example, if "P" & "S" were circled, subjects were to circle all the P's and S's on that page. They were told to do this task as fast as they could and, further, that they should stop letter- circling and look up at the presentation screen when they heard the slide projector advance.

(3) For the distributed presentation - imaging condition, subjects viewed each of the six targets three times for two seconds each with 10 seconds of off- time between presentations. Thus, the faces were presented as follows: the first face was presented for two seconds, followed by 10 seconds of blank (imaging) time, then the first face was presented a second time for two seconds, followed by another 10 seconds of blank time; the first face was then presented a third time for two seconds, followed by another 10 seconds of blank time. Then the second face was presented for the first time for two seconds, followed by 10 seconds of blank (imaging) time, and so on through the sequence until the sixth face was presented the third time. Like the massed presentation - imaging condition, subjects were instructed to try to hold an image of the face by "seeing" or visualizing it in front of them or in their mind during the 10 second periods following each face presentation.

(4) For the distributed presentation - distractor task condition,

subjects viewed each of the six targets three times for two seconds each with 10 seconds of off- time between presentations. Like the massed presentation - distractor condition, during the interval between presentations subjects performed a letter- circling task. Subjects were told that the experiment also dealt with the measurement of speeded perceptual scanning. After a new face presentation, they were told turn to the next page in their booklets. Each of the six sheets contained a large array of letters and on each page two different letters were printed on the top. The pages were divided into thirds. After the first presentation of a face subjects were to circle letters on the first section of the page. After the second presentation of a face subjects were to work on the letters on the middle third of the page. And after the third and last presentation of a face subjects were to circle letters on the bottom section of the page. Just prior to the onset of the next target, subjects were instructed to turn to the next page in their booklets, where they would begin this process again. Like the other distractor task group, subjects in this condition were told to do this task as fast as they could but it was also emphasized that they should stop and look up at the presentation screen when they heard the slide projector advance.

Subjects were initially given a consent form and a booklet of forms, the contents of which depended on the condition. For both distractor conditions, the booklet contained six pages of randomly ordered letters. Each page had a different set of target letters printed at the top of the page to specify which letters to circle. For the distributed - distractor condition, the letter sheets were divided into thirds with lines separating the sections. For the massed - distractor condition, the letter sheets were not broken up into sections. The booklets for the imaging conditions had no random letter- circling pages.

After the study phase was completed, subjects were given a questionnaire which examined study strategies. Subjects required, on the average, approximately four minutes to complete this questionnaire. The results of this questionnaire will not be discussed in this report. Following completion of the questionnaire, subjects were instructed how to complete their recognition test sheets. The specifics of the test instructions are reported in the Materials and Apparatus section. Prior to the test sequence, subjects were told that the faces they viewed earlier might or might not appear in the test slides. The 140 slides were then presented for eight seconds each. The six target slides were presented in the slide recognition series in positions 54, 73, 87, 104, 116 and 133.

Results

Confidence scores were derived by assigning a score of 6 to the Y3's, 5 to the Y2's, 4 to the Y1's, 3 to the N1's, 2 to the N2's, and 1 to the N3's. From these ratings several measures of recognition performance were derived. The hit- miss (HM) scores were the subjects' mean confidence ratings to the six target slides. If responses of 4, 5, and 6 for the targets are viewed as hits and given scores of one and zeros otherwise, the resulting means for the targets provide a proportion hit (PH) measure. The false alarm correct rejection (FACR) scores were means derived from the subjects' confidence ratings to the 134 distractor faces in the recognition series. Similarly, if 4, 5, and 6 responses for the distractors are viewed as false alarms, the resulting score provides a measure of the proportion of false identifications (PFA). In addition, two discrimination measures were used in order to eliminate effects of bias in the use of the rating scale. One discrimination measure was a difference between each subject's mean HM score and mean FACR score (HM/FACR DIFF). The other discrimination measure was a standardized hit- miss (SHM) score. This score was obtained by standardizing each persons' responses to all the photographs in the recognition series and then taking a mean for the targets. Signal detection analyses were not used in the present

experiments because only six target photographs were viewed, and therefore, only a small number of hits per subject were possible.

Separate 2 X 2 between- subjects analysis of variance (ANOVA) was carried out using each of the six measures. Significant effects are based on probability levels (p) of less than .05. The top rows of each cell in Table 1 show the mean HM and PH scores (PH scores are shown in parentheses). Higher hit scores signify better performance. The ANOVA using the HM measure showed statistically reliable main effects of presentation condition (massed vs. distributed) and intervening task (imaging vs. distractor), $F(1, 68) = 12.32$, $MS_e = .733$, $p < .001$, and $F(1, 68) = 12.00$, $MS_e = .733$, $p < .001$, respectively, demonstrating better recognition for the groups that had distributed presentation and for the groups that imaged the faces. However, the ANOVA also yielded a significant interaction of presentation condition and intervening task, $F(1, 68) = 3.98$, $MS_e = .733$, $p < .05$. Examination of the HM means in Table 1 shows that the interaction is primarily due to lower target recognition in the massed - distractor condition compared to the other conditions (Fisher's L.S.D. = .57). The other conditions did not differ among

Table 1

Mean recognition scores as a function of exposure and intervening task conditions

		EXPOSURE CONDITION		
		Massed	Distributed	Mean
Imaging	HM (PH)	4.72 (.80)	5.03 (.81)	4.88 (.81)
	FACR (PFA)	2.22 (.21)	1.95 (.16)	2.09 (.80)
	HM/FACR DIFF (SHM)	2.50 (1.85)	3.08 (2.23)	2.79 (2.04)
INTERVENING TASK				
Distractor	HM (PH)	3.62 (.49)	4.73 (.84)	4.18 (.18)
	FACR (PFA)	2.54 (.28)	2.40 (.24)	2.47 (.26)
	HM/FACR DIFF (SHM)	1.08 (.71)	2.33 (1.61)	1.71 (1.16)
Mean	HM (PH)	4.17 (.64)	4.88 (.83)	
	FACR (PFA)	2.38 (.25)	2.175 (.20)	
	HM/FACR DIFF (SHM)	1.79 (1.28)	2.70 (1.92)	

themselves.

Examination of the PH means within Table 1 show the same pattern as the HM measure. The ANOVA yielded significant main effects for both the presentation condition and the intervening task, $F(1, 68) = 15.94$, $MS_e = .039$, $p < .001$, and $F(1, 68) = 8.97$, $MS_e = .039$, $p < .004$, respectively, and an interaction, $F(1, 68) = 12.91$, $MS_e = .039$, $p < .0001$. Like the HM means, the PH interaction is due to lower target recognition in the massed - distractor condition (L.S.D. = .57) compared to the other conditions which do not differ among themselves.

The mean FACR and PFA scores are presented in the second row of each cell of Table 1. Lower false alarm scores signify better performance. The ANOVA on the FACR scores showed a statistically significant main effect of the intervening task, $F(1, 68) = 5.41$, $MS_e = .493$, $p < .03$, demonstrating lower FACR scores for the imaging conditions. Examination of the right column of Table 1 shows that imaging produces lower FACR scores than the distractor task. No effect of presentation condition nor an interaction was noted, $F(1, 68) = 1.49$, $MS_e = .493$, $p > .05$, and $F(1, 68) < 1.0$, respectively. The pattern of the PFA results

parallel the FACR results. A statistically significant effect of the intervening task was shown, $F(1, 68) = 5.03$, $MS_e = .022$, $p < .03$. Imaging produces lower PFA scores than the distractor task. There was no effect of presentation condition nor an interaction, $F(1, 68) = 1.80$, $MS_e = .022$, $p > .05$, and $F < 1.0$, respectively.

The third row of each cell in Table 1 shows the means for the two discrimination measures: the difference scores between individual mean HM and FACR scores (HM/FACR DIFF), and the standardized hit- miss measure (SHM). An ANOVA with the HM/FACR DIFF scores indicated significant main effects for both presentation condition and intervening task, $F(1, 68) = 17.17$, $MS_e = .869$, $p < .05$, and $F(1, 68) = 24.34$, $MS_e = .869$, $p < .05$, respectively. Subjects in the distributed presentation conditions discriminated better than those in the massed conditions. Furthermore, subjects in the imaging conditions discriminated better than subjects in the distractor task conditions. There was no significant interaction, $F(1, 68) = 2.30$, $MS_e = .87$, $p > .05$. The SHM scores showed the same pattern of results as the HM/FACR DIFF scores. An ANOVA on the SHM scores showed significant main effects of presentation condition,

$F(1, 68) = 10.86$, $MS_e = .684$, $p < .05$, and intervening task, $F(1, 68) = 20.23$, $MS_e = .684$, $p < .05$. Discrimination performance was higher for distributed than for massed presentations and higher after imaging than after working on the distractor task. Again, there was no significant interaction, $F(1, 68) = 1.77$, $MS_e = .684$, $p > .05$.

Discussion

The target hit results showed that when study is not distributed and imaging is prevented, then performance is lower. The interaction between exposure condition and intervening task demonstrated that recognition is especially low for the massed - distractor condition. This interaction indicated that the effects are not additive; rather, distributed presentation and imaging (either alone or together) will promote maximum recognition. A ceiling effect appeared to be present with regard to the target hit means. Indeed, with the more sensitive discrimination measures, additive effects of presentation mode and post- exposure task were seen. The highest recognition performance is seen with the combination of distributed presentation and post- exposure imaging.

Experiment 2

The first experiment dealt with the beneficial effects of imaging and

distributed presentation using face stimuli. A second experiment examines the effects of distributed practice and imaging on another type of complex visual- pictorial material. Rather than faces, pictures of poisonous plants were shown to subjects. This class of stimuli was chosen for two reasons: first, it was of interest to determine whether the conclusions drawn from Experiment 1 are specific to faces or are more general. Would similar results be found with a different class of complex visual stimuli with which people are less familiar (i.e., processed less frequently). Second, people are more familiar with faces than with poisonous plants, therefore it should be more difficult for subjects to distinguish the latter class of stimuli than the former. This might reduce recognition and also might reduce the effectiveness of distributed or imaging conditions.

It was decided to utilize a different distractor activity in the second experiment. This decision was motivated by concern that some imaging might still occur while subjects were engaged in the distractor (letter-circling) task. Previous research (e. g., Reitman, 1971) has shown that the performance of tasks with content similar to what is being stored in memory leads to a recognition decrement. In order to determine if this effect works with visual as well as verbal stimuli, it was decided to utilize a distractor activity more exclusively of a visual nature. In this study,

subjects either imaged the plant just presented (the imaging condition) or image a face that was shown prior to the plant slides during the off- times (the distractor condition). It is hoped that the modified distractor activity used in this second experiment will be as effective or more effective at preventing rehearsal due to its visual nature than the distractor task used in Experiment 1.

The second study compares the effect of post- exposure imaging (imaging plants vs. imaging a distractor face) and mode of presentation (massed vs. distributed) on subsequent recognition of target plant slides. One might expect, based on the previous experiment, a similar pattern of results or, because of the differences in the stimuli and the distractor task, a different pattern could emerge.

Method

Subjects. Eighty University of Richmond undergraduates participated in this experiment for fulfillment of introductory psychology course requirements. There were 20 subjects in each condition.

Materials and Apparatus. The materials included seventy- eight color 35mm slides of poisonous plants, of which six were randomly chosen to be targets. The same target pictures were used at study and test (i. e. , they were not different depictions of the same plants). The tapes were

prepared using a BASIC computer program, which allows the production of a more accurate timing program than is possible using a stopwatch.

The recognition test sheet was almost identical to the one used in Experiment 1. Subjects were also given a form which asked them to rate how much imaging they did during the blank- time intervals. The rating was on a one to seven scale: "one" meaning that the subjects imaged the plants all the time, "four" indicating that they imaged the face and plant equally and a rating of "seven" meaning that the subject imaged the face all the time. A sheet of cardboard with eighteen 4 x 6 black- and- white photographs was used to test for recognition of the distractor face. The photographs were arranged in three rows of six photographs each. Under each photograph were the letters "A" through "Q", with each picture having only one of the letters below it.

Design and Procedure. The experiment was a 2 X 2 between- subjects design. One factor was exposure condition (massed vs. distributed) and the other was intervening task (imaging the plant vs. imaging the face). Subjects were randomly assigned to one of four conditions: 1) massed - imaging, 2) massed - distractor, 3) distributed - imaging, and 4) distributed - distractor. The total on- time for all conditions was 36 seconds, while the total off- time for all conditions was

180 seconds. The specifics of each condition follow:

1) For the massed presentation - imaging condition, subjects were shown each of the six target plant slides continuously for six seconds each, with 30 seconds of off- time before the next target presentation. During the interval between presentations, subjects were instructed to try to image the plant just presented. They were told to keep trying to visualize the plant during the entire 30 second period following the presentation of the plant.

2) For the massed presentation - distractor condition, subjects were shown a randomly selected facial slide for six seconds, then were shown the six target plant slides continuously for six seconds each, with 30 seconds of off- time between each target. During the off- time, subjects were instructed not to image the plant just presented but to image the face shown at the beginning of the presentation. They were told to continue to image the face during the entire 30 second period following the presentation of the plant slide.

3) For the distributed presentation - imaging condition, subjects were shown each of the six target plant slides three times for two seconds each, with 10 seconds of off- time between presentations. Subjects were instructed to image the plant just presented during the off- time.

4) For the distributed presentation - distractor condition, subjects were shown the same randomly selected facial slide for six seconds, then viewed each of the six target plant slides three times for two seconds each, with 10 seconds of off- time between presentations. Subjects were told to image the face during the off- time.

In this study, no questionnaire was given to subjects between study and test. After the study phase was completed, the subjects were given a recognition test sheet and instructed how to complete it. Prior to the test sequence, subjects were told that the plants they viewed earlier might or might not appear in the test slides. The recognition test slides were then shown for eight seconds each. The six target slides were presented in the slide recognition series in positions 40, 48, 53, 59, 66 and 71.

After the recognition test, subjects were asked to rate the amount and type of imaging they did according to the scale on the form described in the Materials and Apparatus section. The subjects then wrote this rating number in space 99 on their recognition test sheet. The subjects were then shown the 18 facial photographs described in the Materials and Apparatus section. The subjects were asked to write down the letter that corresponded to the face that they were shown at the beginning of the experiment. Beside this letter they were instructed to indicate their

confidence in their answer using the same scale utilized to rank their confidence for the recognition slides. Both the target letter and its confidence rating were placed in space 100 on the recognition test sheet. The target face was in position "P" and it was located on the bottom row, third photograph from the right.

Results

It should be emphasized that, in this experiment, the plant slides served as targets and imaging the initial facial slide was the distractor task. The same recognition performance measures used in Experiment 1 were also examined here. The mean recognition performance scores are presented in Table 2.

A separate 2 x 2 between- subjects ANOVA was performed on each of these measures. The ANOVA using the HM measure showed no significant main effect for exposure conditions (massed vs. distributed), $F(1,76) = 1.0$, $p > .05$. There was a significant main effect for post- exposure task (imaging the plants vs. imaging the distractor face), $F(1,76) = 13.73$, $MS_e = .870$, $p < .001$. These means show that subjects who were instructed to image the plants during the off- time had significantly higher HM scores than subjects who were instructed to image the distractor face. There was no

Table 2

Mean recognition measures as a function of imaging task and exposure

		EXPOSURE CONDITION		
		Massed	Distributed	Mean
Face	HM (PH)	2.83 (.38)	2.78 (.37)	2.81 (.38)
	FACR (PFA)	2.07 (.20)	1.82 (.13)	1.95 (.17)
	HM/FACR DIFF (SHM)	0.77 (1.01)	0.96 (.74)	0.86 (.88)
IMAGING TASK				
Plants	HM (PH)	3.70 (.56)	3.46 (.48)	3.58 (.52)
	FACR (PFA)	2.25 (.23)	1.96 (.17)	2.10 (.20)
	HM/FACR DIFF (SHM)	1.45 (.90)	1.50 (.98)	1.48 (.94)
Mean	HM (PH)	3.27 (.47)	3.14 (.43)	
	FACR (PFA)	2.16 (.21)	1.90 (.15)	
	HM/FACR DIFF (SHM)	1.11 (.95)	1.24 (.87)	

significant interaction between exposure and intervening task, $F < 1.0$.

The ANOVA using the PH measure showed no effect of presentation mode, $F < 1.0$. There was a significant main effect for the post- exposure task, $F(1, 76) = 7.07$, $MS_e = .056$, $p < .01$. Subjects who imaged the plants had significantly higher PH scores than subjects who imaged the distractor face. There was no interaction, $F < 1.0$.

The mean FACR and PFA scores are presented in the second row of each cell of Table 2. Relative to the hit measures, the false alarm scores show a different pattern of results. The ANOVA using the FACR measure showed a marginal effect of presentation mode, $F(1,76) = 3.54$, $MS_e = .400$, $p = .06$, suggesting a trend towards more false alarms for the massed conditions. There was no significant main effect for the post- exposure task, $F(1,76) = 1.26$, $MS_e = .400$, $p > .05$. The interaction was also not significant, $F < 1.0$. Regarding the PFA scores, the ANOVA indicated a significant effect of presentation mode, $F(1, 76) = 5.14$, $MS_e = .016$, $p < .03$. This indicates that subjects in the massed conditions had significantly greater false alarms than subjects in the distributed conditions. No significant main effect for post- exposure task was found, $F(1, 76) = 1.13$,

$MS_e = .016$, $p > .05$. There was no significant interaction, $F < 1.0$.

The third row of each cell in Table 2 shows the means for the HM/FACR DIFF and SHM scores. The ANOVA using the HM/FACR DIFF measure demonstrated no significant main effect for exposure condition, $F < 1.0$. A significant main effect for post-exposure task was found, $F(1, 76) = 10.99$, $MS_e = .686$, $p = .001$. Subjects who imaged the plants had significantly higher HM/FACR scores than subjects who imaged the distractor face. There was no interaction, $F < 1.0$. The ANOVA using the SHM scores yielded no significant main effects (both F 's < 1.0). There was also no interaction, $F(1, 76) = 1.18$, $MS_e = .509$, $p > .05$.

A separate ANOVA was performed on the initial face data. The results showed no effect of presentation mode, $F(1, 76) = 1.32$, $MS_e = 1.94$, $p > .05$. There was, however, a significant effect for imaging task, $F(1, 76) = 41.84$, $MS_e = 1.94$, $p = .0001$. This result indicates that subjects in the image plant conditions claimed to have imaged the plants almost exclusively (mean = 2.44), whereas subjects in the image face conditions claimed to have imaged the face and plants about equally (mean = 4.46). There was no significant interaction between imaging task and

presentation mode, $F(1, 76) = 1.17$, $MS_e = 1.94$, $p > .05$.

Another ANOVA was performed on the initial face data to determine if subjects in any conditions had higher recognition scores for the initial face. Subjects in the image face conditions would be expected to have higher recognition for the initial face than subjects who imaged the plants. There was a trend for the image face condition (mean = .80) to have higher recognition than the image plant condition (mean = .76). However, the ANOVA showed no effect of presentation mode ($F < 1.0$) nor post-exposure task ($F < 1.0$). Further, there was no significant interaction, $F < 1.0$. The means showed that performance was rather high in all conditions (means ranged from .7 to .81.) This may be indicative of ceiling effects.

Discussion

The goal of Experiment 2 was to examine whether a different set of stimuli (plants) would show the same or different pattern of recognition as Experiment 1 (faces). Subjects in the massed - imaging and distributed - imaging conditions were instructed to image the plant that they had just seen. Subjects in the distractor conditions imaged a face. Subjects who imaged the plants had higher mean HM and PH scores than subjects who

imaged the distractor face. This was also apparent in the HM/FACR DIFF scores. The effects of imaging seem to generalize across classes of stimuli. This imaging effect is consistent with that found for faces in Experiment 1.

There are some interesting and somewhat puzzling discrepancies between the two studies, however. For Experiment 1, a mode of presentation effect was found for faces using the hit and discrimination measures. However, such a finding was not found in Experiment 2. However, the superiority of distributed over massed presentation was seen for plants using the false alarm measures, particularly the PFA scores. Apparently, distributed presentation does facilitate plant recognition but it does so in a different way than for faces. If subjects can discriminate between faces easier than they can between plants, then this inability to effectively discriminate between plants might act to change the massed/distributed effect. This might be due to a response criterion difference that emerges when subjects try to distinguish between these two different classes of stimuli.

Experiment 3

There are some obvious inconsistencies between the results for Experiments 1 and 2; therefore, a third study was undertaken in an

attempt to resolve some of these discrepancies.

There are two important differences between Experiments 1 and 2 and Experiment 3. First, the third study compares the effects of two different post- exposure distractor activities upon subsequent recognition. These distractor activities are similar to those used in Experiments 1 and 2-- specifically, letter- circling and a visual distractor task. The effects of the two distractor activities are compared to the effect of imaging the target slides. Would both kinds of distractor activities show equal interference?

Second, in the third experiment half of the targets shown to the subjects are the same view at study and test while the other half are shown from different views at study and test. What is the rationale for doing this? Let us return to the convenience store scenario. Suppose the convenience store cashier is the victim of a robbery. The police will likely ask the cashier to go to the station to look through a "mug file" book in order to identify the assailant. Let us suppose that the assailant's picture is in the mug file book. If the cashier's memory of the assailant's face exists as a type of "picture" in his/her mind, then recognition will occur if the "mental picture" and the mug file picture correspond. The problem is that even if the assailant's picture is in the mug file, the picture will

almost certainly be different from the cashier's mental image. The suspect's picture, if present in the mugfile, is likely to have been taken at a different time period than the eyewitness incident. Features change over time, as do hair styles, clothing and facial expressions. Additionally, there is a good possibility that the picture of the assailant in the mug file will be from a different view (or angle) than the view the cashier had of the assailant during the robbery. Since these variables (e.g., different facial expressions, hair styles, clothing, lighting, view, etc.) are present in forensic settings, experiments that ignore such factors would seem to threaten ecological validity. In order to make experiments such as these more applicable to real world situations, the stimuli should be varied from initial presentation to recognition test. In the first two experiments, the target slides were nearly identical from study to test. (Experiment 1 did have a change from color to black- and- white.) In order to increase the ecological validity, subjects in Experiment 3 saw some targets from the same view at study and test and others from different views at study and test (pictures of the targets taken a year later). This manipulation enables one to examine whether the effects of presentation mode and post-exposure task differ as a function of the kind of picture view at study and test.

Method

Subjects. Ninety- six undergraduates were recruited from the Richmond and Lynchburg areas. All voluntarily participated for either extra course credit or for \$3.00. Subjects were tested in small groups and were also given consent and debriefing forms.

Materials and Apparatus. The materials included 12 facial target slides (6 faces, 2 views of each), 73 recognition distractor slides, and one initially- studied face distractor slide. All of the slides were reproduced from 1980 and 1981 University of Richmond yearbooks and represented a homogeneous set of males. Yearbook pictures of the targets from a year earlier or later were reproduced and served as the different view slides.

The present study makes use of an improved timing device for the presentation and intervening task intervals. The three tapes were prepared using a Macintosh computer program. (The synch machine was used for playback.) All other materials were similar to those used in Experiments 1 and 2.

Design and Procedure. Using the hit and discrimination measures, the experiment was a 2 X 3 X 2 mixed design. There were two between- subjects variables and one within- subjects variable. The first factor was presentation method (massed vs. distributed). The second factor was

post- exposure task (imaging the target faces, imaging a distractor face or performing a letter- circling activity). The third factor was a repeated measures factor; this variable was test view (i. e., whether or not the targets were shown from the same view or from a different orientation at test.) A 2 (presentation mode) x 3 (post- exposure task) between- subjects ANOVA was performed on the FACR and PFA measures and a 2 (presentation mode) x 3 (post- exposure task) x 2 (test view) between- subjects ANOVA was performed on the initial face data.

Subjects were randomly assigned to one of six conditions: 1) massed - imaging targets, 2) distributed - imaging targets, 3) massed - imaging initial face, 4) distributed - imaging initial face, 5) massed - letter circling, or 6) distributed - letter circling. The total on- time for all conditions was 36 seconds (6 seconds for each of the 6 target faces), while the total off- time across conditions was 180 seconds (30 seconds for each of the 6 target faces). The specifics follow:

The initial face, like the targets, was either shown from the same or different view at test. All subjects in all conditions were first shown the initial facial slide for 2 seconds. Subjects in the "imaging initial face" conditions were instructed to image this initial face during all the off- times. Subjects in the "imaging targets" and "letter- circling" conditions

were simply told to try to remember the face.

1) For the massed presentation - imaging condition, subjects were shown each of the six target slides continuously for six seconds each, with 30 seconds of off- time before the next target presentation. During the 30 second interval between presentations, subjects were instructed to try to image the most recently seen face. They were told to keep trying to visualize the face during the entire 30 second period.

2) For the distributed presentation - imaging condition, subjects were shown each of the six target slides three times for two seconds each, with 10 seconds of off- time between presentations. During the 10 second interval between presentations, subjects were instructed to try to image the most recently seen face.

3) For the massed presentation - imaging initial face condition, subjects were told to image the initial face (not the targets) during all off- time periods. Then the subjects were shown each of the six target slides continuously for six seconds each, with 30 seconds of off- time after each target presentation. They were told to keep trying to visualize the initial face during the 30 second period.

4) For the distributed presentation - imaging initial face condition, subjects were told to image the initial face (not the targets) during all off-

time periods. Then the subjects were shown each of the six target slides three times for two seconds each, with 10 seconds of off- time between presentations. They were told to keep trying to visualize the initial face during the 10 second period.

5) For the massed presentation - letter- circling condition, subjects were shown each of the six target slides continuously for six seconds each, with 30 seconds of off-time before the next target presentation. During the 30 second interval between presentations, subjects were instructed to perform a letter- circling task. These subjects were told that the experiment also dealt with the measurement of speeded perceptual scanning. The random letter pages and the instructions given subjects for completing them are identical to the massed- distractor condition of Experiment 1.

6) For the distributed presentation - letter- circling condition, subjects were shown each of the six target slides three times for two seconds each, with 10 seconds of off- time between presentations. During the 10 second interval between presentations, subjects were instructed to perform a letter- circling task. The random letter pages and the instructions given subjects for completing them are identical to the distributed presentation - distractor condition of Experiment 1.

Subjects were given a booklet containing forms that depended on the condition. For both letter- circling conditions, the booklet contained six pages of randomly ordered letters. Each page had a different set of target letters printed at the top of the page to specify which letters to circle. For the distributed presentation - letter- circling condition, the letter sheets were divided into thirds with lines separating the sections. For the massed presentation - letter- circling condition, the letter sheets were not broken up into sections. The booklets for the imaging conditions contained no letter- circling pages.

After the study phase (presentation of targets and completion of post-exposure tasks) was completed, subjects were given a questionnaire which asked subjects to rank themselves on their visual/spatial and verbal/analytical skills. They were also asked to describe whatever study strategies they employed to help them remember the targets. The results of this questionnaire will not be discussed in this report. Following completion of the questionnaire (which took approximately two to four minutes), subjects were instructed how to complete their recognition test sheets. The specifics of these instructions are reported in the Materials and Apparatus section of Experiment 1. Subjects were told that the faces they viewed earlier might or might not appear in the recognition test

series. The 80 slides were then presented for eight seconds each. The six target slides were presented in the slide recognition series in positions 42, 50, 56, 63, 65 and 73. The initial face was presented in position 76.

All target slides were counterbalanced. Targets 1, 3, and 5 were assigned the label "x"; targets 2, 4, and 6 were labeled "y". Each of the six conditions was subdivided into four subconditions of four subjects each. The end result was that half of the subjects saw targets 1, 3, and 5 from the same view at test and targets 2, 4, and 6 from a different view, while the other half saw targets 1, 3, and 5 from a different view at test and targets 2, 4, and 6 from the same view at test. Subjects were randomly assigned to the subconditions that dealt with the counterbalancing of the slide groupings "x" and "y" and the same and different initial face views.

Results

The same recognition performance measures used in Experiments 1 and 2 were also examined here. The mean recognition performance scores are presented in Table 3.

A 2 (presentation mode) X 3 (post- exposure task) X 2 (test view) mixed- model ANOVA was performed on the two hit measures (HM and

Table 3

Mean recognition scores as a function of exposure condition, post-exposure task and viewing conditions

		EXPOSURE CONDITION			
		<u>Massed</u>		<u>Distributed</u>	
		Same View	Different View	Same View	Different View
Imaging Targets	HM (PH)	5.71 (.958)	3.73 (.604)	5.65 (.938)	3.92 (.625)
	FACR (PFA)	2.57 (.280)		2.40 (.272)	
	HM/FACR DIFF (SHM)	3.14 (1.92)	1.16 (.595)	3.25 (1.91)	1.52 (.798)
Imaging Initial Face	HM (PH)	5.00 (.854)	3.59 (.562)	5.31 (.896)	3.17 (.500)
	FACR (PFA)	2.77 (.342)		2.21 (.233)	
	HM/FACR DIFF (SHM)	2.23 (1.43)	.814 (.407)	3.11 (2.11)	.961 (.493)
Letter-Circling	HM (PH)	3.73 (.583)	3.73 (.625)	4.54 (.729)	3.13 (.417)
	FACR (PFA)	2.47 (.267)		2.52 (.284)	
	HM/FACR DIFF (SHM)	1.26 (.807)	1.26 (.780)	2.02 (1.32)	.607 (.299)

PH) and the two discrimination measures (HM/FACR DIFF and SHM).

The ANOVA using the HM measure showed no significant main effect for presentation mode (massed versus distributed presentation), $F(1, 90) < 1.0$. However, there was a significant main effect for post- exposure task (for imaging targets, mean = 4.75; for imaging the initial face, mean = 4.27; for letter- circling, mean = 3.78), $F(2, 90) = 9.47$, $MS_e = 1.59$, $p < .001$.

Comparisons between these means indicate that subjects in the image target conditions had significantly higher HM scores than subjects in the letter- circling conditions (Fisher's L.S.D. = .63). Subjects in the image initial face condition produced HM scores that were intermediate but did not differ from the other two conditions. There was no significant presentation mode x post- exposure task interaction, $F < 1.0$.

There was a significant main effect for test view (i. e. , whether the same view or a different view of the target was shown at test), $F(1, 90) = 114.86$, $MS_e = .876$, $p < .001$. Subjects who saw the same face at study and test had greater HM scores (mean = 4.99) than subjects who saw a different view at study and test (mean = 3.54). Test view also interacted separately with presentation mode and post- exposure task, $F(1, 90) = 5.47$, $MS_e = .876$, $p < .03$ and $F(2, 90) = 7.52$, $MS_e = .876$, $p < .01$.

Table 4

Mean recognition measures as a function of test view and presentation mode

		PRESENTATION MODE	
		Massed	Distributed
TEST VIEW	Same		
	HM (PH)	4.81 (.799)	5.17 (.854)
	HM/FACR DIFF (SHM)	2.21 (1.39)	2.79 (1.78)
TEST VIEW	Different		
	HM (PH)	3.68 (.597)	3.40 (.514)
	HM/FACR DIFF (SHM)	1.08 (.594)	1.03 (.53)

respectively. Examination of the test view x presentation mode means show that the difference between same versus different test pictures was larger under distributed presentation than under massed (Fisher's Least Significant Difference = .38 at alpha level .05). These means can be seen in Table 4.

Examination of the test view x post- exposure task condition means shows that subjects who imaged the target face had higher recognition than subjects who imaged the initial (distractor) face who, in turn, had higher recognition than subjects who letter- circled during the post- exposure period, but this was only true when subjects saw the same view at study and test (L.S.D. = .47). There was no differential effect of post- exposure activity when a different view was seen at study and test. These means can be seen in Table 5.

However, the ANOVA also yielded a small but significant three factor interaction between exposure condition, post- exposure task, and viewing condition, $F(2, 90) = 3.20$, $MS_e = .876$, $p < .05$. Close examination of the means in Table 3 show the same test view x post- exposure task interaction pattern for both massed and distributed presentation except for one apparent difference. Subjects viewing a different picture at study

Table 5

Mean recognition measures as a function of test view and post-exposure task

	POST-EXPOSURE TASK		
	Image Targets	Image Initial Face	Letter-Circling
HM (PH)	5.68 (.948)	5.16 (.875)	4.14 (.656)
Same			
HM/FACR DIFF (SHM)	3.19 (1.92)	2.67 (1.77)	1.64 (1.06)
TEST VIEW			
HM (PH)	3.82 (.615)	3.38 (.531)	3.43 (.521)
Different			
HM/FACR DIFF (SHM)	1.34 (.696)	.887 (.45)	.934 (.539)

and test under distributed presentation had higher recognition performance when they imaged the target face than if they had performed the other two post- exposure activities (L.S.D. = .66).

The ANOVA on the PH scores revealed no significant main effect for presentation mode, $F < 1.0$. There was, however, a significant main effect for post- exposure task, $F(2, 90) = 6.09$, $MS_e = .099$, $p < .01$. Comparisons among these means showed the same pattern as the HM scores (L.S.D. = .16). Specifically, subjects in the image target conditions (mean = .781) had significantly higher PH scores than subjects in the letter- circling conditions (mean = .703). Subjects in the image initial face conditions (mean = .589) produced PH scores that were intermediate but that did not differ significantly from the other two conditions. There was no interaction between presentation mode and post- exposure task, $F < 1.0$.

A main effect for test view was shown, $F(1, 90) = 53.43$, $MS_e = .066$, $p = .0001$. Subjects who saw the same target at both study and test had higher PH scores (mean = .826) than subjects who saw a different view at study and test (mean = .556). The presentation mode x test view interaction was marginal but not significant, $F(1, 90) = 3.51$, $MS_e = .066$, $p < .07$. There was a significant interaction between post- exposure task and

test view, $F(2, 90) = 3.35$, $MS_e = .066$, $p < .05$. (These means can be seen in Table 5.) When given the same view at both study and test, the post-exposure activity of letter- circling led to significantly lower recognition than either imaging the targets or imaging the initial face. However, when given a different study to test view, performance was low and post-exposure activity did not matter ($L.S.D. = .13$). The three- factor interaction source was marginal but not significant, $F(2, 90) = 2.43$, $MS_e = .066$, $p < .10$.

A 2 X 3 between- subjects ANOVA was performed on the FACR and PFA measures. The ANOVA on the FACR scores showed no significant main effect for either presentation mode or post- exposure task, $F(1, 90) = 2.15$, $MS_e = .592$, $p > .05$ and $F < 1.0$, respectively. There was also no significant interaction, $F(2, 90) = 1.31$, $MS_e = .592$, $p > .05$. The ANOVA on the PFA scores was similar. There were no significant main effects for either presentation mode or post- exposure task (both F 's < 1.0). Again, there was no significant interaction, $F(2, 90) = 1.32$, $MS_e = .027$, $p > .05$.

From the examination of Table 3, one can see that the pattern of the HM/FACR DIFF and the SHM means is nearly identical to that of the HM

means. The ANOVA on these scores produced the same pattern of effects as the HM scores, with the only exception being the finding of a marginal three- factor interaction using the SHM scores, $F(2, 90) = 3.01$, $MS_e = .501$, $p < .06$. This effect was significant using the HM measure. The complete ANOVA summary tables can be found in the Appendix.

The data regarding the initial face was analyzed using a $2 \times 3 \times 2$ between- subjects ANOVA. The ANOVA using the HM measure yielded no significant main effect for either presentation mode or post- exposure task, (both F 's < 1.0). There was no significant interaction, $F < 1.0$. There was, however, a significant main effect for target view, $F(1, 84) = 32.72$, $MS_e = 3.00$, $p < .001$, indicating that recognition is higher for the same view (mean = 5.104) than for different view (mean = 3.083). There were no other significant effects. The ANOVA on the PH, HM/FACR DIFF and SHM measures all showed the same test view effect (and no others). The ANOVA summary tables and means for these measures can be found in the Appendix.

Discussion

The third experiment had three purposes: 1) to replicate the results of Experiment 1 using the same type of stimuli, 2) to compare the

effectiveness of two different distractor activities, and 3) to compare recognition scores when targets were changed from study to test.

Inspection of the HM and PH scores reveals no presentation exposure main effect, suggesting that, in general, distributed presentation has no advantage over massed. However, the HM and HM/FACR DIFF scores did reveal a significant interaction of presentation mode, intervening task and test view which indicated that subjects in the different view/image targets conditions performed better if they received distributed presentation compared to those who received massed presentation.

In general, performance was quite poor for the different view conditions, but as mentioned above the combination of distributed presentation and imaging enhanced performance compared to the other different view condition. Why might this be the case? Subjects in the massed conditions were exposed to the targets for relatively long periods of consecutive time; they had time to "stare" at the faces. As a result, these subjects may have encoded very specific features of the target faces. On the other hand, subjects in the distributed conditions got several brief glimpses of the targets. The distributed subjects may have encoded more global (i.e., general) features. Thus, when the faces were altered between study and test, the more global (and unchanging) information that they

encoded might have been more useful for recognition than specific details which were no longer valid or helpful. As similar effect was found by Read et al. (in press).

An effect for post- exposure task was shown for all of the target recognition scores (HM, PH, HM/FACR DIFF, and SHM). The results show that imaging the targets yields better recognition scores than performing a letter- circling task, but this effect seemed to be true only when the same view was shown at study and test (with the exception noted above regarding the three- factor interaction effect). Based upon the results of Experiment 2, one would have expected lower recognition for the image initial face conditions than for the image targets conditions. This was not found. This result could be due to either the difficulty of the image initial face task or to the subject's failure to follow instructions. Many subjects commented that it was very difficult to image the initial face; perhaps this distractor task was too taxing for the subjects, perhaps they simply did not put out the effort to perform such a demanding task or perhaps, as recognition performance of the initial face indicates, they just did not image the initial face to the extent that was requested. If the subjects in the image initial face condition had performed as requested, they should have performed better on their recognition of this face at test

than subjects who imaged the target face or who did the letter circling task, but they did not.

An effect for test view was also found, showing that subjects in general recognize targets shown from the same view at both study and test better than from different views. This was true for both target and initial face recognition. Additionally, analysis revealed a significant interaction between post- exposure task and test view. When subjects saw the same view at study and test, letter- circling led to lower recognition than imaging the initial face, which was in turn lower than imaging the previous face. Again, this may be due to the difficulty of the imaging initial face task or to the subject's unwillingness to perform such a taxing task. This result also suggests that imaging the initial face is not as interfering as has been supposed (relative to the letter- circling task). These results suggest, then, that letter- circling is an effective distractor task.

General Discussion

The purpose of these three experiments was to explore the effects of 1) massed vs. distributed presentation of two kinds of complex visual-spatial stimuli (faces and plants), and 2) imaging and various post-exposure tasks on subsequent recognition performance. This discussion

addresses the following topics: consistent findings across experiments, inconsistent findings, theoretical and applied implications, and suggestions for future research.

Experiment 1 showed that subjects who imaged the target faces had higher recognition discrimination scores (and lower false alarms) than subjects in the distractor task conditions. Further, subjects in the distributed conditions had better recognition discrimination scores than subjects in the massed conditions. The discrimination measures indicated that the effects of presentation mode and post- exposure task is additive (i.e. , the highest recognition performance is seen with the combination of distributed presentation and imaging and the worst with massed presentation and letter- circling). However, the two target hit scores (HM and PH) showed that these two factors interact, but this appeared to be due a ceiling effect as three of the conditions had scores near the possible upper limit.

Experiment 2 examined the effect of presentation mode and post- exposure task on a different kind of complex visual- spatial stimuli-- pictures of plants. The target hit measures (HM, PH) and one of the discrimination measures showed that recognition performance was enhanced by imaging the previously seen target compared to doing the

distractor imaging task (imaging the initial face). Not only does this strongly support previous research on the beneficial effects of imaging, but it suggests that the effect can be generalized across other kinds of complex visual- spatial stimuli. Superiority of distributed presentation was only shown by the PFA scores. Distributed presentation decreased false alarms compared to massed presentation. Why the hit measures or the discrimination measures did not show this effect is not clear, but may be due to differences in the stimuli used or due to response criterion differences which might have been affected by the use of less familiar stimuli in this experiment.

Experiment 3 compared the effects of imaging with two kinds of distractor tasks and showed that imaging the target face produced better recognition performance (as indicated by the target hit and discrimination scores) than either of the two distractor tasks. In addition, the imaging distractor task (image initial face) produced significantly better target recognition than the letter- circling distractor task. This latter result suggests that the letter- circling task prevents rehearsal of the target faces better than the distractor imaging task (imaging the initial face) does. However, the effect of post- exposure task must be qualified as it interacted with test view. Differences between the post- exposure tasks

were primarily shown when the study to test view remained the same.

No effect of post- exposure task was noted when test view was changed because performance was, in general, quite low. The only exception to the finding of poor performance for the changed test view was when presentation was distributed and subjects imaged the target. In this case, performance was higher than in any other condition where test view was changed.

The beneficial effects of rehearsal via imaging has been supported in all three experiments. Apparently, imaging affects the "strength" of visual- spatial stimuli in memory. The underlying reason may be due to either continued encoding during the "off" period (e.g., Read, 1979) or rehearsal of the already stored information (e.g., Graefe & Watkins, 1980). The effect of imaging appears to be strongest when the same stimuli appears at study and at test as Experiment 3 failed to show much benefit of imaging when the target view was changed. However, the results also showed that imaging is facilitative for changed view targets when accompanied by distributed presentation.

All three experiments also demonstrated the superiority of distributed presentation to some extent, although its operation appears to be more complex than imaging. It was speculated in Experiment 3 that people who

see faces in a distributed manner tend to encode more general aspects of faces while those under massed presentation conditions tend to encode specific details. When the faces are altered between study and test, many of the specific features have changed and those subjects who remember more general (and more stable) characteristics tend to have higher recognition scores. It would be difficult to use this result in support of the encoding variability hypothesis given the very small amount of time that passed between stimulus presentations; however, the results of these experiments can easily be used to support the deficient processing theory. Such an approach would postulate that subjects in the massed conditions ceased to attend to the target faces, while those in the distributed conditions continued to show the orienting response, increasing the total amount of time they attended to the target faces, thereby resulting in higher recognition scores.

There were some interesting differences between the three experiments. For example, the effects shown by HM, PH, FACR, and PFA scores for Experiments 1 and 2 are almost opposites of each other. The HM and PH scores for Experiment 1 were not only significant for presentation condition but they showed a significant interaction between presentation condition and intervening task while the FACR and PFA

scores showed no presentation condition effect and no significant interaction. In contrast, the HM and PH scores for Experiment 2 showed no main effect for presentation condition and no interaction between it and intervening task, while the FACR scores for Experiment 2 showed a marginal effect of presentation condition and the PFA scores showed a significant effect of presentation condition. Experiment 3 (like Experiment 2) showed no effect for presentation condition on any measure. These discrepancies might be due to (1) the different types of stimuli utilized in the three experiments (faces and plants) which might have not only affected subjects ability to remember the targets but also might have affected how subjects responded to the stimuli at test, and/or (2) to the different kinds of post- exposure tasks (letter- circling, imaging distractor faces, and imaging targets) that were used.

Experiment 3 underscores the recent call by many researchers in the area of eyewitness identification that more concern is needed at making the experimental situation more ecologically valid. For example, the effects found using pictures that are identical at study and test might not be important. Future research should avoid such sterile conditions rarely encountered outside the laboratory (e.g., presenting identical pictures at study and test). The effect of presentation mode and imaging was much

larger in Experiment 3 when the view was maintained at study and at test than if the view was changed. Fortunately, the finding that distributed presentation and target imaging facilitates recognition in the changed view compared to all other conditions with changed view provides some support for the ecological validity of the present findings. A changed view from an initial encounter to a later encounter is the usual situation, and strategies that improve memory under this condition are important.

The present research has implications for practical applications in a number of areas of human learning: for forensic face identification settings, and for the learning of visual- spatial materials, in general. With regard to face identification, the present research suggests that persons who are under high risk of being involved in a crime situation (e.g., convenience store clerk, bank teller) might benefit from being prepared beforehand on how to best remember a face. The present research indicates that one way to facilitate memory of a face is to view the face in a distributed manner and to image the face during the intervening views. Persons attempting to retain a memory of a face should not simply stare at it for long periods of time trying to remember every detail, but should instead glance at the face briefly several times, attempting to image the face while looking away. Further research might be directed at

simulating a crime and having some subjects use the distributed view/imaging strategy while other subjects are not informed of a strategy. The present results would predict that the former condition would promote better subsequent memory than the latter condition. In addition, the present research might not only have application for persons involved directly in a crime scene but also for police officers who are often shown pictures of suspects for the purpose of assisting them in recognizing wanted persons.

The present research also has implications for the learning of other kinds of complex visual stimuli. Heretofore, no research has reported beneficial effects of distributed presentation using visual- spatial materials. The general finding that distributed presentation facilitates memory of both faces and plants suggests that memory of other kinds of complex visual stimuli might benefit from distributed presentation. The application of this finding could be useful in pilots learning to recognize enemy aircraft, a microbiologist learning to recognize different kinds of viruses, a birdwatcher learning to discriminate between different kinds of birds, and numerous other uses. With the advent of computers with graphics terminals being used in the classroom and in other training situations, software could be programmed to present stimuli multiple

times in a distributed manner for more efficient, facilitated learning.

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Appendix A: Experiment 1 materials and statistical analyses

Consent Form

To the prospective subject:

We are conducting a perception and memory experiment dealing with visual-spatial performance. The tasks you will be asked to perform will involve visual examination of materials and written responses. You will be provided with the necessary instructions and materials.

The results of your participation will remain confidential. Your performance will not be compared to that of other subjects-- rather, your results will be averaged with other subject's results so we can compare group averages under different conditions. Your anonymity is guaranteed.

There is no risk involved; nevertheless, you are free to withdraw without penalty.

PARTICIPANT'S CONSENT:

I have read the above statement and understand the conditions under which I agree to participate in this study.

**Signed,
(signature)**

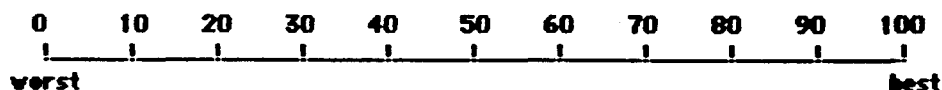
Print name below.

Course credit? _____

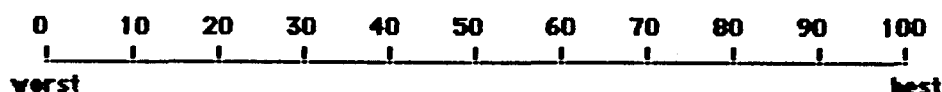
**If yes, please give course
number and section below.**

NAME: _____ SEX: M _____ F _____ Group _____

1. How do you think you rank compared to most people on visual/ spatial skills? Please indicate how good your visual/spatial skills are by circling a percentile (%) on the scale below:



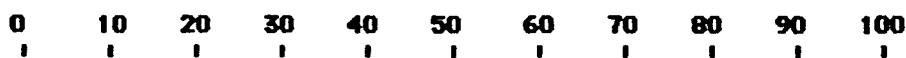
2. How do you think you rank compared to most people on verbal/ analytical skills? Please indicate how good your verbal/analytical skills are by circling a percentile (%) on the scale below:



The next two questions, 3A & 3B, are very similar. The first asks, "What strategies did you use to help you study the face when it was being presented?" The second one asks, "What strategies did you use to help you remember the face during the time between study presentations?" Please be sure that you make separate determinations for these two questions.

3A. *What strategies did you use to help you study the face when it was being presented?* Please look over the strategies shown below and then give the percent of time (%) these strategies were used when you were trying to remember the face when it was being presented at study. **NOTE:** The percentages across all strategies do not have to add up to 100%, since it may be possible that you can do more than one at the same time.

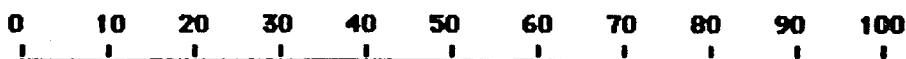
Looking at the individual features:



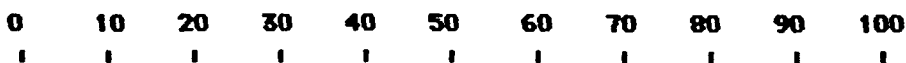
Looking at relationships between features and groups of features:



Imaging the whole face:



Naming or labeling features:



3B. What strategies did you use to help you remember the face during the time between study presentations? Please look over the strategies shown below and then give the percent of time (%) these strategies were used during the time interval between face presentations. **NOTE:** The percentages across all strategies do not have to add up to 100%, since it may be possible that you can do more than one at the same time.

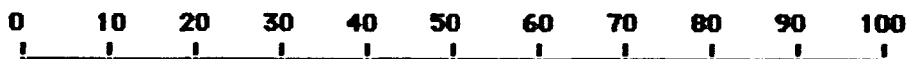
Looking at the individual features:



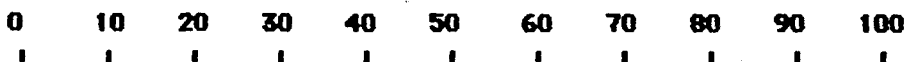
Looking at relationships between features and groups of features:



Imaging the whole face:



Naming or labeling features:



NAME: _____

3C. *What strategies did you use to help you remember the faces at test?* Please look over the strategies shown below and then give the percent of time (%) these strategies were used **when you were trying to remember the faces when they were being presented during the test phase.** ***NOTE:*** The percentages across all strategies **do not** have to add up to 100%, since it may be possible that you can do more than one at the same time.

Looking at the individual features:

0 10 20 30 40 50 60 70 80 90 100
|-----|

Looking at relationships between features and groups of features:

0 10 20 30 40 50 60 70 80 90 100
|-----|

Imaging the whole face:

0 10 20 30 40 50 60 70 80 90 100
|-----|

Naming or labeling features:

0 10 20 30 40 50 60 70 80 90 100
|-----|

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1 1 10 10 70 10 20 10 80 0 40 10 50 20
1 1 80 50 30 70 50 40 60 50 60 30 50 40
1 1 10 60 80 30 0 40 70 10 20 0 50 20
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1 1 30 8 90 90 25 10 88 90 40 10 70 20
1 1 50 30 70 20 50 0 70 0 70 40 70 0
1 1 70 80 60 50 40 80 50 40 70 60 60 40
1 1 80 30 70 30 30 10 90 10 80 20 70 20
1 1 70 0 10 40 80 0 5 30 50 0 20 30
1 1 90 30 60 60 80 20 90 20 20 30 90 50
1 1 80 30 40 70 40 10 80 60 90 70 10 60
1 1 70 30 70 70 70 30 70 70 65 40 90 75
1 1 75 85 95 55 45 65 95 65 90 80 70 60
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1 1 60 30 60 70 70 40 60 70 80 70 20 60
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1 1 50 50 30 20 50 70 40 40 80 60 80 30
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1 2 100 100 70 70 60 50 90 80 80 70 90 70
1 2 60 40 60 70 70 60 70 50 20 40 50 60
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1 2 45 75 95 45 35 35 25 25 55 95 95 45
1 2 70 50 60 30 80 30 50 60 60 30 90 50
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1 2 70 80 20 90 30 50 80 90 10 80 90 40
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2 1 20 10 70 0 10 10 80 0 40 10 50 0
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2 1 60 30 10 50 60 20 50 50 60 50 30 20
2 1 90 70 90 80 90 60 90 30 70 40 90 60
2 1 70 80 90 80 80 90 90 20 90 50 100 50
2 1 60 70 80 80 20 40 50 90 50 60 90 70
2 1 40 10 30 50 30 10 50 30 40 10 30 50
2 1 60 0 80 0 50 0 90 0 50 50 70 0
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2 1 50 20 70 0 30 40 70 0 30 10 60 0
2 1 50 0 100 0 50 0 100 0 0 0 100 0
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2 2 30 40 70 10 40 60 60 20 30 30 40 20
2 2 10 0 70 10 0 0 90 0 20 0 60 0
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2 2 70 20 90 100 20 20 50 100 40 20 70 90
2 2 80 30 30 80 80 30 30 80 80 30 80 30
2 2 80 30 90 20 10 10 80 30 80 30 90 40
2 2 30 30 70 10 10 10 80 10 30 10 70 30

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2	2	70	40	80	50	50	50	90	40	60	80	50	40
2	2	90	40	60	0	20	80	90	0	30	30	60	20
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2	2	50	20	90	60	30	30	60	50	50	40	70	60

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XUFOTDJSJ6GFDK6SJ6FDBJUWYHRIWLIQIURKJCBUWEYHRLIH6WY

NAME _____ COND _____

INSTRUCTIONS: For each of the slides that you will be shown please indicate whether you remember seeing that person earlier. Please also indicate your confidence in each answer by using the rating scale below.

N = No, not presented

Y = Yes, presented

Confidence Rating

1 = guessed

2 = probably correct

3 = certain

e.g. Y2 - probably presented

N3 - certain was not presented

Note: The faces you viewed earlier may not be presented in this set.

- | | | | |
|-----------|-----------|-----------|------------|
| 1. _____ | 26. _____ | 51. _____ | 76. _____ |
| 2. _____ | 27. _____ | 52. _____ | 77. _____ |
| 3. _____ | 28. _____ | 53. _____ | 78. _____ |
| 4. _____ | 29. _____ | 54. _____ | 79. _____ |
| 5. _____ | 30. _____ | 55. _____ | 80. _____ |
| 6. _____ | 31. _____ | 56. _____ | 81. _____ |
| 7. _____ | 32. _____ | 57. _____ | 82. _____ |
| 8. _____ | 33. _____ | 58. _____ | 83. _____ |
| 9. _____ | 34. _____ | 59. _____ | 84. _____ |
| 10. _____ | 35. _____ | 60. _____ | 85. _____ |
| 11. _____ | 36. _____ | 61. _____ | 86. _____ |
| 12. _____ | 37. _____ | 62. _____ | 87. _____ |
| 13. _____ | 38. _____ | 63. _____ | 88. _____ |
| 14. _____ | 39. _____ | 64. _____ | 89. _____ |
| 15. _____ | 40. _____ | 65. _____ | 90. _____ |
| 16. _____ | 41. _____ | 66. _____ | 91. _____ |
| 17. _____ | 42. _____ | 67. _____ | 92. _____ |
| 18. _____ | 43. _____ | 68. _____ | 93. _____ |
| 19. _____ | 44. _____ | 69. _____ | 94. _____ |
| 20. _____ | 45. _____ | 70. _____ | 95. _____ |
| 21. _____ | 46. _____ | 71. _____ | 96. _____ |
| 22. _____ | 47. _____ | 72. _____ | 97. _____ |
| 23. _____ | 48. _____ | 73. _____ | 98. _____ |
| 24. _____ | 49. _____ | 74. _____ | 99. _____ |
| 25. _____ | 50. _____ | 75. _____ | 100. _____ |

101. _____	126. _____	151. _____	176. _____
102. _____	127. _____	152. _____	177. _____
103. _____	128. _____	153. _____	178. _____
104. _____	129. _____	154. _____	179. _____
105. _____	130. _____	155. _____	180. _____
106. _____	131. _____	156. _____	181. _____
107. _____	132. _____	157. _____	182. _____
108. _____	133. _____	158. _____	183. _____
109. _____	134. _____	159. _____	184. _____
110. _____	135. _____	160. _____	185. _____
111. _____	136. _____	161. _____	186. _____
112. _____	137. _____	162. _____	187. _____
113. _____	138. _____	163. _____	188. _____
114. _____	139. _____	164. _____	189. _____
115. _____	140. _____	165. _____	190. _____
116. _____	141. _____	166. _____	191. _____
117. _____	142. _____	167. _____	192. _____
118. _____	143. _____	168. _____	193. _____
119. _____	144. _____	169. _____	194. _____
120. _____	145. _____	170. _____	195. _____
121. _____	146. _____	171. _____	196. _____
122. _____	147. _____	172. _____	197. _____
123. _____	148. _____	173. _____	198. _____
124. _____	149. _____	174. _____	199. _____
125. _____	150. _____	175. _____	200. _____

To the subject:

Your participation in this perception and memory study has been extremely helpful to applied cognitive psychologists investigating the underlying processes of face memory. In this study we are primarily interested in the effects of massed vs. distributed presentation and various post-exposure activities upon subsequent performance on a recognition memory test. We are investigating ways of facilitating recognition and exploring how increased memory performance could be of benefit in forensic applications.

If you are interested in the outcome of this study or would like further information related to this line of research, you may contact John Cayard (phone: 747-3519) or Dr. Michael S. Wogalter (phone: 289-8125), both located in the University of Richmond Psychology Department. Thank you for your participation.

It would be greatly appreciated if you would not discuss with anyone the purposes or the procedure of this study as it might affect the results of subsequent testings. Thanks.

	MASS(1)/DISTRIB(2)	IMAG(1)/DISTR(2)	HTMS	FACR	PROP HITS
1	1	1	5.50000	3.10448	1.00000
2	1	1	4.66667	1.02239	.83333
3	1	1	4.66667	2.60448	.66667
4	1	1	5.00000	1.50000	.83333
5	1	1	4.00000	1.21642	.66667
6	1	1	4.16667	2.70896	.66667
7	1	1	5.50000	1.59701	1.00000
8	1	1	3.16667	1.78358	.50000
9	1	1	5.00000	1.10448	.83333
10	1	1	5.00000	3.20149	1.00000
11	1	1	4.66667	3.38806	.83333
12	1	1	4.66667	1.55224	.83333
13	1	1	3.83333	2.41045	.50000
14	1	1	6.00000	2.88806	1.00000
15	1	1	3.66667	1.85821	.50000
16	1	1	4.66667	2.46269	.83333
17	1	1	5.50000	3.29104	1.00000
18	1	1	5.33333	2.28358	.83333
19	1	2	4.83333	3.03731	.83333
20	1	2	2.00000	1.99254	.16667
21	1	2	3.50000	2.88060	.50000
22	1	2	4.50000	1.41045	.83333
23	1	2	4.33333	3.05224	.50000
24	1	2	3.16667	2.54478	.16667
25	1	2	4.33333	2.05970	.83333
26	1	2	4.16667	3.35075	.50000
27	1	2	4.16667	3.76119	.66667
28	1	2	1.16667	1.41045	0
29	1	2	3.50000	2.95522	.50000
30	1	2	4.33333	2.83582	.66667
31	1	2	3.33333	2.97761	.50000
32	1	2	4.66667	1.76866	.83333
33	1	2	2.16667	2.47761	.16667
34	1	2	4.50000	2.35821	.66667
35	1	2	3.50000	1.80597	.33333
36	1	2	3.00000	2.97761	.16667
37	2	1	6.00000	1.37313	1.00000
38	2	1	5.83333	3.14925	1.00000
39	2	1	4.50000	1.23134	.66667
40	2	1	3.16667	1.67910	.50000
41	2	1	4.66667	1.52239	.66667
42	2	1	5.33333	1.44030	.83333

	MASS(1)/DISTRIB(2)	IMAG(1)/DSTR(2)	HTMS	FACR	PROP HITS
43	2	1	4.83333	2.56716	.83333
44	2	1	6.00000	1.58209	1.00000
45	2	1	4.16667	2.76866	.66667
46	2	1	5.00000	2.29104	.83333
47	2	1	4.16667	1.41045	.66667
48	2	1	4.33333	1.48507	.66667
49	2	1	5.16667	1.72388	.83333
50	2	1	5.50000	2.84328	1.00000
51	2	1	5.33333	1.30597	.83333
52	2	1	5.83333	2.86567	1.00000
53	2	1	6.00000	2.67164	1.00000
54	2	1	4.66667	1.17910	.66667
55	2	2	5.16667	2.73134	.83333
56	2	2	3.66667	2.89552	.66667
57	2	2	4.66667	3.02985	.83333
58	2	2	3.50000	2.04478	.66667
59	2	2	5.00000	2.90299	1.00000
60	2	2	4.33333	2.46269	.66667
61	2	2	5.33333	3.55970	1.00000
62	2	2	4.50000	2.38806	.83333
63	2	2	4.33333	2.57463	.66667
64	2	2	5.66667	1.23881	1.00000
65	2	2	5.50000	2.38806	1.00000
66	2	2	3.66667	1.17164	.83333
67	2	2	3.00000	1.58955	.50000
68	2	2	6.00000	2.14925	1.00000
69	2	2	4.83333	2.60448	.83333
70	2	2	5.16667	2.00746	.83333
71	2	2	5.83333	3.44776	1.00000
72	2	2	5.00000	2.08209	1.00000

	PROP FALSE ALARMS	NM/FACR DIFF	STANDARDIZED HTMS	PINDS	PRELFS
1	.41045	2.39552	1.29611	10	10
2	0	3.64428	4.18554	80	50
3	.25373	2.06222	1.26616	10	60
4	.02985	3.50000	2.80792	80	10
5	.03731	2.78358	2.52123	30	8
6	.30597	1.45771	.92729	50	30
7	.14925	3.90299	2.31098	70	80
8	.13433	1.38308	.94195	80	30
9	.01492	3.89552	3.71941	70	0
10	.44776	1.79851	.94205	90	30
11	.40298	1.27861	.85237	80	30
12	.02239	3.11443	2.84902	70	30
13	.17910	1.42289	1.13287	75	85
14	.37313	3.11194	1.58814	100	30
15	.12687	1.80846	1.36226	60	30
16	.23881	2.20398	1.46925	50	30
17	.46269	2.20896	1.21175	50	50
18	.19403	3.04975	1.83440	0	0
19	.40298	1.79602	1.00317	80	70
20	.12687	.00746	.00552	100	100
21	.38060	.61940	.36250	60	40
22	.08209	3.08955	2.32561	60	70
23	.34328	1.28109	.84400	80	30
24	.21642	.62189	.54422	60	80
25	.21642	2.27363	1.30162	45	75
26	.45522	.81592	.51376	70	50
27	.59702	.40547	.23530	80	50
28	.06716	-.24378	-.23624	90	50
29	.37313	.54478	.33005	30	10
30	.35821	1.49751	.82993	20	10
31	.44030	.35572	.21802	30	0
32	.17164	2.89801	1.84731	40	50
33	.23134	-.31095	-.22068	40	20
34	.20149	2.14179	1.40802	70	80
35	.06716	1.69403	1.44533	90	30
36	.37313	.02239	.01437	90	90
37	.05970	4.62687	3.27424	90	10
38	.42537	2.68408	1.32163	20	10
39	.04478	3.26866	2.59085	70	20
40	.10448	1.48756	1.19073	80	50
41	.06716	3.14428	2.53737	60	30
42	.08209	3.89303	2.63770	90	70

	PROP FALSE ALARMS	HM/FACR DIFF	STANDARDIZED HTMS	PINDS	PRELFS
43	.28358	2.26617	1.17308	70	80
44	.02985	4.41791	3.59150	60	70
45	.31343	1.39801	.97860	40	10
46	.17910	2.70896	1.72570	60	0
47	.02985	2.75622	2.56630	70	40
48	0	2.84826	2.94154	80	40
49	.12687	3.44279	2.08955	70	0
50	.33582	2.65672	1.73744	70	20
51	.03731	4.02736	3.05754	70	20
52	.42537	2.96766	1.71121	75	70
53	.26119	3.32836	2.17147	50	20
54	.03731	3.48756	2.81914	50	0
55	.26866	2.43532	1.51002	20	40
56	.35075	.77114	.48101	30	40
57	.36567	1.63682	1.05144	10	0
58	.20895	1.45522	.90757	60	20
59	.35075	2.09701	1.39201	20	30
60	.15672	1.87065	1.39573	90	50
61	.53731	1.77363	.91314	70	80
62	.20149	2.11194	1.47536	80	20
63	.26119	1.75871	1.08294	60	30
64	.02239	4.42786	3.82903	30	70
65	.23881	3.11194	1.95415	70	20
66	.02239	2.49502	2.73293	80	30
67	.07463	1.41045	1.20025	80	30
68	.20149	3.85075	2.06183	30	30
69	.26866	2.22886	1.33416	70	40
70	.17910	3.15920	2.81461	30	40
71	.47015	2.38557	1.52247	40	50
72	.17164	2.91791	2.13889	50	20

	PIMG5	PLABL5	PINDF1	PRELF1	PIMG1	PLABL1	PINDF2	PRELF2
1	70	10	20	10	80	0	40	10
2	30	70	50	40	60	50	60	30
3	80	30	0	40	70	10	20	0
4	90	60	60	0	90	10	50	20
5	90	90	25	10	88	90	40	10
6	70	20	50	0	70	0	70	40
7	60	50	40	80	50	40	70	60
8	70	30	30	10	90	10	80	20
9	10	40	80	0	5	30	50	0
10	60	60	80	20	90	20	20	30
11	40	70	40	10	80	60	90	70
12	70	70	70	30	70	70	65	40
13	95	55	45	65	95	65	90	80
14	60	50	70	20	90	90	100	10
15	60	70	70	40	60	70	80	70
16	70	80	30	20	90	60	20	40
17	30	20	50	70	40	40	80	60
18	0	0	90	80	40	60	30	40
19	40	30	30	70	80	20	90	70
20	70	70	60	50	90	80	80	70
21	60	70	70	60	70	50	20	40
22	20	10	40	30	90	10	50	40
23	80	40	30	10	90	20	90	20
24	60	20	10	60	30	30	40	50
25	95	45	35	35	25	25	55	95
26	60	30	80	30	50	60	60	30
27	80	20	80	30	70	40	20	30
28	90	60	90	30	90	60	80	30
29	60	70	20	30	60	70	70	20
30	70	30	30	20	60	40	20	40
31	80	0	10	10	80	0	30	20
32	80	80	40	50	70	70	60	50
33	90	20	30	30	80	20	30	50
34	20	90	30	50	80	90	10	80
35	40	70	20	10	80	65	70	30
36	90	40	30	50	10	10	60	30
37	90	90	10	90	90	20	90	50
38	70	0	10	10	80	0	40	10
39	90	40	20	40	90	60	30	50
40	80	20	60	50	90	10	70	50
41	10	50	60	20	50	50	60	50
42	90	80	90	60	90	30	70	40

	PIMGS	PLABLS	PINDF1	PRELF1	PIM61	PLABL1	PINDF2	PRELF2
43	90	80	80	90	90	20	90	50
44	80	80	20	40	50	90	50	60
45	30	50	30	10	50	30	40	10
46	80	0	50	0	90	0	50	50
47	20	50	70	30	20	60	80	20
48	40	80	90	60	30	70	80	80
49	80	20	60	0	90	0	80	0
50	10	30	10	0	80	20	80	10
51	40	80	30	0	90	60	50	0
52	80	80	80	60	70	70	65	70
53	70	0	30	40	70	0	30	10
54	100	0	50	0	100	0	0	0
55	70	30	40	30	70	60	10	40
56	70	10	40	60	60	20	30	30
57	70	10	0	0	90	0	20	0
58	70	40	20	60	90	10	20	40
59	40	10	10	10	70	10	20	20
60	30	40	40	20	50	30	20	40
61	80	40	40	80	80	60	70	60
62	90	30	70	50	80	40	70	70
63	90	40	40	40	80	20	50	20
64	90	20	40	90	90	40	40	80
65	90	100	20	20	50	100	40	20
66	30	80	80	30	30	80	80	30
67	90	20	10	10	80	30	80	30
68	70	10	10	10	80	10	30	10
69	80	50	50	50	90	40	60	80
70	80	0	20	50	90	0	30	30
71	20	10	40	40	40	10	30	30
72	90	60	30	30	60	50	50	40

	PIM62	PLABL2
1	50	20
2	50	40
3	50	20
4	100	10
5	70	20
6	70	0
7	60	40
8	70	20
9	20	30
10	90	50
11	10	60
12	90	75
13	70	60
14	80	90
15	20	60
16	80	50
17	80	30
18	80	100
19	30	10
20	90	70
21	50	60
22	70	20
23	80	20
24	30	10
25	95	45
26	90	50
27	90	30
28	90	90
29	70	40
30	70	10
31	80	0
32	20	70
33	80	20
34	90	40
35	70	60
36	50	20
37	70	90
38	50	0
39	90	30
40	80	30
41	30	20
42	90	60

	PIM62	PLABL2
43	100	50
44	90	70
45	30	50
46	70	0
47	20	50
48	70	80
49	70	20
50	10	30
51	60	50
52	90	70
53	60	0
54	100	0
55	70	30
56	40	20
57	60	0
58	70	40
59	30	30
60	30	20
61	80	70
62	100	50
63	90	40
64	80	30
65	70	90
66	80	30
67	90	40
68	70	30
69	50	40
70	80	20
71	50	0
72	70	60

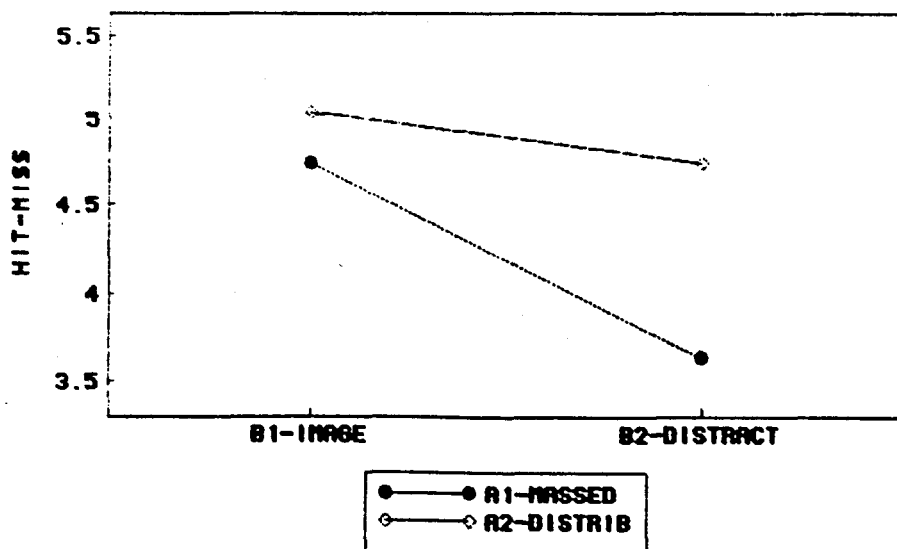
Anova Table for a 2-factor Analysis of Variance on Y1: HTMS

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	9.031	9.031	12.321	.0008
IMA6(1)/DSTR(2) (B)	1	8.797	8.797	12.001	.0009
AB	1	2.92	2.92	3.984	.0499
Error	68	49.844	.733		

There were no missing cells found.

The AB Incidence table on Y1: HTMS

IMA6(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		4.722	3.62	4.171
	level 2	18	18	36
		5.028	4.731	4.88
Totals:		36	36	72
		4.875	4.176	4.525



Anova table for a 2-factor Analysis of Variance on Y2: FACR

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	.735	.735	1.491	.2263
IMAG(1)/DSTR(2) (B)	1	2.667	2.667	5.409	.023
AB	1	.087	.087	.176	.6761
Error	68	33.532	.493		

There were no missing cells found.

The AB Incidence Table on Y2: FACR

IMAG(1)/DSTR...		level 1	level 2	Totals
MASS(1)...	level 1	18 2.221	18 2.536	36 2.379
	level 2	18 1.949	18 2.404	36 2.177
Totals		36 2.085	36 2.47	72 2.278

2 X 2 BETWEEN SUBJECTS DESIGN. MASS(1)/DISTRIB(2)/IMGEFACE(1)/IMGEPLNT(2)

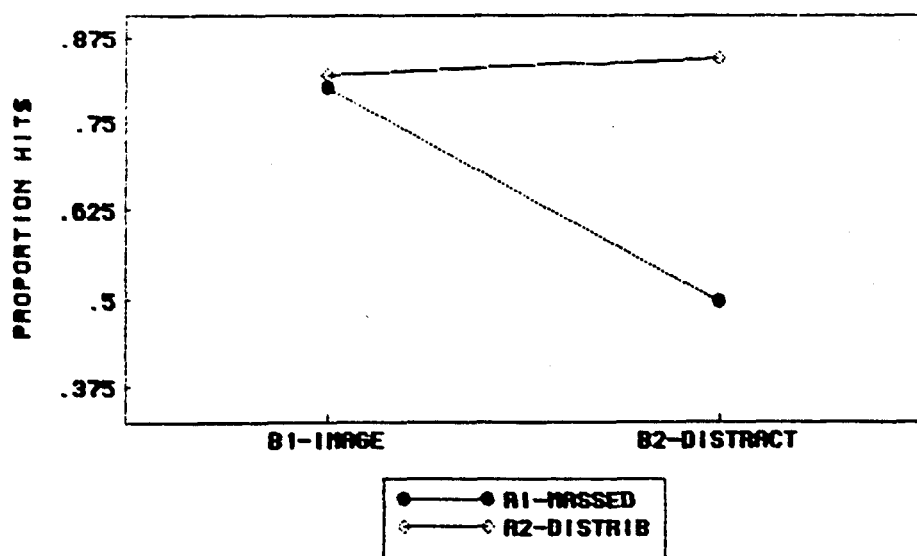
Anova Table for a 2-factor Analysis of Variance on Y3: PROP HITS

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	.617	.617	15.944	.0002
IMAG(1)/DSTR(2) (B)	1	.347	.347	8.966	.0038
AB	1	.5	.5	12.914	.0006
Error	68	2.633	.039		

There were no missing cells found.

The AB Incidence Table on Y3: PROP HITS

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		.796	.491	.644
	level 2	18	18	36
		.815	.843	.829
Totals:		36	36	72
		.806	.667	.736



2 x 2 BETWEEN SUBJECTS DESIGN. MASS(1)/DISTRIB(2)/IMGEFACE(1)/IMGEPLNT(2)

Anova Table for a 2-factor Analysis of Variance on Y4: PROP FALSE ALARMS

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	.04	.04	1.804	.1837
IMAG(1)/DSTR(2) (B)	1	.111	.111	5.029	.0282
AB	1	4.834E-4	4.834E-4	.022	.8828
Error	68	1.502	.022		

There were no missing cells found.

The AB Incidence Table on Y4: PROP FALSE ALARMS

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		.21	.284	.247
	level 2	18	18	36
		.158	.242	.2
Totals:		36	36	72
		.184	.263	.223

Anova Table for a 2-factor Analysis of Variance on Y5: HM/FACR DIFF

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	14.92	14.92	17.168	.0001
IMAG(1)/DSTR(2) (B)	1	21.152	21.152	24.339	.0001
AB	1	2	2	2.301	.1339
Error	68	59.097	.869		

There were no missing cells found.

The AB Incidence Table on Y5: HM/FACR DIFF

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		2.501	1.064	1.793
	level 2	18	18	36
		3.078	2.328	2.703
Totals:		36	36	72
		2.79	1.706	2.248

Anova table for a 2-factor Analysis of Variance on Y6: STANDARDIZED HTMS

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	7.426	7.426	10.855	.0016
IMA6(1)/DSTR(2) (B)	1	13.838	13.838	20.229	.0001
AB	1	1.209	1.209	1.767	.1882
Error	68	46.516	.684		

There were no missing cells found.

The AB Incidence Table on Y6: STANDARDIZED HTMS

IMA6(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18 1.845	18 .71	36 1.278
	level 2	18 2.229	18 1.611	36 1.92
	Totals:	36 2.037	36 1.16	72 1.599

Upper Triangle: .05 level ; Lower Triangle: .01 level

	A	B	C	D
A. A1 MASSE B2 DISTR	X	S	S	S
B. A1 MASSE B1 IMAGI	S	X	-	-
C. A2 DISTR B1 IMAGI	S	-	X	-
D. A2 DISTR B2 DISTR	S	-	-	X

Upper Triangle: .05 level ; Lower Triangle: .01 level

	A	B	C	D
A. A1 MASSE B2 DISTR	X	S	S	S
B. A1 MASSE B1 IMAGI	S	X	-	-
C. A2 DISTR B2 DISTR	S	-	X	-
D. A2 DISTR B1 IMAGI	S	-	-	X

ANOVA Summary Table for Mac Houston 1:CAVARD-EXP1 QUESTIONNAIRE

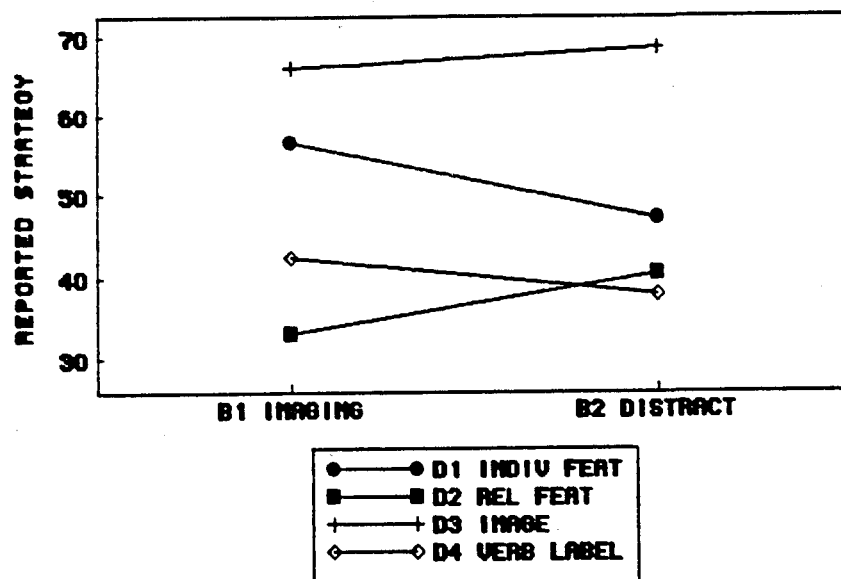
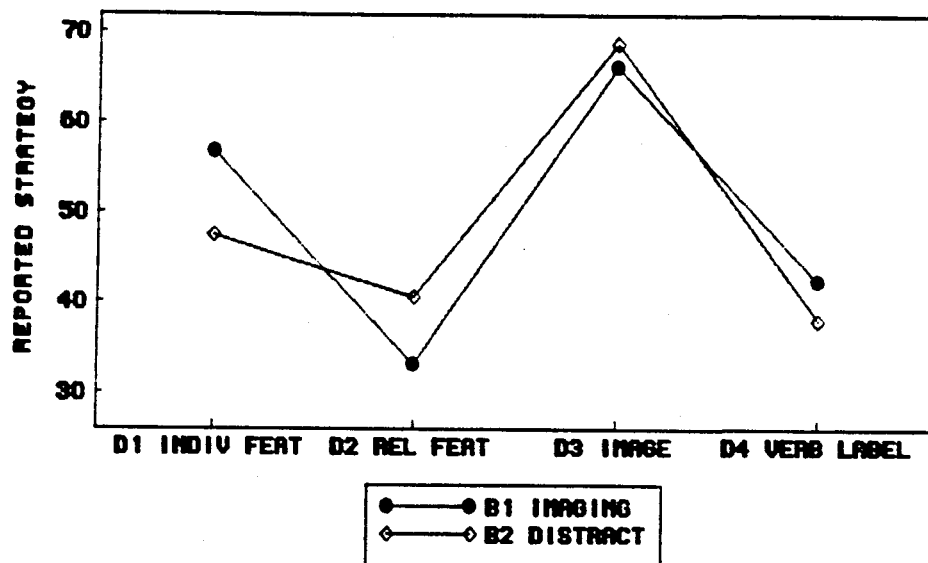
Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	1669.446	1669.446	.753	.3885	
B	1	195.510	195.510	.088	.7673	
AB	1	1475.279	1475.279	.666	.4174	
Error	68	150686.005	2215.971			
C	2	3211.444	1605.722	5.177	.0068	
AC	2	53.343	26.671	.086	.9177	
BC	2	401.583	200.792	.647	.5250	
ABC	2	822.370	411.185	1.326	.2691	
Error	136	42185.259	310.186			.91
D	3	123442.837	41147.612	38.756	.0000	
AD	3	2473.253	824.418	.777	.5083	
BD	3	8976.170	2992.057	2.818	.0401	
ABD	3	901.587	300.529	.283	.8376	
Error	204	216586.236	1061.697			.91
CD	6	9752.194	1625.366	5.668	.0000	
ACD	6	1608.444	268.074	.935	.4697	
BCD	6	1935.944	322.657	1.125	.3467	
ABCD	6	305.528	50.921	.178	.9829	
Error	408	117002.556	286.771			.82

E1 STUDY	51.1215
C2 POSTE	48.3993
C3 TEST	48.8021

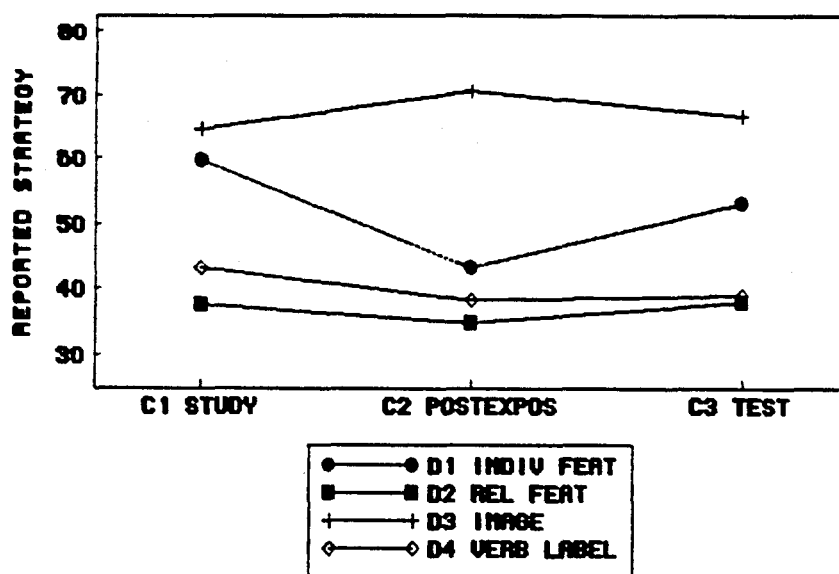
D1 INDIV	51.6898
D2 REL F	36.4954
D3 IMAGE	67.0278
D4 VERB	39.8843

B1 IMAGI B1 INDIV	56.3669
B1 IMAGI D2 REL F	32.7593
B1 IMAGI D3 IMAGE	65.7685
B1 IMAGI D4 VERB	42.0833
B2 DISTR D1 INDIV	46.9907
B2 DISTR D2 REL F	40.2315
B2 DISTR D3 IMAGE	68.2870
B2 DISTR D4 VERB	37.6852

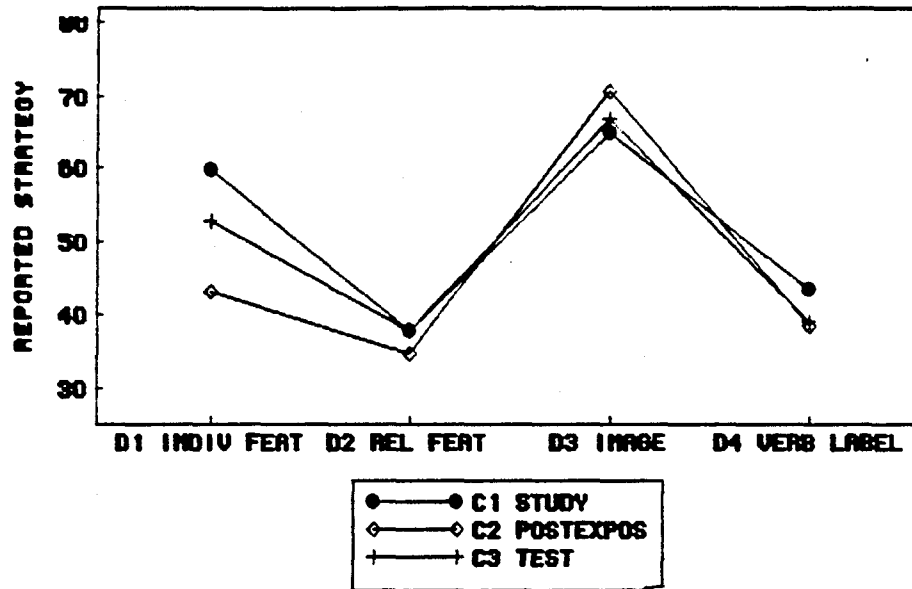
Effect	MSn	DFn	DFe	MSe	F	P
Bt D1 INDIV FEAT	4769.560	1	239	1350.266	3.532	.061
B at D2 REL FEAT	3015.042	1	239	1350.266	2.233	.136
B at D3 IMAGE	342.519	1	239	1350.266	.254	.615
Bt D4 VERB LABEL	1044.560	1	239	1350.266	.774	.380
D at B1 IMAGING	23296.710	3	204	1061.697	21.943	.000
D at B2 DISTRACT	20842.959	3	204	1061.697	19.632	.000



C1 STUDY D1 INDIV	69.5139
C1 STUDY D2 REL F	37.4722
C1 STUDY D3 IMAGE	64.4444
C1 STUDY D4 VERB	43.0556
C2 POSTE D1 INDIV	42.8472
C2 POSTE D2 REL F	34.4444
C2 POSTE D3 IMAGE	70.3194
C2 POSTE D4 VERB	37.0661
C3 TEST D1 INDIV	52.7083
C3 TEST D2 REL F	37.5694
C3 TEST D3 IMAGE	66.3194
C3 TEST D4 VERB	38.6111



Effect	MSn	DFn	DFe	MSe	F	p
Ct D1 INDIV FEAT	5056.019	2	136	357.230	14.153	.000
C at D2 REL FEAT	227.310	2	136	248.141	.916	.403
C at D3 IMAGE	648.375	2	136	327.934	1.977	.142
Ct D4 VERB LABEL	550.116	2	136	237.194	2.319	.102
D at C1 STUDY	11983.087	3	204	543.419	22.051	.000
D at C2 POSTEXPOS	19163.781	3	204	606.460	31.599	.000
D at C3 TEST	13251.476	3	204	485.360	27.302	.000



Anova Table for a 2-factor Analysis of Variance on Y7: PINDS

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	125.347	125.347	.212	.6465
IMAG(1)/DSTR(2) (B)	1	425.347	425.347	.719	.3996
AB	1	1556.681	1556.681	2.633	.1093
Error	68	40248.611	591.891		

There were no missing cells found.

The AB Incidence Table on Y7: PINDS

IMAG(1)/DSTR...		level 1	level 2	Totals:
MASS(1)...	level 1	16 58.611	18 63.056	36 60.833
	level 2	16 65.278	18 51.111	36 58.194
	Totals:	36 61.944	36 57.063	72 59.514

Anova table for a 2-factor Analysis of Variance on Yg: PRELFS

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	1233.389	1233.389	1.942	.168
IMAG(1)/DSTR(2) (B)	1	2134.222	2134.222	3.36	.0712
AB	1	747.556	747.556	1.177	.2819
Error	68	43198.778	635.276		

There were no missing cells found.

The AB incidence table on Yg: PRELFS

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...		18	18	36
	level 1	32.944	50.278	41.611
	level 2	31.111	35.556	33.333
Totals:		36	36	72
		32.028	42.917	37.472

Anova Table for a 2-factor Analysis of Variance on Yg: PIM6S

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	355.556	355.556	.525	.4711
IMAG(1)/DSTR(2) (B)	1	734.722	734.722	1.086	.3012
AB	1	12.5	12.5	.018	.8923
Error	68	46025	676.838		

There were no missing cells found.

The AB Incidence Table on Yg: PIM6S

IMAG(1)/DST...		level 1	level 2	Totals
MASS(1)...	level 1	18	18	36
		58.611	65.633	62.222
	level 2	18	18	36
		63.889	69.444	66.667
Totals:		36	36	72
		61.25	67.639	64.444

Anova Table for a 2-factor Analysis of Variance on Y10: PLABLS

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	800	800	1.009	.3188
IMAG(1)/DSTR(2) (B)	1	1334.722	1334.722	1.683	.1999
AB	1	312.5	312.5	.394	.5323
Error	68	53930.556	793.096		

There were no missing cells found.

The AB Incidence table on Y10: PLABLS

IMAG(1)/DST...		level 1	level 2	Totals
MASS(1)...	level 1	18 48.611	18 44.167	36 46.389
	level 2	18 46.111	18 33.333	36 39.722
	Totals:	36 47.361	36 38.75	72 43.056

Anova Table for a 2-factor Analysis of Variance on Y₁₁: PINDF1

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	475.347	475.347	.794	.3761
IMAG(1)/DSTR(2) (B)	1	2392.014	2392.014	3.994	.0497
AB	1	100.347	100.347	.168	.6836
Error	68	40723.611	598.877		

There were no missing cells found.

The AB incidence table on Y₁₁: PINDF1

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		50	40.833	45.417
	level 2	18	18	36
		47.222	33.333	40.278
Totals:		36	36	72
		48.611	37.083	42.847

Anova table for a 2-factor Analysis of Variance on Y12: PRELF1

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	68.889	68.889	.135	.714
IMA6(1)/DSTR(2) (B)	1	501.389	501.389	.764	.3851
AB	1	12.5	12.5	.019	.8906
Error	68	446.25	6.5625		

There were no missing cells found.

The AB Incidence Table on Y12: PRELF1

IMA6(1)/DST...		level 1	level 2	Totals
MASS(1)...	level 1	18 30.278	18 36.389	36 33.333
	level 2	18 33.333	18 37.778	36 35.556
	Totals	36 31.606	36 37.083	72 34.444

Anova table for a 2-factor Analysis of Variance on Y13: PIM61

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	260.681	260.681	.508	.4785
IMAG(1)/DSTR(2) (B)	1	120.125	120.125	.234	.6301
AB	1	2.347	2.347	.005	.9463
Error	68	34908.5	513.36		

There were no missing cells found.

The AB incidence table on Y13: PIM61

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18 69.889	16 66.944	36 68.417
	level 2	18 73.333	18 71.111	36 72.222
	Totals:	36 71.611	36 69.028	72 70.319

Anova Table for a 2-factor Analysis of Variance on Y14: PLABL1

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	1558.681	1558.681	1.913	.1712
IMAG(1)/DSTR(2) (B)	1	.347	.347	4.261E-4	.9636
AB	1	17.014	17.014	.021	.8855
Error	68	55406.944	814.608		

There were no missing cells found.

The AB Incidence Table on Y14: PLABL1

IMAG(1)/DST...		level 1	level 2	Totals
MASS(1)...	level 1	18 43.056	18 42.222	36 42.639
	level 2	18 32.778	18 33.889	36 33.333
Totals:		36 37.917	36 38.056	72 37.986

Anova table for a 2-factor Analysis of Variance on Y15: PINDF2

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASS(1)/DISTRIB(2)...	1	475.347	475.347	.783	.3794
IMA6(1)/DSTR(2) (B)	1	2508.661	2508.661	4.132	.046
AB	1	475.347	475.347	.783	.3794
Error	68	41287.5	607.169		

There were no missing cells found.

The AB Incidence table on Y15: PINDF2

IMA6(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18 58.611	18 51.944	36 55.276
	level 2	18 58.611	18 41.667	36 50.139
	Totals:	36 58.611	36 46.806	72 52.708

Anova table for a 2-factor Analysis of Variance on Y16: PRELF2

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value
MASS(1)/DISTRIB(2)...	1	292.014	292.014	.51	.4777
IMAG(1)/DSTR(2) (B)	1	703.125	703.125	1.227	.2718
AB	1	153.125	153.125	.267	.6068
Error	68	38951.389	572.815		

There were no missing cells found.

The AB Incidence table on Y16: PRELF2

IMA6(1)/DST..		level 1	level 2	Totals
MASS(1)...	level 1	16	18	36
		35	44.167	39.583
	level 2	18	18	36
		33.889	37.222	35.556
Totals:		36	36	72
		34.444	40.694	37.569

Anova Table for a 2-factor Analysis of Variance on Y17: PIM62

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	.347	.347	.001	.9808
IMAG(1)/DSTR(2) (B)	1	253.125	253.125	.424	.5173
AB	1	78.125	78.125	.131	.7187
Error	68	40618.056	597.324		

There were no missing cells found.

The AB Incidence Table on Y17: PIM62

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18 63.333	18 69.167	36 66.25
	level 2	18 65.556	18 67.222	36 66.389
	Totals:	36 64.444	36 68.194	72 66.319

Anova Table for a 2-factor Analysis of Variance on Y18: PLABL2

Source	df	Sum of Squares	Mean Square	F-test	P value
MASS(1)/DISTRIB(2)...	1	138.889	138.889	.203	.6538
IMAG(1)/DSTR(2) (B)	1	401.389	401.389	.587	.4464
AB	1	34.722	34.722	.051	.8225
Error	68	46536.111	684.355		

There were no missing cells found.

The AB Incidence Table on Y18: PLABL2

IMAG(1)/DST...		level 1	level 2	Totals:
MASS(1)...	level 1	18	18	36
		43.056	36.944	40
	level 2	18	18	36
		38.889	35.556	37.222
Totals:		36	36	72
		40.972	36.25	38.611

Appendix B: Experiment 2 materials and statistical analyses

Instructions

(to be read by the experimenter to the subject)

- 1. Ask subjects to read and sign consent forms.*
- 2. Read instructions and scenario slowly.*

In the first stage of the experiment, we would like you to imagine that you are working at a 7-11 convenience store as a clerk. You are working there to make some extra money and have been working there for the past 2 weeks in late night shift. It is a Tuesday night between 1 & 1:30 A.M. and a man comes into the store alone but you don't pay too much attention because you are waiting on another customer, a young woman. After the woman leaves the store, the man walks over to the counter and pulls out a gun from inside his jacket and points it at you. He says, "Open the cash register and give me the money." You are startled and frightened--afraid that he might do something bad to you. You open the register and give him all of the the bills. Before he yells to you to lie down on the floor, you take a good look at the man(show slide for 5 or 20 seconds).

RECOGNITION TEST

In the next section of the experiment, you will be shown a series of colored slides containing plants. You should examine each plant to determine whether or not you saw it earlier in the study session. If you did

not see that plant before then you should put a "N" on your response sheet. If you did see that plant before then you should put a "Y". Next to the Y or N you should indicate your confidence in your answer on the 1 to 3 scale shown on your response sheet--"1" indicating that you guessed, "2" indicating that your answer is probably correct, and "3" indicating that you are positive that your answer is correct. For example, an answer "Y2" would mean that you probably saw that plant before. An "N3" would mean that you are very certain that you never saw that plant earlier in the study list.

NOTE: You should make your answers according to whether you saw that plant before, not whether you saw a particular picture before--the quality of the picture may change. You should indicate whether you saw the plant before--not whether you saw a particular picture before. You should take note that the plant you saw earlier may or may not be in the following test list.

You will be given 8 seconds per plant to respond whether you saw the plant earlier in the study session. Allow yourself enough time to give your response before the next test plant is shown. Give your full attention to this task because otherwise you might lose track of what slide number we're on. Also it is important that if you see a plant that you've seen before, please do not say anything or do anything that might cue someone else in the room.

Any questions?

(REMINDERS: Repeat instructions as often as necessary--in your own words. Don't assume they understand them. Answer them by giving approximately the same information as was in the instructions--perhaps in different wording. Don't tell them much more than this.)

Write down any wierd things in the experiment, particularly if you see a person do something strange (e.g. something wierd about a subject, talking or laughing during the experiment, mechanical malfunctions, etc.).

NAME _____ COND _____

INSTRUCTIONS: For each of the slides that you will be shown please indicate whether you remember seeing that person earlier. Please also indicate your confidence in each answer by using the rating scale below.

N = No, not presented

Y = Yes, presented

Confidence Rating

1 = guessed

2 = probably correct

3 = certain

e.g. Y2 - probably presented

N3 - certain was not presented

Note: The faces you viewed earlier may not be presented in this set.

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| 7. _____ | 32. _____ | 57. _____ |
| 8. _____ | 33. _____ | 58. _____ |
| 9. _____ | 34. _____ | 59. _____ |
| 10. _____ | 35. _____ | 60. _____ |
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	IMAGEPL/FACE	MASSED/DISTRIB	IMAGE-TIMERATE	FACEHIT	CONFHT	MMTMS
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2	1	2	6	1	3	4.00000
3	1	2	6	0	1	2.33333
4	1	2	3	1	1	4.16667
5	1	2	1	1	3	1.66667
6	1	2	1	0	1	3.16667
7	1	2	6	1	2	4.66667
8	2	2	2	1	3	2.83333
9	2	2	5	1	3	4.16667
10	2	2	3	1	2	3.33333
11	2	2	1	1	3	1.83333
12	2	2	2	1	3	4.66667
13	2	2	3	1	3	4.00000
14	2	2	2	0	1	2.66667
15	2	2	3	1	3	3.83333
16	2	2	3	1	2	3.16667
17	1	1	3	0	1	5.16667
18	1	1	4	0	2	1.66667
19	1	1	3	1	3	2.83333
20	1	1	5	1	3	2.50000
21	1	1	5	1	3	2.50000
22	1	1	3	1	2	3.00000
23	1	1	2	1	3	1.00000
24	1	1	5	0	1	4.00000
25	2	1	2	1	3	2.83333
26	2	1	2	1	3	2.66667
27	2	1	3	0	3	4.00000
28	2	1	4	1	3	3.16667
29	2	1	4	1	3	4.33333
30	2	1	6	1	3	4.00000
31	2	1	3	1	3	3.33333
32	1	2	3	1	2	2.33333
33	1	2	5	1	3	2.33333
34	1	2	6	1	3	1.50000
35	1	2	1	1	3	1.83333
36	1	2	4	1	2	2.00000
37	2	2	3	1	3	1.66667
38	2	2	5	1	3	3.00000
39	2	2	2	1	3	4.00000
40	2	2	2	0	1	4.50000
41	2	2	2	1	3	2.50000
42	2	2	2	0	0	3.50000

	IMAGEPL/FACE	MASSED/DISTRIB	IMAGE-TIMEERRATE	FACENIT	CONFHT	NHTMS
43	1	1	5	1	3	2.50000
44	1	1	6	1	2	3.16667
45	1	1	4	1	2	4.33333
46	1	1	5	1	3	2.16667
47	2	1	2	0	2	4.33333
48	2	1	1	1	3	3.33333
49	2	1	2	1	3	4.16667
50	2	1	2	0	5	3.50000
51	2	2	3	0	2	4.50000
52	2	2	2	1	3	3.33333
53	2	2	2	1	3	4.33333
54	2	1	3	1	3	2.83333
55	2	1	2	1	3	4.83333
56	2	1	2	1	3	3.66667
57	2	1	2	0	2	3.83333
58	2	1	2	1	3	3.33333
59	2	1	1	1	3	4.16667
60	2	1	2	1	3	4.83333
61	2	1	2	0	3	4.16667
62	2	1	2	0	2	2.66667
63	1	2	3	1	3	3.66667
64	1	2	7	1	3	1.00000
65	1	2	4	1	3	2.00000
66	1	2	5	0	2	3.50000
67	1	2	2	1	3	2.83333
68	1	2	5	1	3	3.00000
69	1	2	6	1	3	2.66667
70	2	2	1	1	3	3.33333
71	2	2	2	1	3	2.33333
72	2	2	1	1	3	5.16667
73	1	1	6	1	2	3.83333
74	1	1	5	1	3	2.00000
75	1	1	6	1	3	3.33333
76	1	1	5	0	2	3.00000
77	1	1	5	1	3	3.33333
78	1	1	7	1	3	1.00000
79	1	1	7	1	2	2.50000
80	1	1	5	1	3	2.83333

	FACR	NM/FACR DIFF	Proportion Hit	Proportion False Alarm	STAND HIT-MIS
1	3.11594	1.05072	.83333	.31884	.83156
2	2.10145	1.89855	.66667	.15942	1.05669
3	1.30435	1.02899	.16667	.85797	.93544
4	1.82609	2.34058	.66667	.10145	1.56005
5	1.31884	.34783	.16667	.81449	.45263
6	2.33333	.83333	.50000	.21739	.51499
7	2.69565	1.97101	.83333	.26087	1.03903
8	1.33333	1.50000	.33333	.82899	1.47715
9	2.88406	1.28261	.66667	.26087	.82689
10	2.27536	1.05797	.50000	.20290	.62187
11	1.11594	.71739	.16667	.82899	.76733
12	1.63768	3.02899	.83333	.11594	1.78715
13	1.63768	2.36232	.50000	.14493	1.30657
14	2.15942	.50725	.33333	.23188	.26943
15	3.01449	.81884	.58000	.37681	.44349
16	1.55072	1.61594	.16667	.84348	1.48346
17	2.14493	3.02174	.83333	.23188	1.48947
18	1.47826	.18841	.16667	.10145	.14169
19	1.36232	1.47101	.50000	.11594	1.13764
20	1.91304	.58696	.16667	.88696	.48200
21	1.94203	.55797	.33333	.20290	.27546
22	1.65217	1.34783	.33333	.11594	1.00937
23	1.14493	-.14493	0	.82899	-.17986
24	2.76812	1.23188	.66667	.30435	.77398
25	1.44928	1.38406	.33333	.87246	1.03281
26	1.89855	.76812	.16667	.11594	.62408
27	3.44928	.55072	.50000	.44928	.28818
28	1.91304	1.25362	.33333	.13044	.89463
29	1.92754	2.40580	.83333	.14493	1.51511
30	1.37681	2.62319	.66667	.84348	1.92599
31	2.55072	.78261	.50000	.27536	.46715
32	2.15942	.17391	.16667	.14493	.13322
33	1.21739	1.11594	.16667	.84348	1.07142
34	1.17391	.32689	.16667	0	.52678
35	1.23188	.60145	.16667	.84348	.60885
36	1.76812	.23188	.16667	.10145	.16996
37	1.31884	.34783	.16667	.85797	.29860
38	1.53623	1.46377	.33333	.88696	1.07105
39	2.59420	1.40580	.50000	.34783	.64283
40	2.40580	2.09420	.83333	.17391	1.57777
41	1.68116	.81884	.16667	.88696	.69008
42	2.28986	1.21014	.50000	.18841	.69889

	FACR	HM/FACR DIFF	Proportion Hit	Proportion False Alarm	STAND HIT-MIS
43	1.79710	.70290	.33333	.13044	.45821
44	3.20290	-.03623	.33333	.44928	-.02038
45	3.10145	1.23188	.83333	.43478	.66958
46	2.37681	-.21014	.16667	.23188	-.11781
47	2.85507	1.47826	.83333	.37681	.66452
48	1.52174	1.81159	.50000	.88696	1.22640
49	2.47826	1.68841	.66667	.28985	.84547
50	2.84058	.65942	.50000	.39130	.35579
51	1.55072	2.94928	.66667	.11594	1.56448
52	2.88406	.44928	.66667	.42029	.23573
53	1.79710	2.53623	.83333	.14493	1.50447
54	2.75362	.87971	.33333	.34783	.84786
55	2.05797	2.77536	.66667	.21739	1.34391
56	1.66667	2.00000	.83333	.14493	1.27240
57	2.53623	1.29710	.50000	.24638	.86983
58	1.71814	1.62319	.50000	.84348	1.29713
59	1.49275	2.67391	.66667	.18145	1.54524
60	2.85507	1.97826	.83333	.31884	1.18354
61	3.37681	.78986	.66667	.49275	.31715
62	2.26087	.40580	.33333	.24638	.23835
63	2.39130	1.27536	.50000	.26887	.65599
64	1.36232	-.36232	0	.05797	-.36815
65	1.00000	1.00000	.16667	0	1.56662
66	1.46377	2.03623	.66667	.87246	1.55393
67	1.53623	1.29710	.33333	.11594	.91714
68	1.60870	1.39130	.33333	.18145	.97668
69	3.05797	-.39130	.33333	.43478	-.19062
70	2.59420	.73913	.33333	.23188	.49618
71	1.37681	.95652	.16667	.87246	.69515
72	1.50725	3.65942	.83333	.18145	2.05818
73	2.40580	1.42754	.66667	.27536	.77100
74	1.95652	.04348	.16667	.15942	.03183
75	2.31884	1.01449	.50000	.27536	.50577
76	2.44928	.55072	.33333	.24638	3.00000
77	3.14493	.18841	.66667	.46377	3.33333
78	1.04348	-.04348	0	0	1.00000
79	1.33333	1.16667	.33333	.82899	2.50000
80	1.78261	1.05072	.33333	.18145	2.83333

Anova table for a 2-factor Analysis of Variance on Y₁: IMAGE-TIMERATE

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	80.97	80.97	41.838	.0001
MASSED/DISTRIB (B)	1	2.561	2.561	1.323	.2536
AB	1	2.264	2.264	1.17	.2829
Error	76	147.082	1.935		

There were no missing cells found.

The AB incidence table on Y₁: IMAGE-TIMERATE

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL..	level 1	20	19	39
		4.8	4.105	4.462
	level 2	20	21	41
		2.45	2.429	2.439
Totals:		40	40	80
		3.625	3.225	3.425

Anova Table for a 2-factor Analysis of Variance on Y2: FACEHIT

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.032	.032	.176	.6762
MASSED/DISTRIB (B)	1	.049	.049	.27	.6051
AB	1	.072	.072	.396	.5306
Error	76	13.796	.182		

There were no missing cells found.

The AB incidence table on Y2: FACEHIT

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20	19	39
		.8	.789	.795
	level 2	20	21	41
		.7	.81	.756
Totals:		40	40	80
		.75	.8	.775

Anova table for a 2-factor Analysis of Variance on Y3: CONFHIT

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	1.814	1.814	3.301	.0732
MASSED/DISTRIB (B)	1	1.034	1.034	1.882	.1741
AB	1	.788	.788	1.434	.2349
Error	76	41.77	.55		

There were no missing cells found.

The AB incidence table on Y3: CONFHIT

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20	19	39
		2.45	2.421	2.436
	level 2	20	21	41
		2.95	2.524	2.732
Totals:		40	40	80
		2.7	2.475	2.588

Anova Table for a 2-factor Analysis of Variance on Y4: NHTMS

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	11.94	11.94	13.731	.0004
MASSED/DISTRIB (B)	1	.427	.427	.491	.4858
AB	1	.175	.175	.201	.6552
Error	76	66.087	.87		

There were no missing cells found.

The AB incidence table on Y4: NHTMS

MASSED/DIS...		level 1	level 2	Totals:
B-IMAGEPL...	level 1	20	19	39
		2.833	2.781	2.808
	level 2	20	21	41
		3.7	3.46	3.577
	Totals:	40	40	80
	3.267	3.138	3.202	

Anova Table for a 2-factor Analysis of Variance on Y5: FACR

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.503	.503	1.258	.2656
MASSED/DISTRIB (B)	1	1.406	1.406	3.517	.0646
AB	1	.011	.011	.029	.8661
Error	76	30.383	.4		

There were no missing cells found.

The AB incidence table on Y5: FACR

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20 2.066	19 1.825	39 1.946
	level 2	20 2.249	21 1.959	41 2.1
Totals:		40 2.157	40 1.895	80 2.026

Anova Table for a 2-factor Analysis of Variance on Y6: HM/FACR DIFF

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	7.542	7.542	10.99	.0014
MASSED/DISTRIB (B)	1	.264	.264	.413	.5222
AB	1	.097	.097	.141	.7084
Error	76	52.157	.686		

There were no missing cells found.

The AB Incidence Table on Y6: HM/FACR DIFF

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20	19	39
		.767	.956	.859
	level 2	20	21	41
		1.451	1.501	1.477
Totals:		40	40	80
		1.109	1.242	1.176

Anova table for a 2-factor Analysis of Variance on Y7: Prop Hits

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.399	.399	7.072	.0095
MASSED/DISTRIB (B)	1	.047	.047	.833	.3643
AB	1	.023	.023	.4	.5291
Error	76	4.291	.056		

There were no missing cells found.

The AB incidence table on Y7: Prop Hits

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20 .383	19 .368	39 .376
	level 2	20 .558	21 .476	41 .516
	Totals:	40 .471	40 .425	80 .448

Anova table for a 2-factor Analysis of Variance on Yg: Prop False Alarms

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.018	.018	1.127	.2917
MASSED/DISTRI (B)	1	.083	.083	5.136	.0263
AB	1	1.480E-4	1.480E-4	.009	.9242
Error	76	1.233	.016		

There were no missing cells found.

The AB incidence table on Yg: Prop False Alarms

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20 .199	19 .132	39 .166
	level 2	20 .227	21 .165	41 .195
Totals:		40 .213	40 .149	80 .181

2 X 2 Betw-Ss: ImageFace(1)vs.ImagePlant(2) & Massed(1)vs.Distrib(2)

Anova Table for a 2-factor Analysis of Variance on Yg: STAND HIT-MIS

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.088	.088	.172	.6794
MASSED/DISTRIB (B)	1	.177	.177	.347	.5577
AB	1	.599	.599	1.177	.2814
Error	76	38.703	.509		

There were no missing cells found.

The AB Incidence Table on Yg: STAND HIT-MIS

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL	level 1	20	19	39
		1.005	.737	.875
	level 2	20	21	41
		.898	.977	.938
Totals:		40	40	80
		.951	.863	.907

Anova table for a 2-factor Analysis of Variance on Y10: FaceHit*Conf

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
IMAGEPL/FACE (A)	1	.158	.158	.1	.7532
MASSED/DISTRIB (B)	1	.178	.178	.112	.7391
AB	1	.386	.386	.243	.6235
Error	76	120.806	1.59		

There were no missing cells found.

The AB incidence table on Y10: FaceHit*Conf

MASSED/DIS...		level 1	level 2	Totals:
IMAGEPL...	level 1	20	19	39
		2.15	2.105	2.128
	level 2	20	21	41
		2.1	2.333	2.22
Totals:		40	40	80
		2.125	2.225	2.175

Appendix C: Experiment 3 materials and statistical analyses

STUDY INSTRUCTIONS TO SUBJECTS

IN MASSED, IMAGING CONDITIONS:

In this experiment, I will first show you a slide of a person's face. You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I am going to show you six other faces and I would like for you to try to remember them as best you can. I will show you each face three times in quick succession. There will then be a time interval when no face will be shown. During this blank-time period, I would like for you to try to image, or visualize, the face you have just seen. Then I will show you the next face three times, and I would like for you to try to visualize it just as you did the previous face. Please follow this procedure for all of the faces I show you. Are there any questions?

One last thing-- try to remember the persons's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide-- concentrate on the face. The pose or facial expression may even be different when you are tested later. Is everything clear?

Let me reiterate that you should image the most recently seen face after I present each face the third time.

IN MASSED, IMAGE INITIAL FACE CONDITIONS:

In this experiment, I will first show you a slide of a person's face. Let's call this face the 'initial face.' You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I am going to show you six more faces. I will show you each face three times in quick succession. After you have seen the first face three times, there will then be a time interval when no face will be shown. During this blank-time period, I would like for you to try to image, or visualize, the very first face I showed you-- the 'initial face', not the face you just saw. In other words, for the face I just showed you, you should try to image it during the blank-time interval. Then I will show you another face three times; then there will be another time interval when no face is shown-- here again you should visualize the initial face. Then I will show you another face three times, followed by another blank-time period. During this period, you should try to visualize the initial face. Then I will show you another face and you should follow the same procedure with it. You will continue to do this for all the faces I show you.

So, everytime there is a period when no face is shown, you are to visualize the initial face, not the face you just saw. Are there any questions?

One last thing-- try to remember the persons's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide-- concentrate on the face. The pose or facial expression may be different when you are tested later. Is everything clear?

Let me palterate that you are to image the initial face during the blank-time periods.

IN MASSED, LETTER-CIRCLING

CONDITIONS:

In this experiment, I will first show you a slide of a person's face. You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I am going to show you six more faces. I will show you each of these six faces three times in quick succession. After you have seen each face three times, there will then be a time interval when no face will be shown. During this time period, we are doing another experiment. During this blank-time period (after each set of three slides), I would like for you to perform a letter-circling task-- this serves as a measure of your perceptual scanning ability. Perceptual scanning has been found in previous research to relate to face memory. So, after you see a face three times, there will be a blank time when no face will be shown. During this time, turn to the first page in your booklet and you will see a page of letters. There will be two letters printed at the top of the page in red ink. Your task is to find and circle as many of those 2 red letters on the page as you can--starting from the top. You should continue to circle all instances of those 2 letters throughout the blank-time period. When it is over, I will show you another face. You will also see it three times, just like the first face. After you see this second face three times, you should turn to the second page in your booklets and circle the letters indicated in red on that page. You will continue to circle these letters until the blank-time is over. You should follow this procedure for all of the faces I show you. Are there any

questions?

One last thing-- try to remember the persons's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide-- concentrate on the face. The pose or facial expression may even be different when you are tested later. Is everything clear? It is important that you look up after the blank-time interval is over so that you won't miss the next face.

Let me repeat: after the third time each face is shown, immediately start letter-circling; as soon as you see light being projected on the screen, you should immediately look up so that you don't miss the next face presentation.

IN DISTRIBUTED, IMAGING CONDITIONS:

In this experiment, I will first show you a slide of a person's face. You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I will show you six more faces and I would like for you to try to remember them as best you can. I will show you each face three times. After you see the first face the first time, there will be a short time interval when no face will be shown. During this period, I would like for you to try to image, or visualize, the face you just saw. Then I will show you the same face a second time. Please look at the face again. Then there will be another blank-time interval. Please try to visualize the face again. I will then show you the face one last time-- please image or visualize it again when the blank-time period begins. After you see the face three times, with a blank-time period after each presentation, you will see a second face three times with a blank-time period after each presentation. During each blank-time, you should image the most recently seen face. You should follow this procedure for all of the faces I show you. Are there any questions?

One last thing-- try to remember the person's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide-- concentrate on the face. The pose or facial expression may even be different when you are tested later. Is everything clear?

Let me reiterate: every time the screen is dark, try to visualize the face you most recently saw.

IN DISTRIBUTED, IMAGE INITIAL FACE CONDITIONS:

In this experiment, I will first show you a slide of a person's face. You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I am going to show you six more faces. I will show you each face three times. After you see the first face the first time, there will be a short time interval when no face will be shown. During this period, I would like for you to try to form an image, or visualize, the very first face I showed you-- the 'initial face', not the face you just saw. Then I will show you the same slide again. After you see this same face the second time, there will be another blank-time period when no face is shown. During this blank-time period, you should again image the initial face. Then I will show you the same slide one last time. After you see it the third time, there will be another blank-time period when you will again visualize the initial face. Then I will show you a second face three times with blank-time intervals between each presentation, just as I did with the first face. During all of these blank-time periods (when no face is shown), you should try to image, or visualize, the initial face.

So, everytime there is a period when no face is shown, you are to visualize the initial face, not the face you just saw. Are there any questions?

One last thing-- try to remember the persons's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide--

concentrate on the face. The pose or facial expression may even be different when you are tested later. Is everything clear?

Let me repeat: every time the screen is dark, try to visualize the initial face, not the face just presented.

IN DISTRIBUTED, LETTER-CIRCLING CONDITIONS:

In this experiment, I will first show you a slide of a person's face. You will not see it long so examine it carefully. I would like for you to examine it closely and try to remember it. (SHOW SLIDE)

Now, I am going to show you six more faces. I will show you each face three times. After you see the first face the first time, there will be a short time interval when no face will be shown. During this blank-time period, we are doing another experiment. During this blank-time period, I would like for you to perform a letter-circling task-- this serves as a measure of your perceptual scanning ability. Perceptual scanning has been found in previous research to relate to face memory. So, after you see the first face the first time, there will be a blank time when no face will be shown. During this time, turn to the first page in your booklet and you will see a page of letters divided into thirds. There will be two letters printed at the top of the page in red ink. Your task is to find and circle as many of those 2 red letters in the upper third of the first page as you can. When the blank-time period is over, I will show you the same face a second time. Please look at the face again. Then there will be another blank-time period when no face will be shown. During this interval, you should begin circling the same letters in the middle third of the first page. Then the same face will be shown a third time, followed by another blank-time period. During the blank-time interval, you should circle the same letters in the bottom third of the first page of your booklets. Then I will show you a second face. After you see it

the first time, turn to the second page of your booklets and circle the letters indicated in red in the upper third of that page. Then I will show you this face a second time. Then there will be another blank-time period, during which you should circle the same letters in the middle third of the second page, and so on. Follow the same procedure for all of the faces I show you. Are there any questions?

One last thing-- try to remember the persons's face, not any of the peculiarities of the slide. That is, don't concentrate on remembering any scratches or blotches on the slide-- concentrate on the face. The pose or facial expression may even be different when you are tested later. Is everything clear? Be sure to look up after the blank-time interval is over so that you won't miss the next presentation of the face.

Let me reiterate: after each slide will be a period when the screen is dark; during this period you should letter-circle. As soon as you see light being projected on the screen, you should immediately look up so that you don't miss the next face presentation.

Recognition Instructions for Subjects

Now, please turn to the next page in your booklets. You should see a series of numbered blanks. Please read the instructions printed at the top of the page

Let me go over the rating scale with you. If you are absolutely sure that you have seen a person before, write 'Y3'; if you think you've seen the face before, then write 'Y2'; if you're just making a guess that you've seen the face before, then write 'Y1'; if you are certain that a face was not presented before, then write 'N3'; if you think you've never seen that person before, then write 'N2'; finally, if you're just making a guess that you've never seen that person before, then write 'N1.'

I am now going to show you a sequence of faces. Some or all of the faces I have already shown you may appear again. If you recognize **ANY** of the faces I have already shown you, please mark that on your sheets according to the instructions. Some of the faces may be from a different view (or angle) and some of the faces may have a different expression than they had before. Mark whether or not you have seen that person before, not whether or not you have seen that particular picture before. Are there any questions?

	Sub	MASDSTR	POEXPOS	TARCON	INIFACE	INITF-HTMS	SAME-HTMS
1	1	1	1	1	1	2	5.33333
2	2	1	1	1	1	6	6.00000
3	3	1	1	1	1	6	5.66667
4	4	1	1	1	1	2	4.33333
5	5	1	1	2	1	6	6.00000
6	6	1	1	2	1	6	6.00000
7	7	1	1	2	1	5	6.00000
8	8	1	1	2	1	6	5.66667
9	9	1	1	1	2	3	6.00000
10	10	1	1	1	2	1	6.00000
11	11	1	1	1	2	1	4.33333
12	12	1	1	1	2	5	6.00000
13	13	1	1	2	2	4	6.00000
14	14	1	1	2	2	5	6.00000
15	15	1	1	2	2	2	6.00000
16	16	1	1	2	2	4	6.00000
17	17	1	2	1	1	6	4.33333
18	18	1	2	1	1	4	5.66667
19	19	1	2	1	1	6	4.66667
20	20	1	2	1	1	6	6.00000
21	21	1	2	2	1	5	5.66667
22	22	1	2	2	1	2	4.33333
23	23	1	2	2	1	4	4.00000
24	24	1	2	2	1	6	4.33333
25	25	1	2	1	2	1	4.66667
26	26	1	2	1	2	5	4.33333
27	27	1	2	1	2	4	5.66667
28	28	1	2	1	2	6	5.33333
29	29	1	2	2	2	6	4.00000
30	30	1	2	2	2	1	6.00000
31	31	1	2	2	2	1	6.00000
32	32	1	2	2	2	1	5.00000
33	33	1	3	1	1	2	5.00000
34	34	1	3	1	1	6	4.66667
35	35	1	3	1	1	6	2.66667
36	36	1	3	1	1	6	2.66667
37	37	1	3	2	1	5	3.66667
38	38	1	3	2	1	6	4.33333
39	39	1	3	2	1	5	4.66667
40	40	1	3	2	1	4	2.33333
41	41	1	3	1	2	2	2.33333
42	42	1	3	1	2	2	4.33333

	Sub	MASDSTR	POENPOS	TRACON	INIFACE	INITF-HTMS	SAME-HTMS
43	43	1	3	1	2	4	4.33333
44	44	1	3	1	2	5	2.00000
45	45	1	3	2	2	2	4.33333
46	46	1	3	2	2	3	5.00000
47	47	1	3	2	2	6	5.33333
48	48	1	3	2	2	5	4.00000
49	49	2	1	1	1	5	5.66667
50	50	2	1	1	1	6	6.00000
51	51	2	1	1	1	6	6.00000
52	52	2	1	1	1	6	5.66667
53	53	2	1	2	1	1	4.33333
54	54	2	1	2	1	6	6.00000
55	55	2	1	2	1	6	6.00000
56	56	2	1	2	1	6	6.00000
57	57	2	1	1	2	1	6.00000
58	58	2	1	1	2	6	6.00000
59	59	2	1	1	2	5	6.00000
60	60	2	1	1	2	2	5.66667
61	61	2	1	2	2	5	5.00000
62	62	2	1	2	2	3	4.00000
63	63	2	1	2	2	6	6.00000
64	64	2	1	2	2	2	6.00000
65	65	2	2	1	1	6	4.66667
66	66	2	2	1	1	6	4.00000
67	67	2	2	1	1	6	4.33333
68	68	2	2	1	1	6	6.00000
69	69	2	2	2	1	1	6.00000
70	70	2	2	2	1	4	4.33333
71	71	2	2	2	1	6	5.66667
72	72	2	2	2	1	5	6.00000
73	73	2	2	1	2	1	6.00000
74	74	2	2	1	2	1	6.00000
75	75	2	2	1	2	2	5.66667
76	76	2	2	1	2	6	4.33333
77	77	2	2	2	2	4	6.00000
78	78	2	2	2	2	1	4.33333
79	79	2	2	2	2	1	6.00000
80	80	2	2	2	2	5	5.66667
81	81	2	3	1	1	6	4.33333
82	82	2	3	1	1	5	4.33333
83	83	2	3	1	1	5	6.00000
84	84	2	3	1	1	6	6.00000
85	85	2	3	2	1	6	6.00000
86	86	2	3	2	1	5	5.66667
87	87	2	3	2	1	6	4.33333
88	88	2	3	2	1	6	5.33333
89	89	2	3	1	2	1	4.00000
90	90	2	3	1	2	2	3.33333
91	91	2	3	1	2	5	5.33333
92	92	2	3	1	2	2	4.66667
93	93	2	3	2	2	5	4.00000
94	94	2	3	2	2	1	2.66667
95	95	2	3	2	2	1	1.00000
96	96	2	3	2	2	1	5.66667

	DIFF-HIMS	SAME: NM/FACR DF	DIFF: NM/FACR DF	INITFAC: NM/FACR DF	DISUAL
1	1.00000	2.77169	-1.56160	-.5616	80
2	4.66667	3.56164	2.22830	3.5616	70
3	4.00000	3.50228	1.83560	3.8356	70
4	2.33333	1.63470	-.36530	-.6986	40
5	4.33333	3.17808	1.51140	3.1781	88
6	1.33333	4.71233	.84570	4.7123	80
7	3.66667	3.69863	1.36530	2.6986	70
8	5.00000	3.03653	2.36990	3.3699	70
9	4.66667	3.05479	1.72150	.8548	80
10	4.33333	3.16438	1.49770	-1.8356	90
11	3.66667	1.10046	.43380	-2.2329	78
12	4.66667	4.13699	2.80370	3.1370	38
13	4.66667	3.39726	2.06390	1.3973	78
14	3.66667	3.16438	.83110	2.1644	90
15	3.33333	3.32877	.66210	-.6712	60
16	4.33333	2.75342	1.88680	.7534	78
17	4.33333	1.84566	1.84570	2.7123	60
18	2.66667	1.96804	-1.83200	.3014	60
19	2.33333	1.88584	-.44750	3.2192	70
20	4.66667	2.50685	1.17350	2.5068	80
21	2.66667	4.63927	1.63930	3.9726	68
22	5.33333	1.18265	2.18260	-1.1507	60
23	3.66667	1.88822	1.47490	1.8882	90
24	4.66667	.45662	.79000	2.1233	78
25	2.33333	1.74886	-.58450	-1.9178	78
26	1.66667	2.44292	-.22370	3.1096	80
27	2.66667	2.85845	-.14160	1.1918	60
28	4.00000	2.97717	1.64380	3.6438	50
29	3.33333	1.00000	.33330	3.0000	50
30	4.00000	3.27397	1.27400	-1.7260	70
31	5.33333	3.97260	3.30590	-1.8274	90
32	3.66667	1.91781	.58450	-2.8822	50
33	3.00000	.98630	.98630	-.0137	50
34	4.66667	1.40639	1.40640	2.7397	50
35	2.33333	1.26941	.93610	4.6027	80
36	3.33333	1.25571	1.92240	4.5890	68
37	4.00000	.74886	1.08220	2.0822	50
38	5.00000	1.59361	2.26030	3.2603	60
39	4.00000	2.55708	1.89040	2.8904	90
40	2.33333	.16895	.16890	1.8356	10
41	2.66667	.67580	1.00910	.3425	20
42	5.33333	.71689	1.71690	-1.6164	40

	DIFF-NTMS	SAME: NM/FACR DF	DIFF: NM/FACR DF	INITFAC: NM/FACR DF	VISUAL
43	4.33333	1.38813	1.38810	1.0548	50
44	1.00000	.78082	-.21920	3.7808	90
45	4.66667	1.89498	2.22830	-.4384	50
46	4.33333	.82192	.15530	-1.1781	30
47	5.00000	2.51142	2.17810	3.1781	60
48	3.66667	1.41896	1.07760	2.4110	60
49	5.33333	2.99543	2.66210	2.5288	60
50	5.66667	3.79452	3.46119	3.7945	80
51	4.00000	4.91781	2.91781	4.9178	50
52	4.00000	1.95434	.28767	2.2877	50
53	2.66667	3.03196	1.36530	-.3014	80
54	2.66667	3.84932	.51598	3.8493	80
55	4.00000	3.76712	1.76712	3.7671	80
56	3.33333	3.28767	.62180	3.2877	58
57	4.33333	3.19178	1.52511	-1.8082	70
58	3.66667	2.86301	.52968	2.8630	90
59	2.66667	3.24658	-.88676	2.2466	90
60	2.00000	4.03653	.36986	.3699	80
61	4.33333	2.08219	1.41553	2.0822	58
62	6.00000	.46575	2.46575	-.5342	80
63	4.66667	3.67123	2.33790	3.6712	90
64	3.33333	4.86381	2.19635	.8630	80
65	3.00000	2.17352	.50685	3.5068	58
66	2.00000	2.39726	.39726	4.3973	58
67	1.80000	2.38813	-.94521	4.8548	68
68	2.66667	4.80822	1.47489	4.8082	80
69	1.00000	4.83562	-.16438	-.1644	60
70	4.66667	2.07306	2.40639	1.7397	50
71	3.33333	3.59817	1.26484	3.9315	80
72	5.00000	2.67123	1.67123	1.6712	70
73	2.00000	4.67123	.67123	-.3288	90
74	5.00000	4.50685	3.50685	-.4932	80
75	1.33333	4.22831	-.10502	.5616	60
76	4.66667	.49772	.83105	2.1644	70
77	3.66667	2.79452	.46119	.7945	58
78	4.66667	1.25114	1.58447	-2.0822	90
79	1.66667	4.53425	.20091	-.4658	70
80	5.00000	2.28311	1.61644	1.6164	60
81	1.80000	2.74429	-.58904	4.4110	65
82	3.33333	1.07306	.07306	1.7397	40
83	4.33333	2.90411	1.23744	1.9041	70
84	3.00000	2.93151	-.86849	2.9315	0
85	3.33333	3.97260	1.30594	3.9726	50
86	2.66667	3.43379	.43379	2.7671	30
87	6.00000	.51142	2.17808	2.1781	40
88	3.66667	2.03196	.36530	2.6986	40
89	1.66667	2.35616	.02283	-.6438	80
90	4.00000	-.26941	.39726	-1.6027	60
91	4.00000	3.89498	2.56164	3.5616	30
92	1.66667	2.92694	-.87306	.2603	50
93	4.00000	1.16438	1.16438	2.1644	60
94	1.66667	.58447	-.41553	-1.8822	40
95	1.80000	-.72603	-.72603	-.7260	80
96	4.66667	2.84475	1.84475	-1.8219	50

	VERBAL	INDFER	RELFS	IMBS	NAMLAB	INDFER2	RELFS2	IMBS2
1	70	60	10	80	99	30	20	80
2	60	60	40	70	60	70	60	60
3	60	70	50	80	30	60	50	60
4	60	60	90	80	80	20	80	80
5	80	50	40	30	0	20	40	50
6	70	50	40	80	70	40	40	80
7	70	70	50	10	60	80	50	10
8	70	90	90	70	60	80	90	70
9	60	70	50	70	80	60	50	80
10	80	20	0	80	90	20	0	90
11	60	99	99	40	10	99	99	40
12	80	50	50	80	60	30	0	90
13	85	80	60	65	15	50	20	70
14	99	60	40	99	0	99	40	99
15	80	40	20	30	20	30	30	40
16	70	60	40	10	30	70	50	20
17	90	80	70	70	40	90	40	90
18	80	80	30	40	70	80	30	40
19	80	90	50	90	70	80	60	90
20	80	70	60	70	70	50	50	60
21	60	40	30	30	60	30	30	40
22	80	80	40	20	60	90	30	30
23	80	90	90	99	80	99	99	99
24	80	30	30	80	30	30	40	60
25	70	90	30	90	10	70	50	90
26	40	80	50	90	40	90	20	90
27	60	20	30	60	80	20	20	40
28	50	99	30	90	80	90	70	90
29	35	60	5	30	70	50	20	60
30	40	90	70	80	80	90	80	30
31	80	50	10	50	30	20	10	70
32	60	80	30	80	40	50	20	70
33	50	80	60	80	50	80	60	80
34	40	80	0	30	0	90	0	20
35	80	90	20	20	0	0	0	99
36	90	90	20	40	99	20	30	40
37	60	60	80	70	80	40	70	30
38	70	70	30	99	80	50	30	99
39	60	90	30	40	40	90	40	50
40	40	40	0	50	30	30	0	70
41	70	40	20	10	30	30	10	20
42	90	70	30	10	20	10	30	70

	VERBAL	INDFER	RELS	IMGS	NAMLAB	INDFER2	RELS2	IMGS2
43	40	40	10	80	10	10	0	70
44	70	70	70	30	60	60	60	30
45	90	60	10	80	0	0	0	90
46	50	40	40	20	20	20	20	20
47	90	70	20	80	50	50	10	90
48	60	50	20	20	10	50	20	20
49	70	70	65	50	90	90	65	20
50	90	80	80	20	90	10	90	50
51	60	30	40	80	20	40	30	90
52	90	40	0	30	30	30	0	50
53	80	99	90	80	99	80	70	99
54	90	80	50	70	90	90	20	50
55	80	90	80	60	90	90	80	70
56	70	10	0	90	0	0	0	90
57	70	80	40	80	50	88	30	80
58	80	80	70	90	50	0	0	99
59	60	60	10	90	30	70	50	90
60	80	70	30	50	80	30	50	80
61	70	70	30	40	20	0	0	90
62	70	50	20	99	40	20	20	99
63	80	20	10	30	30	20	0	20
64	70	70	30	40	70	50	20	80
65	80	40	10	70	50	60	0	70
66	50	60	60	80	50	30	20	90
67	50	70	30	80	60	80	30	99
68	80	70	40	80	20	50	30	80
69	80	90	10	90	0	0	0	90
70	70	70	99	70	99	60	99	99
71	60	60	30	40	60	50	70	60
72	90	80	80	50	40	80	90	80
73	90	70	80	50	50	60	70	40
74	80	0	0	99	0	0	0	99
75	40	50	30	10	30	50	30	10
76	40	30	50	40	20	50	40	20
77	70	60	20	30	40	50	40	70
78	90	90	80	80	90	99	90	90
79	80	20	0	40	40	30	30	40
80	80	30	10	50	50	50	10	50
81	65	40	30	60	50	40	40	50
82	40	50	30	60	40	60	30	80
83	60	10	70	80	0	10	70	90
84	30	20	20	60	40	30	40	50
85	90	20	20	80	0	0	0	10
86	50	70	8	50	30	40	0	70
87	60	20	20	40	30	20	20	40
88	40	80	10	40	10	40	10	70
89	80	50	20	90	10	70	20	90
90	65	80	80	60	50	80	80	50
91	50	60	40	50	20	40	20	50
92	40	50	80	90	0	0	0	80
93	80	80	70	80	30	60	30	60
94	60	99	0	0	99	99	30	30
95	80	80	40	80	30	80	50	50
96	70	30	30	90	30	30	60	90

	NAMLAB2	FACR	PROP HIT-INITI...	PROPORTION FA	PROP HIT-SAME	PROP HIT-DIFF
1	99	2.56164	0	.28767	1.00000	0
2	70	2.43836	1	.16438	1.00000	.66667
3	70	2.16438	1	.20548	1.00000	.66667
4	00	2.69863	0	.16438	.66667	0
5	0	2.82192	1	.32877	1.00000	.66667
6	90	1.28767	1	.82740	1.00000	0
7	40	2.38137	1	.26027	1.00000	.66667
8	70	2.63014	1	.26027	1.00000	1.00000
9	70	2.94521	0	.41096	1.00000	1.00000
10	00	2.83562	0	.38356	1.00000	.66667
11	10	3.23288	0	.45205	.66667	.66667
12	40	1.86301	1	.12329	1.00000	1.00000
13	5	2.60274	1	.21918	1.00000	1.00000
14	60	2.83562	1	.45205	1.00000	.66667
15	10	2.67123	0	.28767	1.00000	.33333
16	30	3.24658	1	.45205	1.00000	.66667
17	60	3.28767	1	.42466	.66667	.66667
18	70	3.69863	1	.53425	1.00000	.33333
19	50	2.78882	1	.35616	.66667	.33333
20	70	3.49315	1	.47945	1.00000	1.00000
21	50	1.02740	1	0	1.00000	.33333
22	20	3.15068	0	.41096	.66667	1.00000
23	90	2.19178	1	.34247	1.00000	.66667
24	40	3.87671	1	.60274	.66667	.66667
25	40	2.91781	0	.38356	.66667	.33333
26	90	1.89041	1	.10959	.66667	0
27	60	2.80822	1	.27397	1.00000	.33333
28	99	2.35616	1	.26027	1.00000	.66667
29	00	3.00000	1	.35616	.66667	.33333
30	00	2.72603	0	.28767	1.00000	.66667
31	50	2.02740	0	.21918	1.00000	1.00000
32	50	3.08219	0	.43836	1.00000	.66667
33	50	2.01370	0	.18959	.33333	.33333
34	0	3.26027	1	.39726	.66667	1.00000
35	8	1.39726	1	.09589	.33333	.33333
36	99	1.41096	1	.09589	.33333	.33333
37	90	2.91781	1	.31507	.33333	.66667
38	00	2.73973	1	.36986	.66667	1.00000
39	20	2.10959	1	.15068	1.00000	.66667
40	30	2.16438	1	.27397	.33333	.33333
41	40	1.65753	0	.12329	.33333	.33333
42	20	3.61644	0	.52035	.66667	1.00000

	NAMLAB2	FACR	PROP HIT-INITI...	PROPORTION FA	PROP HIT-SAME	PROP HIT-DIFF
43	10	2.94521	1	.24658	.66667	1.00000
44	40	1.21918	1	.05480	.33333	0
45	0	2.43836	0	.13699	.66667	1.00000
46	20	4.17808	0	.68493	1.00000	.66667
47	10	2.02192	1	.36986	1.00000	.66667
48	10	2.58904	1	.32877	.66667	.66667
49	99	2.67123	1	.34247	1.00000	1.00000
50	90	2.20548	1	.24658	1.00000	1.00000
51	20	1.08219	1	.01370	1.00000	.33333
52	20	3.71233	1	.53425	1.00000	.66667
53	99	1.30137	0	.06049	.66667	.33333
54	70	2.15069	1	.16438	1.00000	0
55	98	2.23288	1	.31507	1.00000	.66667
56	10	2.71233	1	.26027	1.00000	.66667
57	50	2.00822	0	.31507	1.00000	1.00000
58	0	3.13699	1	.42466	1.00000	.66667
59	50	2.75342	1	.36986	1.00000	.33333
60	70	1.63014	0	.10959	1.00000	0
61	0	2.91781	1	.38356	.66667	.66667
62	0	3.53425	0	.50685	.66667	1.00000
63	50	2.32877	1	.27397	1.00000	1.00000
64	70	1.13699	0	.02740	1.00000	.66667
65	40	2.49315	1	.31507	1.00000	.33333
66	20	1.60274	1	.06049	.66667	.33333
67	50	1.94521	1	.21918	.66667	0
68	20	1.19178	1	.04110	1.00000	.33333
69	90	1.16438	0	.02740	1.00000	0
70	80	2.26027	1	.17808	.66667	1.00000
71	70	2.06849	1	.19178	1.00000	.33333
72	60	3.32877	1	.46575	1.00000	1.00000
73	50	1.32877	0	.02740	1.00000	0
74	0	1.49315	0	.13699	1.00000	1.00000
75	30	1.43836	0	.08219	1.00000	0
76	40	3.83562	1	.60274	.66667	1.00000
77	40	3.20548	1	.38356	1.00000	.66667
78	90	3.08219	0	.45205	.66667	1.00000
79	0	1.46575	0	.06049	1.00000	0
80	70	3.38356	1	.46575	1.00000	1.00000
81	40	1.58904	1	.12329	.66667	0
82	40	3.26027	1	.46575	.66667	.33333
83	0	3.09589	1	.35616	1.00000	.66667
84	20	3.06849	1	.45205	1.00000	.33333
85	0	2.02740	1	.09589	1.00000	.33333
86	30	2.23288	1	.26027	1.00000	.33333
87	30	3.82192	1	.56164	.66667	1.00000
88	10	3.30137	1	.46575	1.00000	.66667
89	10	1.64384	0	.05480	.66667	0
90	70	3.60274	0	.56164	.33333	.66667
91	20	1.43836	1	.09589	1.00000	.66667
92	0	1.73973	0	.05480	.66667	0
93	20	2.83562	1	.34247	.66667	.66667
94	99	2.08219	0	.15068	.33333	0
95	40	1.72603	0	.17808	0	0
96	20	2.82192	0	.32877	1.00000	1.00000

	SNM-Initial face	SNM-Same	SNM-Diff
1	-.39190	1.78519	-1.04500
2	2.34240	2.34236	1.39600
3	1.94270	1.76224	.85970
4	-.68530	1.48293	-.37568
5	1.67580	1.67580	.73300
6	3.75920	3.75919	-.16100
7	1.50390	2.11160	.69370
8	1.78270	1.59257	1.21230
9	-.87620	1.75193	.83402
10	-1.16230	1.76176	.78710
11	-.96140	.45504	.17170
12	1.75340	2.37135	1.54740
13	.91060	2.46043	1.42728
14	1.15240	1.73220	.37930
15	-.51300	2.01245	.32880
16	.39840	1.72631	.61970
17	1.33160	.47799	.47800
18	.21000	1.54302	-.85658
19	1.79010	1.02633	-.31838
20	1.47690	1.47692	.63450
21	3.39520	4.00903	1.24680
22	-.75740	.64244	1.24240
23	.94620	.94619	.75650
24	1.16690	.21821	.40800
25	-1.16450	1.03929	-.36310
26	2.09280	1.62578	-.24230
27	.94820	2.41818	-.22790
28	2.03600	1.63973	.84710
29	2.11090	.66136	.17820
30	-1.25350	2.08922	.75210
31	-.73200	2.11077	1.75170
32	-1.88970	.86881	.24260
33	-.88780	.91686	.91610
34	1.75600	.85546	.85550
35	3.50730	.88748	.62550
36	3.08720	.75504	1.22150
37	1.63320	.53757	.81150
38	1.45770	.66761	.98360
39	1.99620	1.74863	1.25340
40	1.02250	.07574	.07570
41	.19090	.42228	.65370
42	-.90090	.34478	.87860

	SNM-Initial face	SNM-Same	SNM-Diff
43	.83880	1.13703	1.13700
44	3.63540	.69770	-.28150
45	-.49930	1.48365	1.76690
46	-.85180	.56785	.89460
47	1.50310	1.16483	.99570
48	1.16160	.65377	.40450
49	1.13260	1.49425	1.31340
50	1.82020	1.82016	1.64560
51	3.53380	3.53382	1.98470
52	1.27600	1.88040	.18270
53	-.32720	2.03071	.85180
54	2.35490	2.35492	1.9690
55	1.83330	1.83333	.78940
56	2.18580	2.18583	.29436
57	-1.20120	1.85911	.83902
58	1.37460	1.37458	.18667
59	1.02560	1.51401	-.11396
60	.14670	2.83653	.14672
61	1.02700	1.02701	.67133
62	-.32800	.18649	1.21541
63	1.65550	1.65554	1.88631
64	.49930	3.89857	1.63237
65	2.85030	1.23727	.22103
66	3.43120	1.81178	.19231
67	2.22130	1.28406	-.59048
68	3.27490	3.27494	.85578
69	-.29720	4.10556	-.29718
70	1.02180	1.24149	1.46122
71	2.22330	2.02297	.62091
72	.69880	1.16854	.69877
73	-.43710	3.72606	.39550
74	-.48370	2.58749	1.97325
75	.32840	3.33878	-.21894
76	1.31070	.26423	.47353
77	.60770	2.44230	.30194
78	-1.31120	.70991	.91202
79	-.46820	3.20368	.02142
80	.87330	1.27479	.87328
81	2.66070	1.62336	-.45122
82	1.13010	.68031	.00562
83	1.32470	2.09271	.81276
84	1.60130	1.60132	-.12207
85	2.61790	2.61787	.74378
86	1.57440	1.98002	.15465
87	.96600	.18063	.96597
88	1.59640	1.18307	.14982
89	-.66480	2.88615	-.05349
90	-.97510	-.15612	.25337
91	2.10100	2.31487	1.45949
92	.13320	2.50101	-.16279
93	1.32260	.67741	.67741
94	-.76120	.41897	-.28915
95	-.44150	-.44150	-.44150
96	-1.25400	1.78908	1.07413

HTMS

Experiment 3 - Cogard

Anova table for a 3-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MIASDSTR (A)	1	.07	.07	.044	.8341
POEXPOS (B)	2	30.031	15.016	9.467	.0002
AB	2	.209	.105	.066	.9361
subjects w. groups	90	142.753	1.586		
Repeated Measure (C)	1	100.63	100.63	114.859	.0001
AC	1	4.792	4.792	5.47	.0216
BC	2	13.17	6.585	7.516	.001
ABC	2	5.612	2.806	3.203	.0453
C x subjects w. groups	90	78.851	.876		

There were no missing cells found.

The AB incidence table

POEXPOS:		level 1	level 2	level 3	Totals:
MIASDSTR	level 1	32 4.719	32 4.292	32 3.729	96 4.247
	level 2	32 4.781	32 4.24	32 3.833	96 4.285
Totals:		32 4.75	32 4.266	32 3.781	192 4.266

The AC incidence table

Repeated Mea...		SAME-HT...	DIFF-HTMS	Totals:
MIASDSTR	level 1	48 4.812	48 3.681	96 4.247
	level 2	48 5.167	48 3.403	96 4.285
Totals:		96 4.99	96 3.542	192 4.266

$$t_{crit} = 1.99$$

$$LSD = t \sqrt{\frac{2 MSe}{5}}$$

$$LSD_B = 1.99 \sqrt{\frac{2(1.586)}{32}} = .6265 \approx .63$$

$$LSD_{AC} = 1.99 \sqrt{\frac{2(.876)}{48}} = .3802 \approx .38$$

$$LSD_{BC} = 1.99 \sqrt{\frac{2(.876)}{32}} = .4656 \approx .47$$

$$LSD_{ABC} = 1.99 \sqrt{\frac{2(.876)}{16}} = .6585 \approx .66$$

The BC incidence table

		All Diff ↓	No Diff ↓		
Repeated Mea...		SAME-HT...	DIFF-HTMS	Totals:	
FOEXPOS	level 1	32	32	64	
		5.677	3.823	4.75	
	level 2	32	32	64	
		5.156	3.375	4.266	
	level 3	32	32	64	
		4.135	3.427	3.781	
Totals:		96	96	192	
		4.99	3.542	4.266	

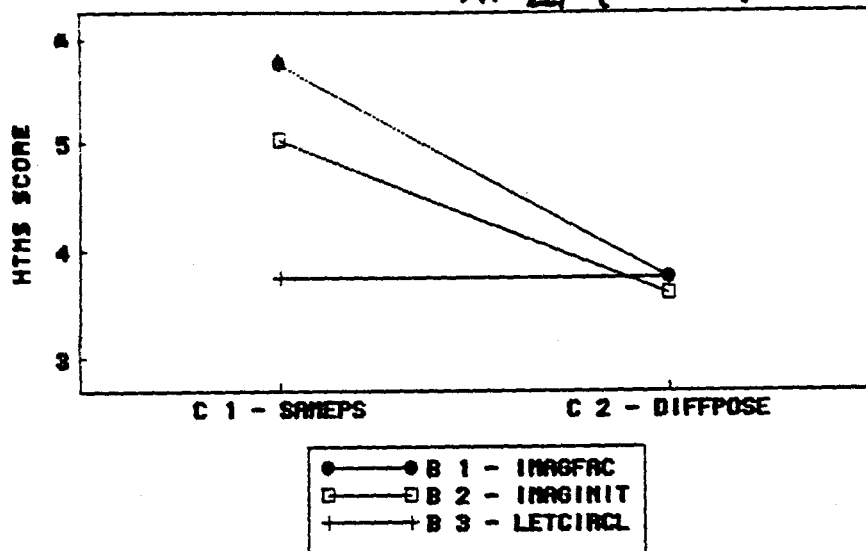
Page 1 of the ABC incidence table

POEXPOS:		level 1		level 2		level 3
Repeated Mea...		SAME-HT...		DIFF-HTMS		SAME-HT...
MASDSTR	level 1	16	16	16	16	16
		5.708	3.729	5	3.583	3.729
	level 2	16	16	16	16	16
		5.646	3.917	5.312	3.167	4.542
Totals:		32	32	32	32	32
		5.677	3.823	5.156	3.375	4.135

Page 2 of the ABC incidence table

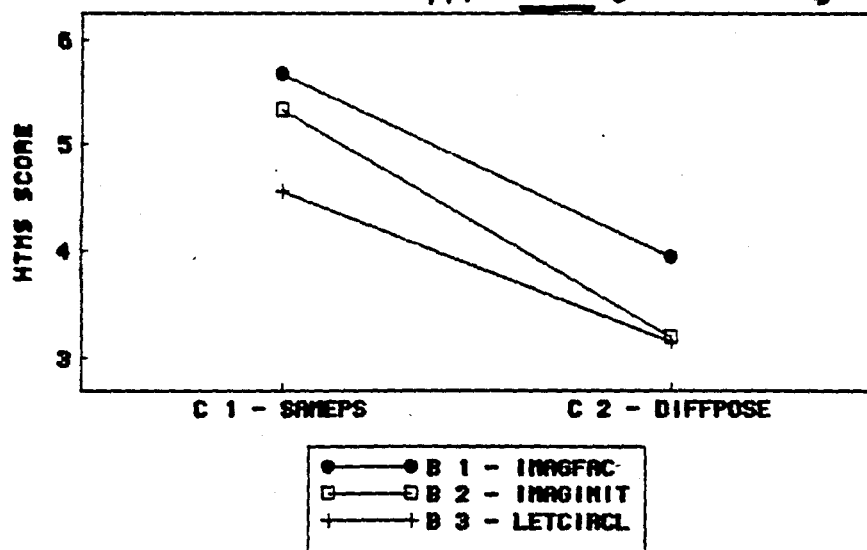
POEXPOS:		level 3	Totals:
Repeated Mea...		DIFF-HTMS	
MASDSTR	level 1	16	96
		3.729	4.247
	level 2	16	96
		3.125	4.285
Totals:		32	192
		3.427	4.266

A + A₁ (Massed)

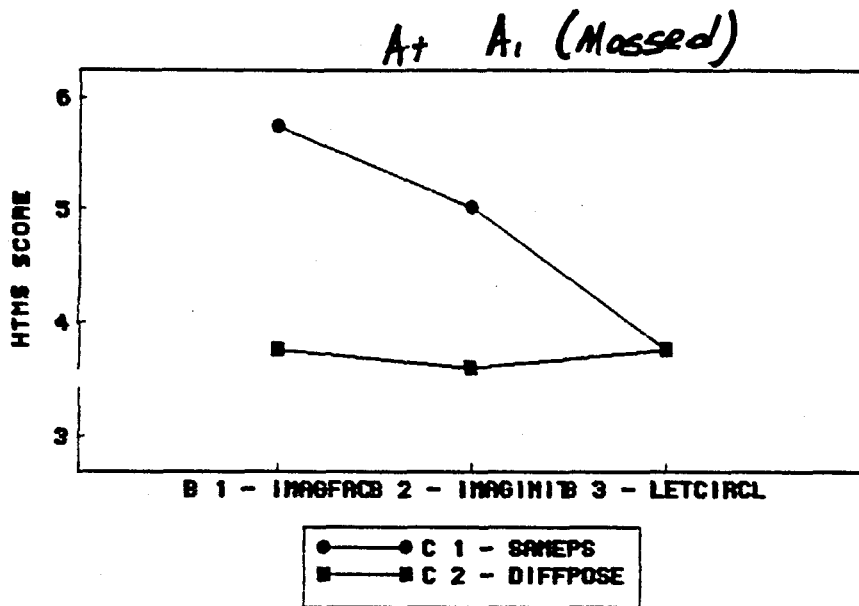


HTMS
ABC interaction

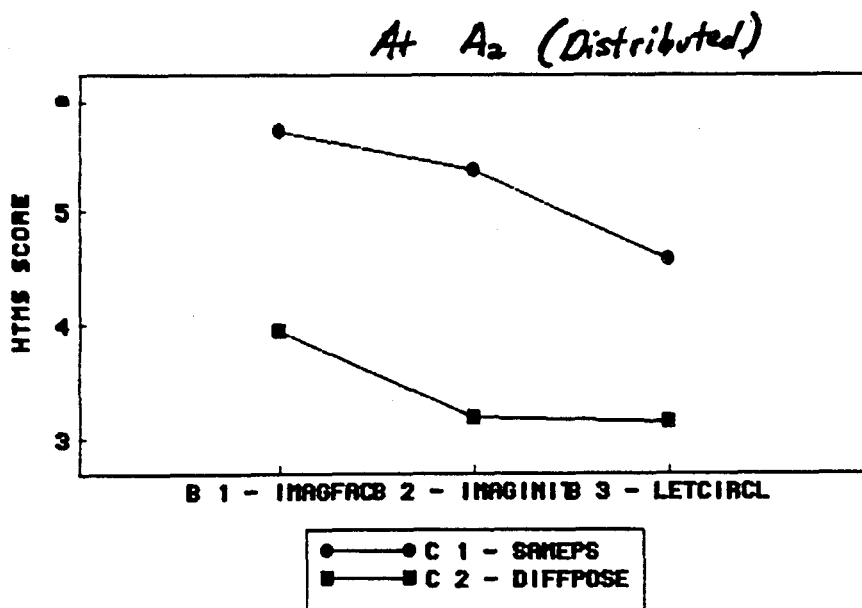
A + A₂ (Distributed)



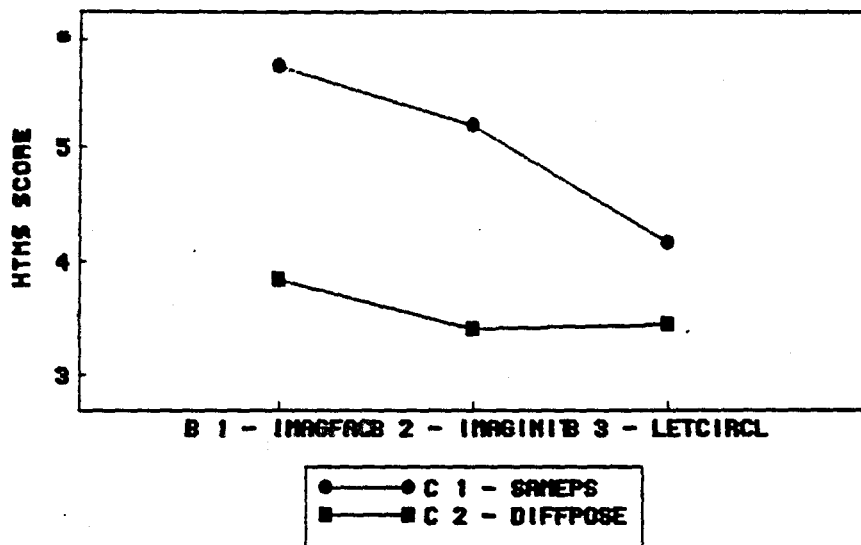
HTMS
ABC interaction



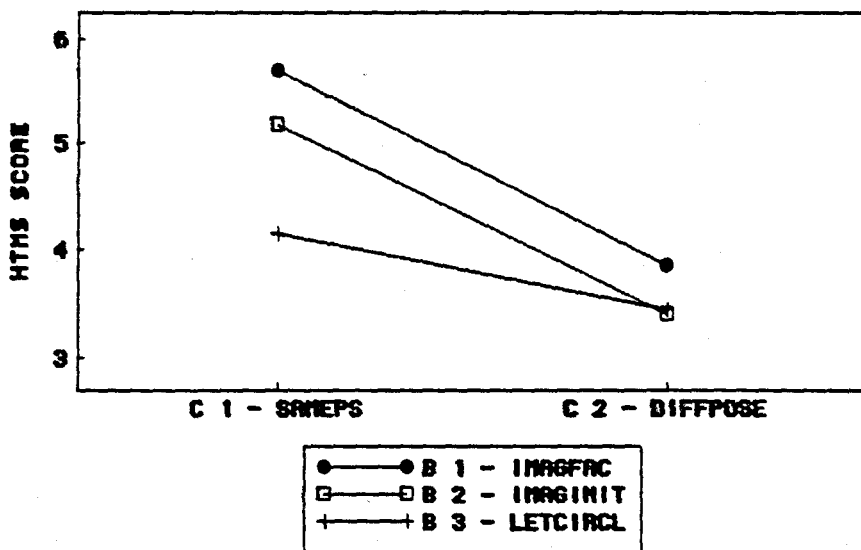
Section II
Reversed
BC view



Section II
Reversed
BC view
ABC interaction
HTMS



BC interaction
HTMS



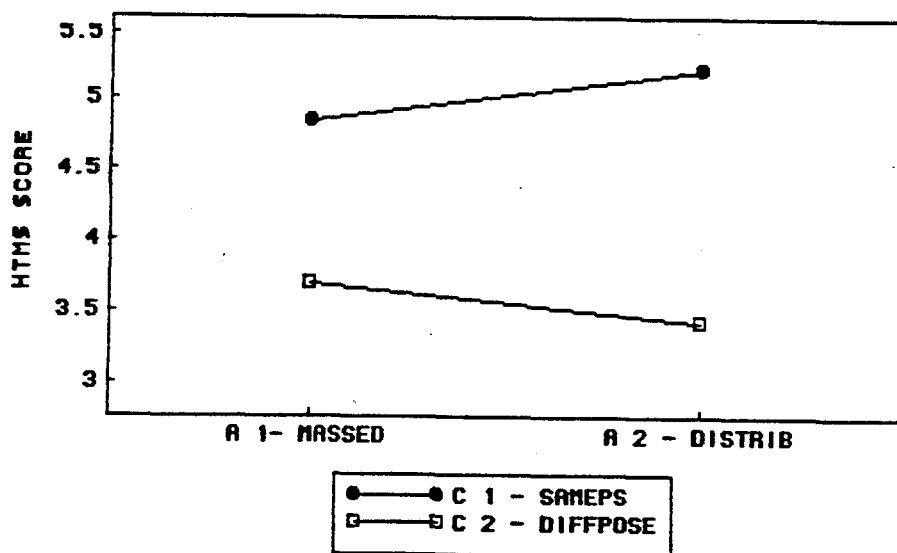
Reverse View
BC interaction
HTMS

Effect	MSn	DFn	DFe	MSe	F	P
Bat C 1 - SAMEPS	19.681	2	166	1.231	15.986	.000
B C 2 - DIFFPOSE	1.920	2	166	1.231	1.560	.213
Ct B 1 - IMAGFAC	55.007	1	90	.876	62.785	.000
C B 2 - IMAGINIT	50.766	1	90	.876	57.944	.000
C B 3 - LETCIRCL	8.028	1	90	.876	9.163	.003

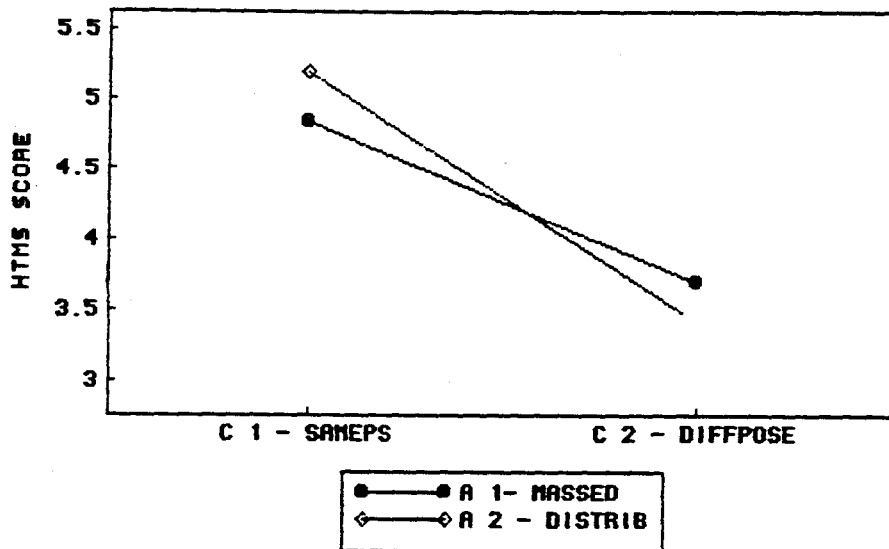
*Simple effects BC interaction
HTMS*

Effect	MSn	DFn	DFe	MSe	F	P
Aat C 1 - SAMEPS	3.010	1	166	1.231	2.445	.120
A C 2 - DIFFPOSE	1.852	1	166	1.231	1.504	.222
C at A 1- MASSED	30.751	1	90	.876	35.099	.000
Ct A 2 - DISTRIB	74.671	1	90	.876	85.230	.000

Simple effects-AC interaction



*AC interaction
HTMS*



Reverse View
AC interaction
HTMS

Upper Triangle: .05 level ; Lower Triangle: .01 level

	A	B	C
A. B 3 - LE	X	S	S
B. B 2 - IM	-	X	S
C. B 1 - IM	S	-	X

t-tests: B

Proportion Hit

Anova table for a 3-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	.009	.009	.094	.7602
POEXPOS (B)	2	1.203	.601	6.088	.0033
AB	2	.008	.004	.041	.9598
subjects w. groups	90	8.889	.099		
Repeated Measure (C)	1	3.521	3.521	53.431	.0001
AC	1	.231	.231	3.513	.0641
BC	2	.441	.22	3.346	.0397
ABC	2	.321	.16	2.433	.0936
C x subjects w. groups	90	5.931	.066		

There were no missing cells found.

$$LSD_B = 1.99 \sqrt{\frac{2(.099)}{32}} = .1565$$

$$\approx .16$$

$$LSD_{BC} = 1.99 \sqrt{\frac{2(.066)}{32}} = .1278$$

$$= .13$$

The AB incidence table

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	32	32	32	96
		.781	.708	.604	.698
	level 2	32	32	32	96
		.781	.698	.573	.684
Totals:		64	64	64	192
		.781	.703	.589	.691

The AC incidence table

Repeated Mea...		PROP HIT...	PROP HIT...	Totals:
MASDSTR	level 1	48	48	96
		.799	.597	.698
	level 2	48	48	96
		.854	.514	.684
Totals:		96	96	192
		.826	.556	.691

The BC incidence table

Repeated Mea...		PROP HIT...	PROP HIT...	Totals:
POEXPOS	level 1	32 .948	32 .615	64 .781
	level 2	32 .875	32 .531	64 .703
	level 3	32 .656	32 .521	64 .589
Totals:		96 .826	96 .556	192 .691

Page 1 of the ABC incidence table

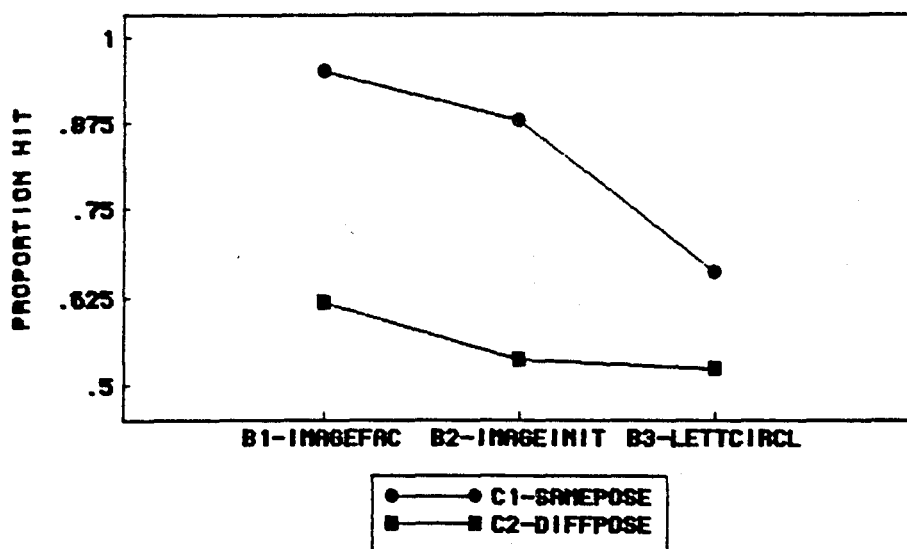
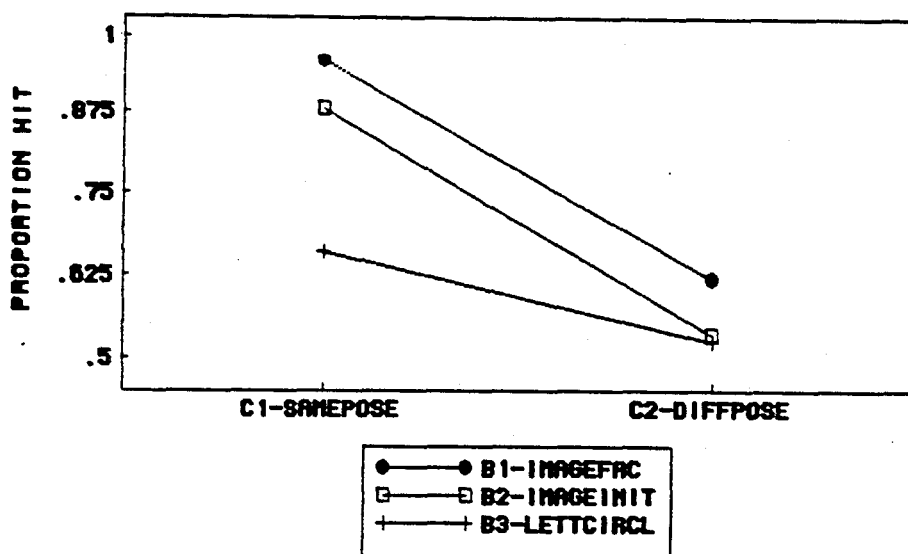
POEXPOS:		level 1		level 2		level 3
Repeated Mea...		PROP HIT...	PROP HIT...	PROP HIT...	PROP HIT...	PROP HIT...
MASDSTR	level 1	16 .958	16 .604	16 .854	16 .562	16 .583
	level 2	16 .938	16 .625	16 .896	16 .5	16 .729
	Totals:	32 .948	32 .615	32 .875	32 .531	32 .656

Page 2 of the ABC incidence table

POEXPOS:		level 3	Totals:
Repeated Mea...		PROP HIT...	
MASDSTR	level 1	16 .625	96 .698
	level 2	16 .417	96 .684
	Totals:	32 .521	192 .691

ANOVA Summary Table for Relax/Seagate0:CLR ANOVA
Folder:EXP3-CAYARD PROP HIT

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	.009	.009	.094	.7602	
B	2	1.203	.601	6.088	.0033	
AB	2	.008	.004	.041	.9598	
Error	90	8.889	.099			
C	1	3.521	3.521	53.431	.0000	
AC	1	.231	.231	3.513	.0641	
BC	2	.441	.220	3.346	.0397	
ABC	2	.321	.160	2.433	.0936	
Error	90	5.931	.066			1.00



Effect	MSn	DFn	DFe	MSe	F	P
B at C1-SAMEPOSE	.737	2	173	.082	8.955	.000
B at C2-DIFFPOSE	.084	2	173	.082	1.026	.361
C at B1-IMAGEFAC	1.778	1	90	.066	26.979	.000
Cat B2-IMAGEINIT	1.891	1	90	.066	28.692	.000
Cat B3-LETTICIRCL	.293	1	90	.066	4.453	.038

Proportion Hit - BC simple effects

Upper Triangle: .05 level ; Lower Triangle: .01 level

	A	B	C
A. b 3	X		
B. b 2	-	X	
C. b 1	-	-	X

Anova table for a 2-factor Analysis of Variance on Y₁: FACR

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	1.27	1.27	2.146	.1464
POEXPOS (B)	2	.002	.001	.001	.9987
AB	2	1.546	.773	1.307	.2758
Error	90	53.252	.592		

There were no missing cells found.

The AB incidence table on Y₁: FACR

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16	16	16	48
		2.571	2.77	2.467	2.603
	level 2	16	16	16	48
		2.395	2.205	2.518	2.373
Totals:		32	32	32	96
		2.483	2.488	2.493	2.488

Anova table for a 2-factor Analysis of Variance on Y₁: PROPORTION FA

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	.027	.027	.977	.3255
POEXPOS (B)	2	.003	.001	.054	.9474
AB	2	.072	.036	1.317	.273
Error	90	2.464	.027		

There were no missing cells found.

The AB incidence table on Y₁: PROPORTION FA

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16 .28	16 .342	16 .267	48 .297
	level 2	16 .272	16 .233	16 .284	48 .263
	Totals:	32 .276	32 .288	32 .276	96 .28

Experiment 3 - Cayard

*HM/FALK
DIFF*

Anova table for a 3-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	3.453	3.453	2.342	.1294
POEXPOS (B)	2	30.645	15.322	10.392	.0001
AB	2	1.702	.851	.577	.5635
subjects w. groups	90	132.703	1.474		
Repeated Measure (C)	1	100.63	100.63	114.859	.0001
AC	1	4.792	4.792	5.47	.0216
BC	2	13.17	6.585	7.516	.001
ABC	2	5.612	2.806	3.203	.0453
C x subjects w. groups	90	78.851	.876		

There were no missing cells found.

The AB incidence table

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	32 2.148	32 1.522	32 1.262	96 1.644
	level 2	32 2.387	32 2.034	32 1.315	96 1.912
	Totals:	64 2.267	64 1.778	64 1.289	192 1.778

The AC incidence table

Repeated Mea...		SAME: H...	DIFF: HM...	Totals:
MASDSTR	level 1	48 2.21	48 1.078	96 1.644
	level 2	48 2.794	48 1.03	96 1.912
	Totals:	96 2.502	96 1.054	192 1.778

The BC incidence table

Repeated Mea...		SAME: H...	DIFF: HM...	Totals:
POEXPOS	level 1	32	32	64
		3.194	1.34	2.267
	level 2	32	32	64
		2.669	.887	1.778
	level 3	32	32	64
		1.643	.934	1.289
Totals:		96	96	192
		2.502	1.054	1.778

Page 1 of the ABC incidence table

POEXPOS:		level 1		level 2		level 3
Repeated Mea...		SAME: H...	DIFF: HM...	SAME: H...	DIFF: HM...	SAME: H...
MASDSTR	level 1	16	16	16	16	16
		3.137	1.158	2.23	.814	1.262
	level 2	16	16	16	16	16
		3.251	1.522	3.107	.961	2.024
Totals:		32	32	32	32	32
		3.194	1.34	2.669	.887	1.643

Page 2 of the ABC incidence table

POEXPOS:		level 3	Totals:
Repeated Mea...		DIFF: HM...	
MASDSTR	level 1	16	96
		1.262	1.644
	level 2	16	96
		.607	1.912
Totals:		32	192
		.934	1.778

SHM

Anova table for a 3-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	1.301	1.301	1.928	.1684
POEXPOS (B)	2	8.341	4.171	6.181	.0031
AB	2	1.205	.602	.893	.4132
subjects w. groups	90	60.727	.675		
Repeated Measure (C)	1	49.942	49.942	99.532	.0001
AC	1	2.508	2.508	4.999	.0073
BC	2	5.998	2.999	5.977	.0037
ABC	2	3.017	1.509	3.007	.0545
C x subjects w. groups	90	45.159	.502		

There were no missing cells found.

$$LSD_B = 1.99 \sqrt{\frac{2(1.675)}{35}} = .4087 \approx .41$$

$$LSD_{AC} = 1.99 \sqrt{\frac{2(.502)}{48}} = .2878 \approx .29$$

The AB incidence table

$$LSD_{BC} = 1.99 \sqrt{\frac{2(.502)}{32}} = .3525 \approx .35$$

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	32	32	32	96
		1.259	.916	.793	.99
	level 2	32	32	32	96
		1.355	1.3	.808	1.154
Totals:		64	64	64	192
		1.307	1.108	.801	1.072

The AC incidence table

No diff

Repeated Mea...		SHM-Same	SHM-Diff	Totals:
MASDSTR	level 1	48	48	96
		1.385	.594	.99
	level 2	48	48	96
		1.779	.53	1.154
Totals:		96	96	192
		1.562	.562	1.072

The BC incidence table

Repeated Mea...		SHM-Same	SHM-Diff	Totals:
POEXPOS	level 1	32 1.918	32 .696	64 1.307
	level 2	32 1.765	32 .45	64 1.108
	level 3	32 1.062	32 .539	64 .801
Totals:		96 1.582	96 .562	192 1.072

Page 1 of the ABC incidence table

POEXPOS:		level 1		level 2		level 3
Repeated Mea...		SHM-Same	SHM-Diff	SHM-Same	SHM-Diff	SHM-Same
MASDSTR	level 1	16 1.924	16 .595	16 1.425	16 .407	16 .807
	level 2	16 1.913	16 .798	16 2.106	16 .493	16 1.317
	Totals:	32 1.918	32 .696	32 1.765	32 .45	32 1.062

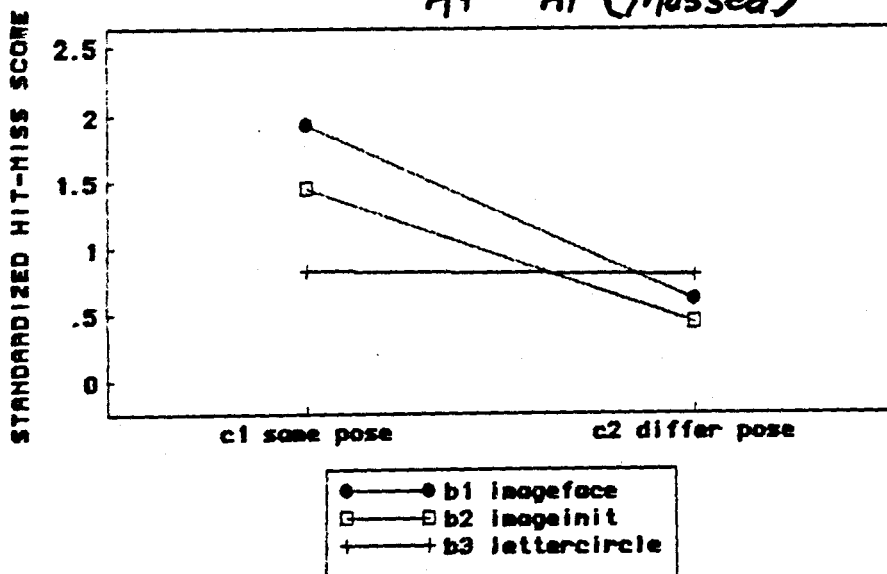
Page 2 of the ABC incidence table

POEXPOS:		level 3	Totals:
Repeated Mea...		SHM-Diff	
MASDSTR	level 1	16 .78	96 .99
	level 2	16 .299	96 1.154
	Totals:	32 .539	192 1.072

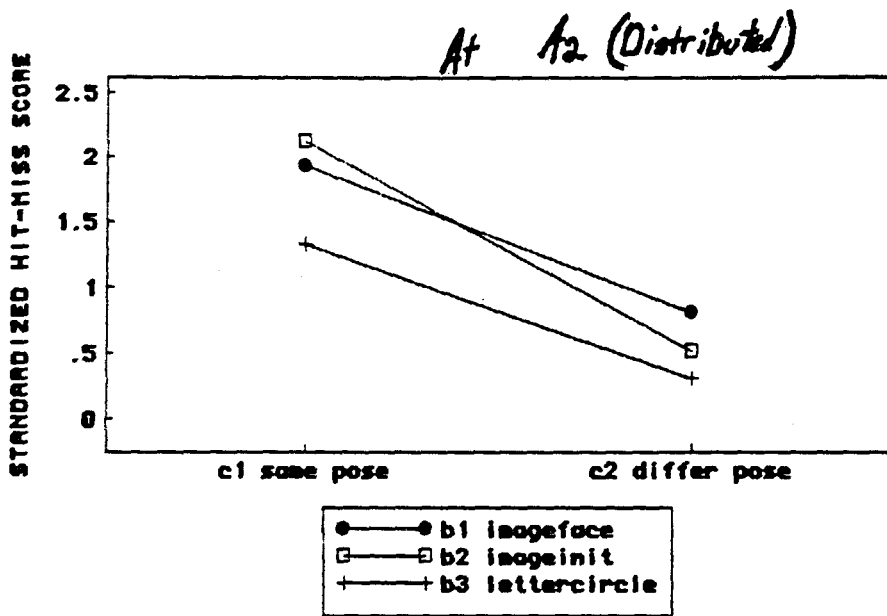
ANOVA Summary Table for Relax/SeagateD:CLA ANOVA
Folder:Exp3-CAYARD-SHM

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	1.301	1.301	1.928	.1684	
B	2	8.341	4.171	6.181	.0031	
AB	2	1.205	.602	.893	.4132	
Error	90	60.727	.675			
C	1	49.942	49.942	99.532	.0000	
AC	1	2.508	2.508	4.999	.0278	
BC	2	5.998	2.999	5.977	.0037	
ABC	2	3.017	1.509	3.007	.0545	
Error	90	45.159	.502			1.00

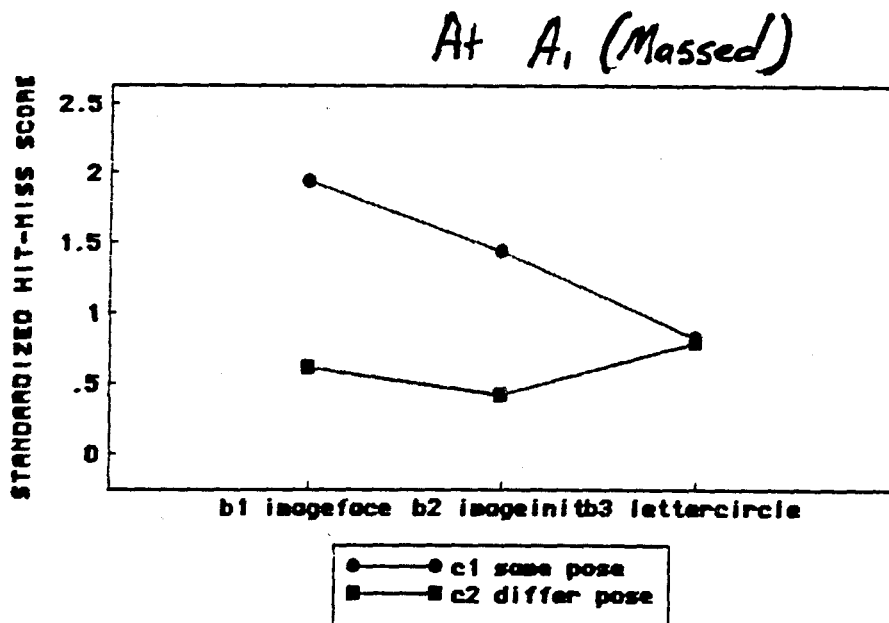
A+ A₁ (Massed)



SHM
ABC interaction
(marginal)

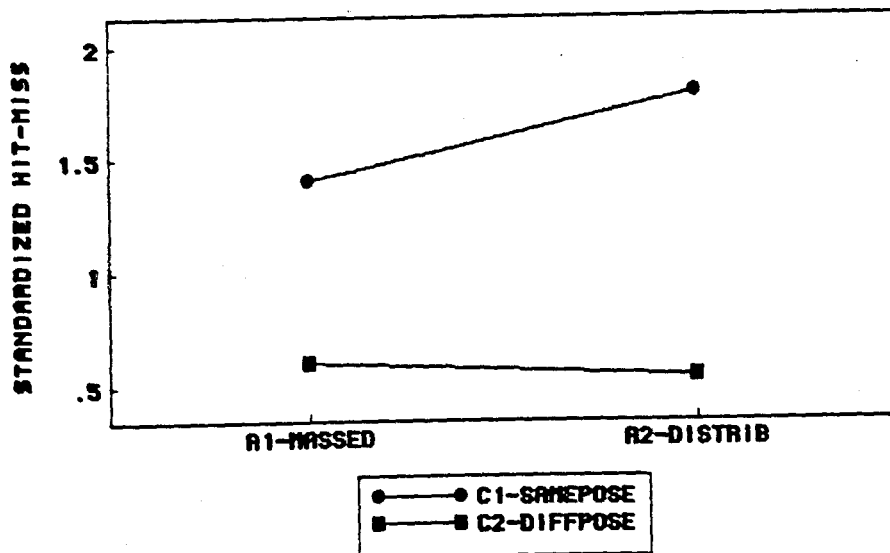
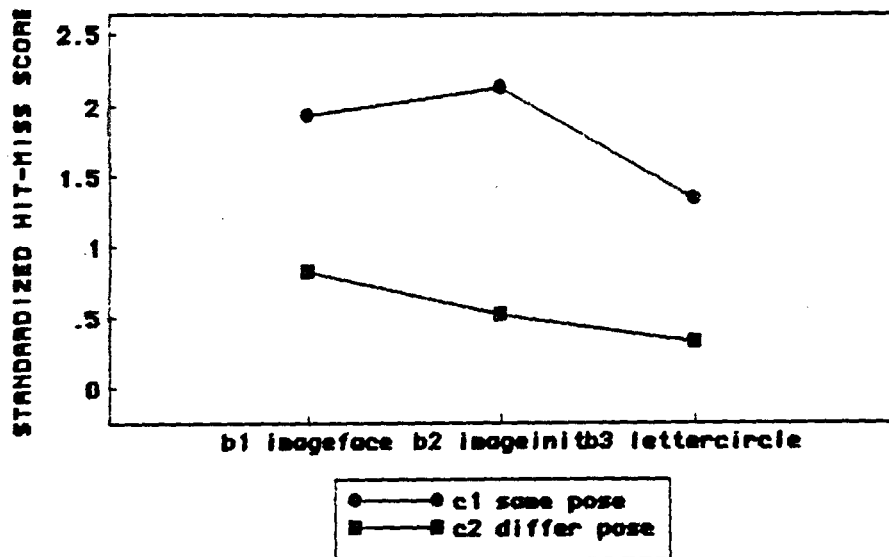


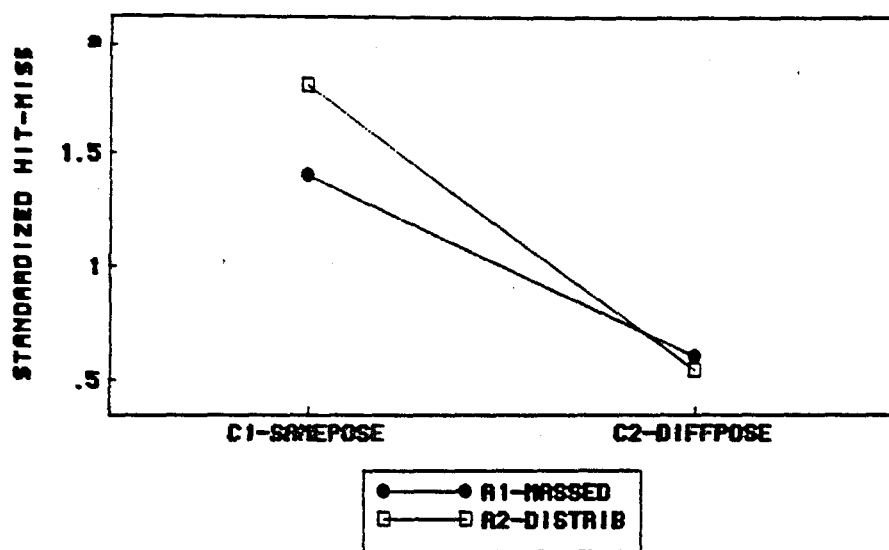
SHM
ABC interaction
(marginal)



Reverse View
SHM
ABC interaction
(marginal)

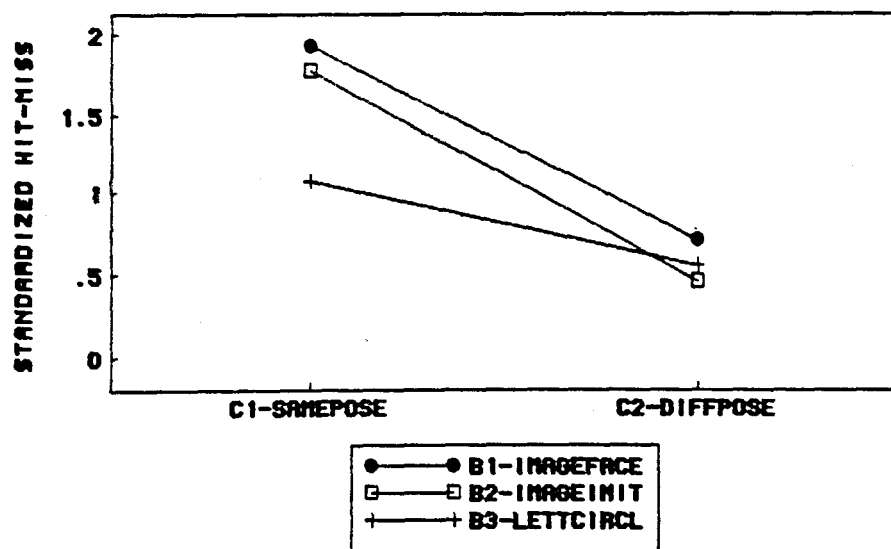
A₁ A₂ (Distributed)

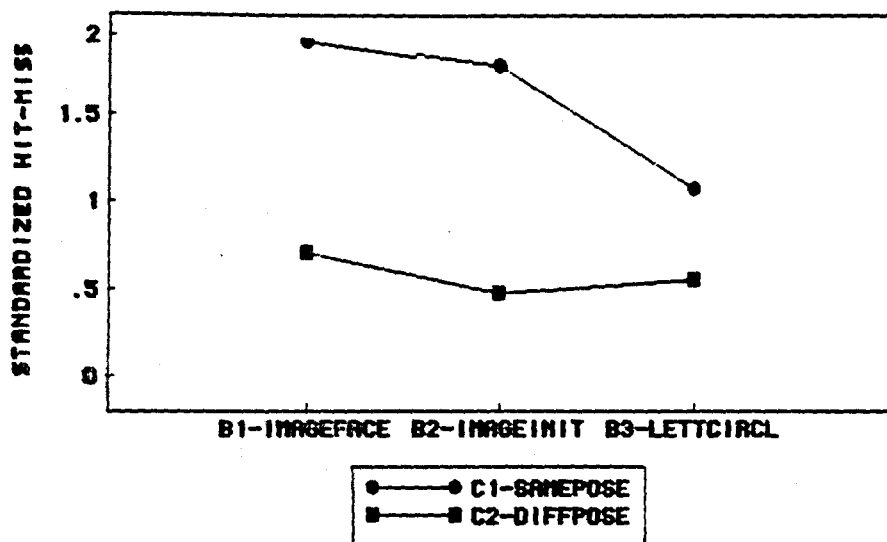




Effect	MS _n	DF _n	DF _e	MS _e	F	P
A at C1-SAMEPOSE	3.712	1	176	.588	6.309	.013
A at C2-DIFFPOSE	.098	1	176	.588	.167	.683
C at A1-MASSED	15.032	1	90	.502	29.959	.000
C at A2-DISTRIB	37.418	1	90	.502	74.573	.000

SHM: AC simple effects





Reverse View
SHM
BC interaction

Effect	MSn	Dfn	DFe	MSe	F	p
B at C1-SAMEPOSE	6.674	2	176	.588	11.345	.000
B at C2-DIFFPOSE	.496	2	176	.588	.843	.432
Cat B1-IMAGEFACE	23.903	1	90	.502	47.637	.000
Cat B2-IMAGEINIT	27.661	1	90	.502	55.127	.000
Cat B3-LETTICIRCL	4.376	1	90	.502	8.722	.004

SHM: BC simple effects

Upper Triangle: .05 level ; Lower Triangle: .01 level

	A	B	C
A. B3-LETTIC	X	s	s
B. B2-IMAGE	-	X	-
C. B1-IMAGE	s	-	X

SHM: B main effect

EXP3 - CAYARD

$r^*(96) = .20$

Correlation Matrix for Variables: X₁ -- X₂₈

	MASDSTR	POEXPOS	TARCON	INIFACE	INITF-H...	SAME-H...	DIFF-HT...	SAME: H...
MASDSTR	1							
POEXPOS	0	1						
TARCON	0	0	1					
INIFACE	0	0	0	1				
INITF-HT...	-.005	-.026	-.037	-.517	1			
SAME-HT...	.158	-.563	.059	-.022	.124	1		
DIFF-HTMS	-.109	-.127	.213	.049	.164	.259	1	
SAME: H...	.223	-.483	2.540E-4	-.058	.04	.813	-.109	1
DIFF: HM...	-.023	-.158	.195	.011	.116	.263	.8	.25
INITFAC: ...	.052	-.027	-.069	-.527	.926	.095	-.055	.236
VISUAL	-.014	-.438	.025	.114	-.085	.207	-.017	.275
VERBAL	.02	-.282	.175	-.001	-.082	.151	.182	.159
INDFER	-.19	-.059	.022	-.067	-.094	-.233	-.094	-.161
RELFS	-.019	-.187	-.089	-.12	-.018	-.049	.102	-.049
IMGS	.066	-.1	-.115	-.042	-.041	.096	-.049	.121
NAMLAB	-.073	-.258	-.013	-.181	-.007	-.037	-.043	.016

Correlation Matrix for Variables: X₁ -- X₂₈

	MASDSTR	POEXPOS	TARCON	INIFACE	INITF-H...	SAME-H...	DIFF-HT...	SAME: H...
INDFEA2	-.112	-.099	.027	-.05	-.037	-.125	-.045	-.152
RELFS2	-.035	-.166	-.002	-.165	-.081	-.024	.093	-.059
IMGS2	.095	-.155	-.096	-.039	-.047	.049	-.016	.102
NAMLAB2	-.118	-.262	-.001	-.18	-.035	-.014	-.102	.051
FACR	-.15	.005	.086	.067	.113	.068	.565	-.525
PROP HIT...	-.022	0	.022	-.461	.933	.124	.141	.05
PROPORT...	-.102	-.001	.097	.069	.127	.045	.541	-.518
PROP HIT...	.118	-.505	.088	-.029	.141	.942	.233	.776
PROP HIT...	-.119	-.11	.199	.099	.112	.225	.935	-.12
SHM-initl...	.003	.01	-.094	-.506	.879	.028	-.128	.21
SHM-Same	.204	-.363	-.018	-.037	-.074	.685	-.276	.935
SHM-Diff	-.05	-.1	.182	.023	.072	.207	.752	.227

Correlation Matrix for Variables: X₁ – X₂₈

	DIFF: H...	INITFAC...	VISUAL	VERBAL	INDFER	RELFS	IMGS	NAMLAB
INDFEA2	-.112	-.065	.24	-.038	.597	.366	.033	.361
RELFS2	.064	-.104	.286	.051	.41	.748	.065	.446
IMGS2	.056	-.006	.161	.156	.144	.07	.696	.011
NAMLAB2	-.045	.007	.218	.06	.395	.287	.118	.794
FACR	-.043	-.269	-.169	-.052	-.065	.012	-.066	-.086
PROP HIT...	.102	.868	-.08	-.078	-.078	.007	-.037	-.007
PROPORT...	-.039	-.24	-.113	-.015	-.04	-.003	-.092	-.063
PROP HIT...	.247	.119	.195	.13	-.213	-.086	.083	-.007
PROP HIT...	.743	-.094	.01	.155	-.04	.103	-.013	-.077
SHM-initi...	.077	.973	-.015	-.099	-.069	-.016	-.038	.015
SHM-Same	.103	.156	.213	.087	-.174	-.054	.099	-.013
SHM-Diff	.973	.102	.065	.212	-.065	.102	-.004	-.024
DIFF: HM...	1							
INITFAC: ...	.129	1						
VISUAL	.102	-.018	1					
VERBAL	.259	-.06	.454	1				
INDFER	-.067	-.067	.227	.106	1			
RELFS	.115	-.022	.245	.099	.439	1		
IMGS	-.011	-.014	.2	.076	-.001	.183	1	
NAMLAB	.01	.026	.171	.087	.348	.321	.021	1

Correlation Matrix for Variables: X₁ – X₂₈

	INDFEA2	RELFS2	IMGS2	NAMLAB2	FACR	PROP HI...	PROPOR...	PROP HI...
INDFEA2	1							
RELFS2	.535	1						
IMGS2	-.083	-.009	1					
NAMLAB2	.421	.477	.052	1				
FACR	.079	.067	-.104	-.108	1			
PROP HIT...	.032	-.044	-.047	-.013	.096	1		
PROPORT...	.126	.087	-.089	-.065	.955	.105	1	
PROP HIT...	-.08	-.034	.045	-.005	.048	.149	.05	1
PROP HIT...	-.016	.075	.029	-.104	.535	.126	.522	.202
SHM-initi...	-.079	-.11	-.025	-.014	-.32	.833	-.297	.057
SHM-Same	-.194	-.096	.078	.03	-.601	-.049	-.628	.646
SHM-Diff	-.112	.047	.066	-.087	-.085	.067	-.103	.184

Correlation Matrix for Variables: X₁ – X₂₈

	PROP HI...	SHM-ini...	SHM-Sa...	SHM-Diff
PROP HIT-DIFF	1			
SHM-initial f...	-.156	1		
SHM-Same	-.281	.177	1	
SHM-Diff	.709	.075	.126	1

Anova table for a 3-factor Analysis of Variance on Y₁: INITF-HTMS

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	.01	.01	.003	.9531
POEXPOS (B)	2	1.938	.969	.323	.7246
AB	2	3.396	1.698	.567	.5695
INFACE (C)	1	98.01	98.01	32.719	.0001
AC	1	3.76	3.76	1.255	.2657
BC	2	2.271	1.135	.379	.6857
ABC	2	5.146	2.573	.859	.4273
Error	84	251.625	2.996		

There were no missing cells found.

The AB incidence table on Y₁: INITF-HTMS

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16 4	16 4	16 4.312	48 4.104
	level 2	16 4.5	16 3.812	16 3.938	48 4.083
	Totals:	32 4.25	32 3.906	32 4.125	96 4.094

The BC incidence table on Y₁: INITF-HTMS

INFACE:		level 1	level 2	Totals:
POEXPOS	level 1	16 5.062	16 3.438	32 4.25
	level 2	16 4.938	16 2.875	32 3.906
	level 3	16 5.312	16 2.938	32 4.125
Totals:		48 5.104	48 3.083	96 4.094

The AC incidence table on Y₁: INITF-HTMS

INFACE:		level 1	level 2	Totals:
MASDSTR	level 1	24 4.917	24 3.292	48 4.104
	level 2	24 5.292	24 2.875	48 4.083
	Totals:	48 5.104	48 3.083	96 4.094

Page 1 of the ABC incidence table on Y_1 : INITF-HTMS

POEXPOS:		level 1		level 2		level 3
INFACE:		level 1	level 2	level 1	level 2	level 1
MASDSTR	level 1	8 4.875	8 3.125	8 4.875	8 3.125	8 5
	level 2	8 5.25	8 3.75	8 5	8 2.625	8 5.625
Totals:		16 5.062	16 3.438	16 4.938	16 2.875	16 5.312

Page 2 of the ABC incidence table on Y_1 : INITF-HTMS

POEXPOS:		level 3	Totals:
INFACE:		level 2	
MASDSTR	level 1	8 3.625	48 4.104
	level 2	8 2.25	48 4.083
Totals:		16 2.938	96 4.094

Anova table for a 3-factor Analysis of Variance on Y2: BITFAC: HM/FACR DF

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	1.05	1.05	.331	.5668
POEXPOS (B)	2	1.976	.988	.311	.7335
AB	2	5.193	2.597	.818	.445
INFACE (C)	1	108.229	108.229	34.076	.0001
AC	1	2.59	2.59	.815	.3691
BC	2	.474	.237	.075	.9282
ABC	2	3.438	1.719	.541	.584
Error	84	266.792	3.176		

There were no missing cells found.

The AB incidence table on Y2: BITFAC: HM/FACR DF

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16 1.429	16 1.23	16 1.845	48 1.501
	level 2	16 2.105	16 1.607	16 1.42	48 1.711
Totals:		32 1.767	32 1.419	32 1.632	96 1.606

The AC incidence table on Y₂: INITFAC: HM/FACR DF

INFACE:		level 1	level 2	Totals:
MASDSTR	level 1	24	24	48
		2.399	.604	1.501
	level 2	24	24	48
		2.937	.485	1.711
	Totals:	48	48	96
2.668		.544	1.606	

The BC incidence table on Y₂: INITFAC: HM/FACR DF

INFACE:		level 1	level 2	Totals:
POEXPOS	level 1	16	16	32
		2.752	.783	1.767
	level 2	16	16	32
		2.465	.372	1.419
	level 3	16	16	32
		2.787	.478	1.632
	Totals:	48	48	96
		2.668	.544	1.606

Page 1 of the ABC incidence table on Y₂: INITFAC: HM/FACR DF

POEXPOS:		level 1		level 2		level 3
INFACE:		level 1	level 2	level 1	level 2	level 1
MASDSTR	level 1	8	8	8	8	8
		2.512	.346	1.937	.524	2.748
	level 2	8	8	8	8	8
		2.991	1.219	2.993	.221	2.825
Totals:		16	16	16	16	16
		2.752	.783	2.465	.372	2.787

Page 2 of the ABC incidence table on Y₂: INITFAC: HM/FACR DF

POEXPOS:		level 3	Totals:
INFACE:		level 2	
MASDSTR	level 1	8	48
		.942	1.501
	level 2	8	48
		.014	1.711
Totals:		16	96
		.478	1.606

Anova table for a 3-factor Analysis of Variance on Y₃: PROP HIT-INITIAL FACE

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	.01	.01	.053	.8178
POEXPOS (B)	2	0	0	0	•
AB	2	.083	.042	.214	.808
INFACE (C)	1	4.594	4.594	23.565	.0001
AC	1	.26	.26	1.336	.251
BC	2	.25	.125	.641	.5292
ABC	2	.083	.042	.214	.808
Error	84	16.375	.195		

There were no missing cells found.

The AB incidence table on Y₃: PROP HIT-INITIAL FACE

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16	16	16	48
		.625	.688	.688	.667
	level 2	16	16	16	48
		.688	.625	.625	.646
Totals:		32	32	32	96
		.656	.656	.656	.656

The AC incidence table on Y₃: PROP HIT-INITIAL FACE

INFACE:		level 1	level 2	Totals:
MASDSTR	level 1	24	24	48
		.833	.5	.667
	level 2	24	24	48
		.917	.375	.646
Totals:		48	48	96
		.875	.438	.656

The BC incidence table on Y3: PROP HIT-INITIAL FACE

POEXPOS:		level 1	level 2	Totals:
POEXPOS:	level 1	16 .812	16 .5	32 .656
	level 2	16 .875	16 .438	32 .656
	level 3	16 .938	16 .375	32 .656
	Totals:	48 .875	48 .438	96 .656

Page 1 of the ABC incidence table on Y3: PROP HIT-INITIAL FACE

POEXPOS:		level 1		level 2		level 3
INFACE:		level 1	level 2	level 1	level 2	level 1
MASDSTR	level 1	8 .75	8 .5	8 .875	8 .5	8 .875
	level 2	8 .875	8 .5	8 .875	8 .375	8 .1
	Totals:	16 .812	16 .5	16 .875	16 .438	16 .938

Page 2 of the ABC incidence table on Y3: PROP HIT-INITIAL FACE

POEXPOS:		level 3	Totals:
INFACE:		level 2	
MASDSTR	level 1	8 .5	48 .667
	level 2	8 .25	48 .646
	Totals:	16 .375	96 .656

Anova table for a 3-factor Analysis of Variance on Y₄: SHM-initial face

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
MASDSTR (A)	1	.002	.002	.001	.9703
POEXPOS (B)	2	.391	.195	.138	.8713
AB	2	2.147	1.073	.758	.4718
INFACE (C)	1	42.665	42.665	30.132	.0001
AC	1	1.376	1.376	.972	.3271
BC	2	.192	.096	.068	.9345
ABC	2	1.185	.592	.418	.6595
Error	84	118.94	1.416		

There were no missing cells found.

The AB incidence table on Y₄: SHM-initial face

POEXPOS:		level 1	level 2	level 3	Totals:
MASDSTR	level 1	16 .839	16 .787	16 1.216	48 .947
	level 2	16 1.121	16 .94	16 .808	48 .956
	Totals:	32 .98	32 .863	32 1.012	96 .952

The BC incidence table on Y₄: SHM-initial face

INFACE:		level 1	level 2	Totals:
POEXPOS	level 1	16 1.604	16 .356	32 .98
	level 2	16 1.511	16 .216	32 .863
	level 3	16 1.74	16 .284	32 1.012
	Totals:	48 1.618	48 .285	96 .952

The AC incidence table on Y4: SHM-initial face

POEXPOS:		level 1	level 2	Totals:
INFACE:				
MASDSTR	level 1	24 1.494	24 .4	48 .947
	level 2	24 1.743	24 .17	48 .956
Totals:		48 1.618	48 .285	96 .952

Page 1 of the ABC incidence table on Y4: SHM-initial face

POEXPOS:		level 1		level 2		level 3
INFACE:		level 1	level 2	level 1	level 2	level 1
MASDSTR	level 1	8 1.491	8 .188	8 1.195	8 .379	8 1.797
	level 2	8 1.716	8 .525	8 1.828	8 .052	8 1.684
Totals:		16 1.604	16 .356	16 1.511	16 .216	16 1.74

Page 2 of the ABC incidence table on Y4: SHM-initial face

POEXPOS:		level 3	Totals:
INFACE:		level 2	
MASDSTR	level 1	8 .635	48 .947
	level 2	8 -.067	48 .956
Totals:		16 .284	96 .952

Appendix D: Experiment 1 raw data

```
DATA CAYARD;
INPUT SUBJ 1-2 MASDSTR 3 IMODSTR 4 SEX 5 VSKL 6-8 VERKIL 9-11
  PINDFS 12-14 PRELFS 15-17 PINGS 18-20 PLABLS 21-23
  PINDF1 24-26 PRELF1 27-29 PING1 30-32 PLABL1 33-35
  PINDF2 36-38 PRELF2 39-41 PING2 42-44 PLABL2 45-47 /
  (F1-F72) (1.) /
  (F73-F140) (1.) ;
/* Masdstr=Massed().Distrib()
```

[illegible]

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511111111112141116111111
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626522525153535511651111416453315525225112311664453666111311425226242652
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41134134152132522213243214232114341111412216212322121111151252112221

```

```

;
DATA CAYARD2; SET CAYARD;
TC1=F54;
TC2=F73;
TC3=F87;
TC4=F104;
TC5=F116;
TC6=F133;
HTMS=TC1+TC2+TC3+TC4+TC5+TC6;
NHTMS=HTMS/6;
UFA=SUM(OF F1-F140);
FACR=UFA-HTMS;
NFACR=FACR/134;
NSCR=NHTMS-NFACR;
DROP F1-F140;
PROC PRINT DATA=CAYARD;

```

THIS IS THE PROPORTION HIT AND PROPORTION FALSE ALARM PART OF THE PROGRAM

```

DATA CAYARD; SET CAYARD;
ARRAY X (140) F1-F140;
DO I=1 TO 140;
IF X(I)>3 THEN X(I)=1; ELSE X(I)=0;
END;
DATA CAYARD2; SET CAYARD;
TC1=F54;
TC2=F73;
TC3=F87;
TC4=F104;
TC5=F116;
TC6=F133;
HTMS=TC1+TC2+TC3+TC4+TC5+TC6;
NHTMS=HTMS/6;
UFA=SUM(OF F1-F140);
FACR=UFA-HTMS;
NFACR=FACR/134;
NSCR=NHTMS-NFACR;
DROP F1-F140;
* THIS IS PROPORTION DATA ;
* ;
DATA CAYARD22; SET CAYARD2;
KEEP MASDSTR IMGDSTR NHTMS;
PROC PRINT DATA=CAYARD22;

```

```
DATA CAYARD3; SET CAYARD2;
KEEP MASDSTR IMGDSTR NFACR;
PROC PRINT DATA=CAYARD3;
```

This is the Standardized Hit-Miss (SHM) Program:

```
data new; set cayard;
keep masdstr imgdstr;
data cayard; set cayard;
keep f1-f140;
proc transpose data=cayard out=cayard;
var f1-f140;
proc standard data=cayard out=cayard mean=0 std=1;
var col1-col172;
proc transpose data=cayard out=cayard;
data cayard; merge new cayard;
DATA CAYARD2; SET CAYARD;
TC1=F54;
TC2=F73;
TC3=F87;
TC4=F104;
TC5=F116;
TC6=F133;
HTMS=TC1+TC2+TC3+TC4+TC5+TC6;
NHTMS=HTMS/6;
DROP F1-F140;
DATA CAYARD3; SET CAYARD2;
KEEP MASDSTR IMGDSTR NHTMS;
PROC PRINT DATA=CAYARD3;
```

Masdstr: 1= 2+

SS*	m/d								
1	1	1	5.5	3.10448	2.39552	1		.41045	1.29611
2	1	1	4.66667	1.02239	3.64428	.83333	0		4.18554
3	1	1	4.66667	2.60448	2.06219	.66667		.25373	1.26616
4	1	1	5	1.5	3.5	.83333		.02985	2.80792
5	1	1	4	1.21642	2.78358	.66667		.03731	2.52123
6	1	1	4.16667	2.70896	1.45771	.66667		.30597	.92729
7	1	1	5.5	1.59701	3.90299	1		.14925	2.31098
8	1	1	3.16667	1.78358	1.38308	.5		.13433	.94195
9	1	1	5	1.10448	3.89552	.83333		.01492	3.71941
10	1	1	5	3.20149	1.79851	1		.44776	.94205
11	1	1	4.66667	3.38806	1.27861	.83333		.40298	.85237
12	1	1	4.66667	1.55224	3.11443	.83333		.02239	2.84902
13	1	1	3.83333	2.41045	1.42289	.5		.1791	1.13287
14	1	1	6	2.88806	3.11194	1		.37313	1.58814
15	1	1	3.66667	1.85821	1.80846	.5		.12687	1.36226
16	1	1	4.66667	2.46269	2.20398	.83333		.23881	1.46925
17	1	1	5.5	3.29104	2.20896	1		.46269	1.21175
18	1	1	4	2.79851	1.20149	.5		.36567	.55449

19	1	1	5.33333	2.28358	3.04975	.83333	.19403	1.8344
20	1	2	4.83333	3.03731	1.79602	.83333	.40298	1.00317
21	1	2	2	1.99254	.00746	.16667	.12687	.00552
22	1	2	3.5	2.8806	.6194	.5	.3806	.3625
23	1	2	4.5	1.41045	3.08955	.83333	.08209	2.32561
24	1	2	4.33333	3.05224	1.28109	.5	.34328	.844
25	1	2	3.16667	2.54478	.62189	.16667	.21642	.54422
26	1	2	4.33333	2.0597	2.27363	.83333	.21642	1.30162
27	1	2	4.16667	3.32836	.83831	.5	.45522	.51021
28	1	2	4.16667	3.76119	.40547	.66667	.59702	.2353
29	1	2	1.16667	1.41045	-.24378	0	.06716	-.23624
30	1	2	3.5	2.95522	.54478	.5	.37313	.33005
31	1	2	4.33333	2.83582	1.49751	.66667	.35821	.82993
32	1	2	3.33333	2.97761	.35572	.5	.4403	.21802
33	1	2	4.66667	1.76866	2.89801	.83333	.17164	1.84731
34	1	2	2.16667	2.47761	-.31095	.16667	.23134	-.22068
35	1	2	4.5	2.35821	2.14179	.66667	.20149	1.40802
36	1	2	3.5	1.80597	1.69403	.33333	.06716	1.44533
37	1	2	3	2.97761	.02239	.16667	.37313	.01437
38	2	1	6	1.35075	4.64925	1	.0597	3.23594
39	2	1	5.83333	3.14925	2.68408	1	.42537	1.32163
40	2	1	4.5	1.23134	3.26866	.66667	.04478	2.59085
41	2	1	3.16667	1.6791	1.48756	.5	.10448	1.19073
42	2	1	4.66667	1.52239	3.14428	.66667	.06716	2.53737
43	2	1	5.33333	1.4403	3.89303	.83333	.08209	2.6377
44	2	1	4.83333	2.56716	2.26617	.83333	.28358	1.17308
45	2	1	6	1.58209	4.41791	1	.02985	3.5915
46	2	1	4.16667	2.76866	1.39801	.66667	.31343	.9786
47	2	1	5	2.29104	2.70896	.83333	.1791	1.7257
48	2	1	4.16667	1.41045	2.75622	.66667	.02985	2.5663
49	2	1	3	2.47761	.52239	.33333	.23134	.33214
50	2	1	4.33333	1.48507	2.84826	.66667	0	2.94154
51	2	1	5.16667	1.72388	3.44279	.83333	.12687	2.08955
52	2	1	5.5	2.84328	2.65672	1	.33582	1.73744
53	2	1	5.33333	1.30597	4.02736	.83333	.03731	3.05754
54	2	1	5.83333	2.86567	2.96766	1	.42537	1.71121
55	2	1	6	2.67164	3.32836	1	.26119	2.17147
56	2	1	4.66667	1.1791	3.48756	.66667	.03731	2.81914
57	2	2	3.5	3.37313	.12687	.5	.47015	.07028
58	2	2	5.16667	2.73134	2.43532	.83333	.26866	1.51002
59	2	2	4.5	2.5	2	.66667	.29105	1.17975
60	2	2	3.66667	2.89552	.77114	.66667	.35075	.48101
61	2	2	5.33333	3.41045	1.92289	.83333	.46269	.96944

62	2	2	4.66667	3.02985	1.63682	.83333	.36567	1.05144
63	2	2	3.5	2.04478	1.45522	.66667	.20895	.90757
64	2	2	5	2.90299	2.09701	1	.35075	1.39201
65	2	2	4.33333	2.43284	1.9005	.83333	.25373	1.31256
66	2	2	4.33333	2.46269	1.87065	.66667	.15672	1.39573
67	2	2	5.33333	3.5597	1.77363	1	.53731	.91314
68	2	2	3.33333	1.96269	1.37065	.5	.02985	1.58743
69	2	2	4.5	2.38806	2.11194	.83333	.20149	1.47536
70	2	2	5.66667	3.71642	1.95025	1	.52985	1.23725
71	2	2	4.33333	2.57463	1.75871	.66667	.26119	1.08294
72	2	2	5	2.28358	2.71642	1	.12687	2.12749
73	2	2	5.66667	1.23881	4.42786	1	.02239	5.66667
74	2	2	5.5	2.38806	3.11194	1	.23881	5.5
75	2	2	3.66667	1.17164	2.49502	.83333	.02239	3.66667
76	2	2	3	1.58955	1.41045	.5	.07463	3
77	2	2	4.66667	2.00746	2.6592	.83333	.13433	4.66667
78	2	2	6	2.14925	3.85075	1	.20149	6
79	2	2	4.83333	2.60448	2.22886	.83333	.26866	4.83333
80	2	2	5.33333	2.98507	2.34826	1	.40298	5.33333
81	2	2	5.16667	2.00746	3.1592	.83333	.1791	5.16667
82	2	2	3.16667	2.17164	.99502	.33333	.0597	3.16667
83	2	2	6	2.16418	3.83582	1	.13433	6
84	2	2	5.83333	3.44776	2.38557	1	.47015	5.83333
85	2	2	5	2.08209	2.91791	1	.17164	5

Appendix E: Experiment 2 raw data

```
OPTIONS LS=80;
data cayard;
input subj 1-2 imgdstr 3 masdstr 4 /
      (f1-f75) (1.) iarrate 76 facehit 77 confhit 78;
cards;
0112
23333525345652543222243242223224222265432243324253453234343543223443352532402
0212
122222122112135221562321112151211132152522111616115511125252511621211161111613
0312
1111111111111214111111111111111115221111111111116313111111111331111441160
0412
12111125112212515222251112111111121252221211226222265221151211222221141521311
0512
111112111111121111211311131421112211221121321431111111111111111121111211113
0612
211121131112421152132552122111222115122152211515522312152552225425221223554101
0712
112122451135162561343251122113321145163633321214655212162163321215432165632612
0822
1111112111211122113121112111121111515131211121511112111212111121111141221213
0922
115231232336141343242341132321615143334335222534656253223252522345222233632513
1022
112253111111525225125161122525112255155526322414321253112121112213211112122312
1122
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1222
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7711
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7811
1121111111111121111111111111211111111111111111111111111111111111111713
7911
111111111111111112111111211121112512112321121422215111511111121112113111712
8011
111112151125311122221161111122221155112526122126523111111121111211121121212513
;

```
DATA CAYARD2; SET CAYARD;
TC1=F40;
TC2=F48;
TC3=F53;
TC4=F59;
TC5=F66;
TC6=F71;
HTMS=TC1+TC2+TC3+TC4+TC5+TC6;
NHTMS=HTMS/6;
UFA=SUM(OF F1-F75);
FACR=UFA-HTMS;
NFACR=FACR/69;
NSCR=NHTMS-NFACR;
data cayard2; set cayard2;
KEEP SUBJ IMGDSTR MASDSTR IMPATE FACEHIT CONFHIT NHTMS NFACR NSCR;
PROC PRINT;
```

THIS IS THE STANDARDIZED HIT-MISS PART OF THE PROGRAM:

```
data cayard; set cayard;
array x(75) f1-f75;
do i=1 to 75;
```

```
if x(i)>3 then x(i)=1; else x(i)=0;  
end;
```

THIS IS THE STANDARDIZED HIT-MISS PART OF THE PROGRAM:

```
;  
data new; set cayard;  
keep masdstr imgdstr;  
data cayard; set cayard;  
keep f1-f75;  
proc transpose data=cayard out=cayard;  
var f1-f75;  
proc standard data=cayard out=cayard mean=0 std=1;  
var col1-col75;  
proc transpose data=cayard out=cayard;  
data cayard; merge new cayard;  
DATA CAYARD2; SET CAYARD;
```

Appendix F: Experiment 3 raw data

01111180706010800030208000
251251215111144131521245232552634415242424153121113241262224331162111524122223
21
02111170606040706070606070
122222233321422135422222222243242522224611222226225226252522226262522262622
22
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11111112111252216315122126114112262511151552151621151635111111612125325626115
1
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425113152241131113443233333524333335222222432222243325333333363333412222233
3
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1122212122111121422211111121411111211111112112611111111116121111111611611
11
07112170707050106080501040
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112111114414135114451564322341511525225136233221644211264533334163544544653354
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