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The effects of noninformative stimulus elements on pattern recognition by pigeons

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THE EFFECTS OF NON-INFORMATIVE STIMULUS ELEMENTS ON PATTERN RECOGNITION BY PIGEONS

by

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Abstract

THE EFFECTS OF NON-INFORMATIVE STIMULUS ELEMENTS ON PATTERN RECOGNITION BY PIGEONS

by

Francisco J. Donis

Advisor: Professor Eric G. Heinemann

Pigeons (columba livia) were trained to discriminate between simple forms ("targets"), displayed on the screen of a computer monitor. In several experiments identical forms ("flankers", ◃ and ▹) accompanied each of the targets. In experiments done with human subjects some flankers have been found to enhance the discrimination of the target forms under some circumstances (the "context superiority effect"), and impair the discrimination under others (the "distractor effect"). The purposes of the present study were to isolate the conditions giving rise to either context superiority or distractor effects in pigeons, and to test predictions from the Heinemann and Chase model of pattern recognition by pigeons.

In all the experiments reported here only one stimulus, randomly selected from the set of stimuli presented for discrimination, was shown on each trial. One of two choice responses (a peck on one of two disks displayed on the monitor) was rewarded and counted as a correct response for each stimulus. The independent variable manipulated was the distance between the target patterns and the flankers, and the dependent variable was the proportion of correct responses.

In one experiment it was found that adding flankers to two previously learned patterns (⊔ and ⊓) produced a decrement in their discrimination. In the rest of the experiments flankers accompanied the target patterns from the beginning of training. In most of these experiments the patterns to be discriminated were white presented in an environment that was otherwise totally dark. Among the patterns studied were two oblique lines, and the same lines to which an identical L-shaped right angle form was added. In contrast to the "context superiority effect" found with human subjects in this situation, the pigeons studied in the present experiments discriminated significantly better between the oblique lines when presented alone than when presented with context.

In other experiments each target consisted of two small squares. One pair of targets used may be described as the end points of two vertical lines differing by 5 mm in their placement along the horizontal axis on the screen, and the other pair as the end points of two oblique lines.

The subjects were unable to discriminate the position of the "vertical line" targets when shown alone, but were able to discriminate the two targets when accompanied by flankers. An opposite effect was found for the "oblique line" targets which were well discriminated when presented alone but poorly discriminated when accompanied by flankers.

Thus, the flankers can produce either a context superiority effect or a distractor effect depending on the discriminability of the target patterns. The magnitude of each of these effects was approximately a linear function of the logarithm of target-flanker separation.

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I would like to express my gratitude to the members of my Dissertation Committee: Professor Sheila Chase, Professor Ching-Tse Lee, and specially to my advisor, Professor Eric Heinemann, who provided a fertile scientific environment without which this dissertation would not have been possible.

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Introduction

Pattern recognition is of fundamental importance because it plays a crucial role in the survival of organisms. In spite of this, pattern recognition by animals has rarely been investigated. Though pattern recognition by humans has received much more attention from investigators, it also is still poorly understood.

When a subject is able to discriminate between two shapes, there is no obvious reason why adding identical extra elements to both patterns should affect that discrimination. However, this is not what usually happens. Depending on the patterns and the constant extra elements added, the results can be no change in the discrimination, enhancement of the discrimination (i.e., the resulting compound patterns are easier to discriminate than the patterns without the added extra elements), or a reduction in discrimination (i.e., the patterns by themselves are easier to discriminate than the patterns with the added extra elements).

A considerable amount of research has been done in attempts to understand the factors involved in producing enhancement or superiority effects in humans (e.g., Enns and Prinzmetal, 1984; Pomerantz, Sager, and Stoever, 1977; Weisstein and Harris, 1974; and Chen, 1982), and in pigeons (e.g., Blough, 1984, 1988). The distractor or inferiority effects have also been studied in humans (e.g., Enns and Prinzmetal, 1984; Eriksen and Eriksen, 1974; Estes, 1972, 1974; and Pomerantz et al., 1977) and in pigeons (e.g., Blough, 1984; Blough and Franklin, 1985; and Steel, 1990).

To be useful, a well developed theory of pattern recognition should be able to predict the conditions under which the addition of non-informative elements will lead to the enhancement of pattern recognition, and those that will lead to an impairment of that performance. Up to now, unfortunately, there has been no attempt to study the relation between these two phenomena systematically and analytically. Most investigators have studied either one or the other phenomenon without attempting to tease out the relationship that may exist between them. It appears that, with one exception, no theory of pattern recognition has been developed that can adequately deal with both enhancement and distractor effects. The one exception is the Heinemann and Chase (1990) quantitative model for pattern recognition in pigeons which already has been successful in providing explanations for many phenomena, e.g., letter confusion matrices generated by pigeons (Heinemann and Chase, 1990), and the way pigeons trained to recognize one abstract form generalize to various transformations of this form in studies done by Cerella (1990).

The Heinemann and Chase model of pattern recognition is a "Fuzzy template" model which was developed from Heinemann's (1984a; 1984b) general model of learning. This model has been applied to experiments done with pigeons who are presented with one of two stimuli, S_1 or S_2, on each of a series of training trials. The pigeons are rewarded for making one response when one of the stimuli is presented, and for making an alternative response when the other stimulus is presented. The model assumes two stages of learning. The first stage is the *Presolution Period* (PSP) during which the subject detects the statistical associations among the stimuli presented, its own behavior, and the consequences of this behavior. When applied to visual pattern recognition, this model treats the distributions of sensations that constitute the internal representations of the visual fields as divided into finite size cells called "pixels" (picture elements). Each pixel is assumed to have a uniform brightness, hue, and saturation. A pattern can be represented by the X-Y coordinates of the pixels making it up and, if desired, by the non-spatial coordinates mentioned above. The model treats each pixel as an independent "sensory channel" that undergoes its own PSP.

During the second stage of learning, important information gathered on each trial is placed in a limited capacity memory, referred to simply as the long term memory (LTM). Each storage location can hold a record which shows the response made, the discriminative stimulus that was present when the response was made, and whether or not reward was received. On each trial, one such record is entered into a randomly selected location of the LTM, destroying the record which previously occupied that location. This model assumes that, while the records are stored in LTM, independent Gaussian noise is added to each of the remembered coordinates. During the decision process a subject retrieves from its LTM a random sample of those records which indicate that reward was received. Estimates of the number of records in the sample vary from 3 to 16.

The values of the X-Y coordinates of the pixels in each record retrieved from memory are assumed to fluctuate rapidly over time while in working memory. These fluctuations result in bivariate normal distributions with the means of the marginal distributions equal to the sensory effect that the subject remembered when the record was retrieved. Only probability densities that lie within 5 standard deviations on either side of the marginal distribution means are used in the computations during the decision process. Densities corresponding to standard deviation values beyond those limits are treated as equal to zero.

During the decision process, each pixel on the stimulus to be identified, the input, is compared to each pixel on one of the memory records in the sample drawn from the LTM. The mean probability density for each pixel in the input is then computed. These mean probability densities for all input pixels are then multiplied, yielding a *joint density* (JD) associated with each of the two responses. When this process has been accomplished for each of the records in the sample, the JD's associated with the same response are summed, and the subject makes the response with the largest total JD.

If the subject is unable to determine the appropriate response, because the sum of the JD's associated with any of the responses is not larger than zero, then the subject draws another sample and again attempts to decide on the appropriate response. If after drawing several samples from its LTM (the exact number has not yet been specified) the subject is still unable to decide on the appropriate response, then it will make the response associated with the greater probability of reward in the past, without reference to the discriminative stimulus.

The Heinemann and Chase model also incorporates Neisser's (1968) notion of "Focal Attention." According to Heinemann and Chase, subjects learn to attend to locations in the visual field in which informative stimuli have appeared. As mentioned previously, the assumed learning process is that described in the theory of the PSP (Heinemann, 1983; Heinemann and Chase, 1990). If, after training, stimuli are presented in locations different from the ones used during training, the subjects will act as if the stimuli did not exist (e.g., Heinemann and Kadison, 1976). Based on this notion it can be predicted that there has to be an area within which non-informative elements added to target stimuli after subjects have been trained to discriminate between the target stimuli alone will be detrimental to target discrimination, and outside of which such elements will have little or no effect .

A computer program has been developed based on the assumptions of the Heinemann and Chase model. One of these assumptions is based on the empirical observation that the distances and orientations of the pigeons' heads from the patterns to be discriminated vary from trial to trial. Goodale (1983) used high-speed cinematography to study head movements made by pigeons when pecking at visual target patterns. Goodale found that pigeons' heads "fixate" at two points during a key peck, which he called "F1" and "F2" respectively. F2 is the most interesting because it is from this point that a pigeon takes its last look at the target. Goodale estimated that the distance from F2 to the target is 54.5 mm on the average, but this distance varies from trial to trial and from pigeon to pigeon. Based on Goodale's findings it can be assumed that pigeons have stored in LTM templates of a given target in various sizes. This is important because it explains why pigeons are able to generalize to patterns that differ in size from those used during training.

The computer program of Heinemann and Chase can be used to simulate experiments done with actual pigeons and will be used to simulate some of the experiments in the present study. The parameters varied in the simulations will be: (1) the distance between the input points and between the means of the distributions that represent the X-Y coordinates of the remembered points, to be referred to simply as "*spacing*", (2) the *Standard Deviation* of viewing distances to be referred to simply as "*viewing distances*", and (3) persistence of memory search (i.e., the number of samples retrieved from LTM before resorting to guessing), to be referred to simply as "*resamplings*". Memory size (i.e., the number of locations in LTM) and sample size (i.e., the number of records in a sample retrieved from LTM) will be kept constant in all the simulations at 1200 and 10 respectively. The learning phase of the experiments will not be simulated. Instead, the simulations will assume a fully trained subject. For such a subject the average proportion of LTM records representing each of the stimuli used in an experiment will equal the proportion of trials on which these stimuli were presented during training. In order to insure accuracy in the simulations, the actual illuminated pixels making up the patterns used in the experiments were captured by a program in Quick Basic. The coordinates of these pixels were saved in files to be retrieved by the program during the simulations. In matching the simulated data to the empirical data, the method of least squares was used.

The present series of experiments attempts to study context superiority and distractor effects in pigeons by using very simple patterns. Predictions made by the Heinemann and Chase model will be tested, especially those based on the center of gravity rule. According to this rule, the center of gravity (*centroid*) of all the pixels in the pattern is computed when a subject compares templates stored in LTM to the patterns being discriminated. During the response-selection process the *centroid* of the input pattern is superimposed on the *centroid* of every remembered pattern in the sample that was retrieved from LTM. The subject will choose the remembered pattern that produces the best match.

Beginning with the assumption that enhancement and distractor effects lie on a continuum, I hope to be able to determine under what circumstances the addition of identical (non-informative) elements leads to enhancement of a discrimination between target patterns, and under what circumstances to impairment of that discrimination. It is also possible that a non-informative element may both enhance and distract from the performance of the discrimination. However, because only performance can be observed, the net result may be (1) a deterioration in performance (i.e., enhancement is less than the distraction), (2) an improvement in performance (i.e., enhancement is greater than the distraction), (3) no change in performance (i.e, the two effects cancel each other out).

In the experiments that will be described the non-informative stimulus elements will be simple shapes placed to the left and right of the target shapes. They will be referred to as "flankers". It is hypothesized that the distance separating the flankers from the targets, the shape of the target patterns, and the amount of initial target-only training will be important factors in determining whether discrimination (as measured by the proportion of correct responses) is either impaired or facilitated.

Although there have been some experiments that demonstrated a distractor effect when flankers were added to target patterns (e.g., Blough, 1984; Steel,1990), very little is known about the factors involved in producing this effect. The present study attempts to increase our understanding of this matter.

GENERAL METHOD

Subjects

The subjects used in the experiments are White Carneaux Pigeons (*Columba Livia;* Palmetto Pigeon Plant, Sumpter, SC). The subjects were maintained at 80% of their ad libitum weight throughout the experiments. Between sessions subjects were housed in a colony room where water and grit were constantly available.

Apparatus

The subjects were trained and tested in a Large Environment Cubicle (Model LEC-006, BRS/LVE; Beltsville, MD) with a white interior. The cubicle was modified so that the Operant Chamber became the Instrument Chamber and the Instrument Chamber became the Operant Chamber (The new interior dimensions for the instrument chamber are: 50.80 cm H, 56.52 cm W, and 45.72 cm D; while for the operant chamber are: 50.80 cm H, 34.80 cm W, and 45.72 cm D). The cubicle was divided into the two compartments by an aluminum panel (3.175 mm thick) which was painted white. On this panel was mounted an infra-red-emitter-detector (Model 1210 Soft-Touch™ Touch-Sensitive Screen; BFANM Corp., Albuquerque, NM). Also mounted on this panel, on the left side, was a dark brown Universal Seed and Water Cup (Penn Plax) and a High-Brightness Amber Led Lamp (Approximately 3 cm above the seed cup). Pigeon Food Pellets (Formula: C1, 45 mg; P. G. Noyes Co., Inc.; Lancaster, NH) were used for reinforcement. These pellets were delivered by a motor driven Dispenser (Model G5110, G. Ralph Gerbrands Co., Inc.; Arlington, MA). To prevent subjects' dander from clouding the monitor screen, a transparent Lexan screen (3.175 mm thick) was installed between the infra-red-emitter-detector unit and the monitor screen. On this lexan screen, were mounted two Electret Mike Elements (Cat. No. 270-090; Radio Shack). These microphones picked up the sounds of the subjects' pecks on the screen and sent this information to an amplifier. The output of the amplifier activated a PC Board Mount Buzzer (Cat. No. 273-065A; Radio Shack) so that the subjects heard a buzzer sound whenever they pecked in a region specified by the experimenter.

A personal computer (Model 1000; Tandy Corp., Fort Worth, TX) using a program in BASIC language, controlled the presentation of the stimuli, delivery of reinforcement, and detection of pecks on the screen. It also provided data storage.

Interfacing of the computer to the experimental box was accomplished through an A-Bus Card (Model MB-120; Alpha Products, Darien, CT), a Relay Card (Model RE-140; Alpha Products), a Digital Input Card (Model IN-141; Alpha Products), and an IBM-Compatible A-Bus Adapter (Model AR-133; Alpha Products). Interfacing of the computer to the touch screen was accomplished through an IBM-Compatible Interface Card and a cable (BFANM Corp.).

Procedure

In all experiments the subjects were trained to discriminate between two simple patterns, to be referred to as "targets". Identical patterns, to be referred to as "context" or "flankers", could be added to each of the targets. At the beginning of each trial one of the target patterns, or a target pattern with context, was presented in the approximate center of the monitor. In some experiments the subject was required to peck on a small circle in order for a stimulus to be flashed on the screen for a brief period of time. In the rest of the experiments, a stimulus was presented at the beginning of a trial and the subject was then required to peck on the target. After a stimulus was flashed on the screen, or after a subject pecked on the target, the stimulus pattern disappeared from the screen and the two response disks were presented to the right and left, and above, the location in which the target had been presented. A peck on one of the response disks was rewarded and counted as a correct response if one of the targets had been presented, and a peck on the other response disk was rewarded and counted as a correct response if the other target had been shown. Following an incorrect response the same stimulus was presented on the next trial (correction method), so that the subject collected all the scheduled rewards. Repeat trial performances were not included in the data analysis. In most of the experiments there were five pairs of stimulus patterns: Targets alone, and targets with flankers at each of four different distances (as measured by the gaps between flankers and targets). The distances used were: 0.2 cm, 0.7 cm, 2.5 cm, and 5.5 cm. These distances will be referred to simply as target-flanker separations, 1 to 4 respectively.

Experiment 1a

In the first phase of this experiment the subjects were trained to discriminate between two targets. In the second phase of training flankers were added to each target, the target-flanker separation varying from trial to trial. The purpose was (a) to examine the effect of target-flanker separation on performance and (b) to find out whether the performance decrement expected at the beginning of the second phase of training would survive prolonged training.

Method

Subjects

The subjects were two male and two female White Carneaux pigeons (*Columba Livia*). They were maintained as described in the general method section.

Apparatus and Stimuli

The apparatus in this experiment is exactly as described in the general method section. The target-stimuli consisted of two U-shaped forms (one upright and one inverted, e.g., ⊔ and ⊓) similar to the ones used by Blough (1984). Each side of the target forms was 6 mm in length. The flankers were isosceles triangles whose bases were vertical and parallel to the sides of the "U" forms (e.g., ◃⊔▹). The lengths of the triangles' bases were 6 mm and the legs measured 7 mm. Because these flankers were paired horizontally to the target patterns, they will also be referred to as "horizontal flankers" (see figure 1b, Appendix B). All the patterns were red on green background except during part of the training phase. Target-stimuli and flankers were presented at about the height of the subject's head (approximately 22 cm from the floor of the experimental chamber).

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. There were five conditions consisting of the target patterns alone, and the target patterns with flankers at each of four different target-flanker separations (see figure 1b, Appendix B, for a list of the stimuli and target-flanker separations printed close to scale).

The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

Phase 1

In the initial phase of the experiment the subjects were trained, by the method of successive approximations, to peck on a small blue circle (to be referred to as the "center key"). Each peck was followed by a beep and by the appearance of one of the two U-shaped forms on the display screen for 785 msec. After two pecks and two presentations of the same stimulus, two "simulated" response keys, which replaced the electro-mechanical response keys usually used in this type of experiments, were presented on the face of the display screen. The subjects were rewarded with three food pellets for making a response to the right-side key when stimulus 1 (S_1) had been presented and for making a response to the left-side key when stimulus 2 (S_2) had been presented. Following a correct response a new stimulus was randomly selected for presentation. Following an incorrect response the stimulus that had been presented was presented again on the succeeding trial. This correction method prevents the development of strong position habits. There was a 9-sec intertrial interval (ITI) during which the display screen became blank and pecks on the screen had no scheduled consequence. A correct response was followed by a beep, delivery of the food pellets, and the lighting of the LED. The LED remained on for the duration of the ITI.

To speed up the learning process, the two targets were at first presented in different colors, one in yellow and the other in red. As the subjects learned the discrimination, a fading procedure was used. This consisted of gradually replacing all the yellow pixels by red pixels. At the end of the fading procedure (when both U-shaped forms were presented in red), a criterion was established for proceeding to Phase 2 of the experiment. It consisted of each subject having to perform at 80% correct or better for at least three consecutive sessions. There were 50 presentations of each pattern per day, which resulted in 100 trials per session.

Phase 2

On the session after the end of Phase 1, those subjects who met the criterion were presented with eight extra stimuli which consisted of each U shape with two vertical flankers at each of the four target-flanker separations mentioned previously. The procedure was the same as the one used in the acquisition phase, with the exceptions that there was no color discrimination in the beginning of this phase, no criterion to be met, and there were ten stimuli instead of two. A correct response was a peck to the right-side key whenever the inverted U-shaped pattern had been shown (with or without flankers), and a peck on the left-side key whenever the upright U-shaped pattern had been presented (with or without flankers). There were ten trials per stimulus for a total of 100 trials per daily session. Subjects were tested for 50 Sessions.

Results

Only two subjects met the criterion for advancement to phase 2 of the experiment. Each session yielded a proportion of correct responses for each of the ten stimuli. The data for the fifty sessions were converted to proportions for each of the five conditions in the experiment. Proportions P, were converted to Arcsine ($P^{1/2}$) using the formula proposed by Freeman and Tukey (1950) for variance stabilization of binomial data (see formula 1 in Appendix A). These transformations will be referred to simply as the "Arcsine transformations". The Arcsine transformations were submitted to an Analysis of Variance (ANOVA) to test the hypothesis that the variance accounted for by the regression of the Arcsine transformations of P on the logarithm of the target-flanker separations is equal to zero. In situations in which there is only one independent variable, as in the present experiment, this analysis is equivalent to testing the hypothesis that the slope of the regression line is equal to zero (Norušis, 1988). The ANOVA showed that there is a linear relationship between the independent and dependent variables [$F(1,6) = 9.61$, $p < .0211$]. The untransformed proportion data were also analyzed yielding comparable results [($F(1,6) = 9.43$, $p < .0219$]. The data for all the individual subjects were included in the regression analysis. The proportions from the individual subjects were converted to mean proportion correct scores to provide indexes of discrimination of the target patterns without flankers, and of the patterns with flankers at each of the four different target-flanker separations. Figure 1 shows these mean proportions for the two subjects.

Figure 2 shows the mean learning curves (for phase 2) for the two subjects. For the sake of clarity, only the curves for the patterns alone and the patterns with flankers at target-flanker separations 1 and 4 are shown.

Discussion

The center key used to initiate the trial was presented about 5 mm above the location where the stimuli were flashed on the display screen. This was done so that the images of the target stimuli would fall on the dorsal posterior quadrant of the retina. This area, which is also referred to as the "Red Area" (because the majority of the cones are associated with red oil droplets), is believed to be an area of acute binocular vision in the

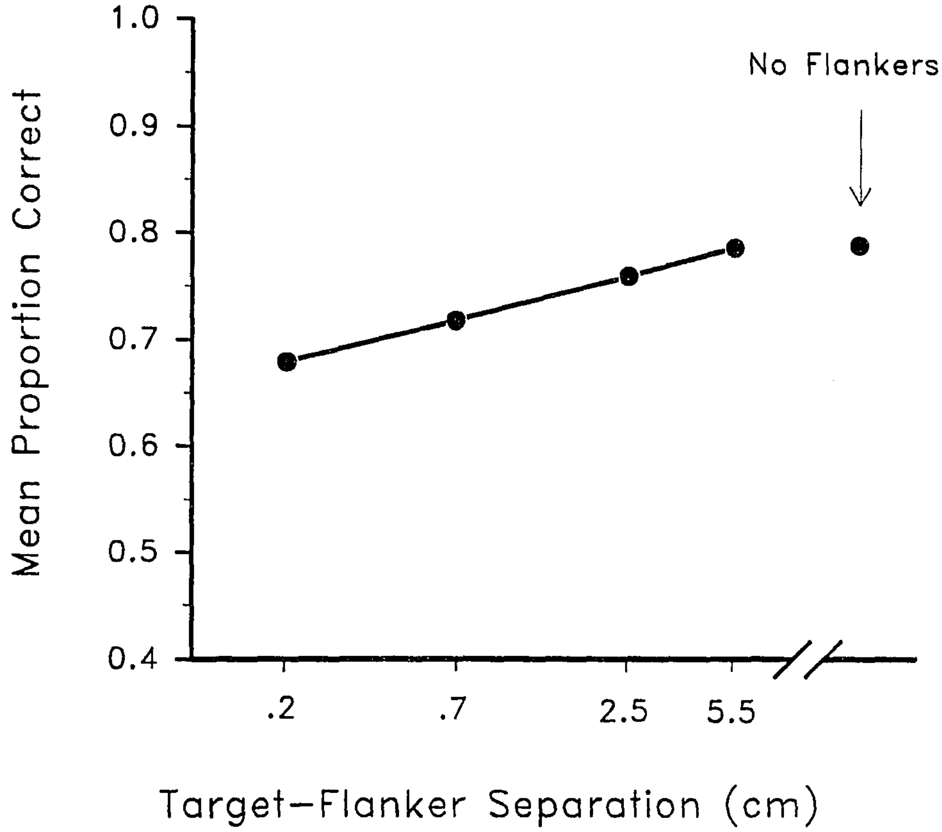

Figure 1. Mean proportion correct as a function of target-flanker separation. Each Mean is based on data from 50 sessions of training and two subjects. Distances along the horizontal axis are scaled logarithmically.

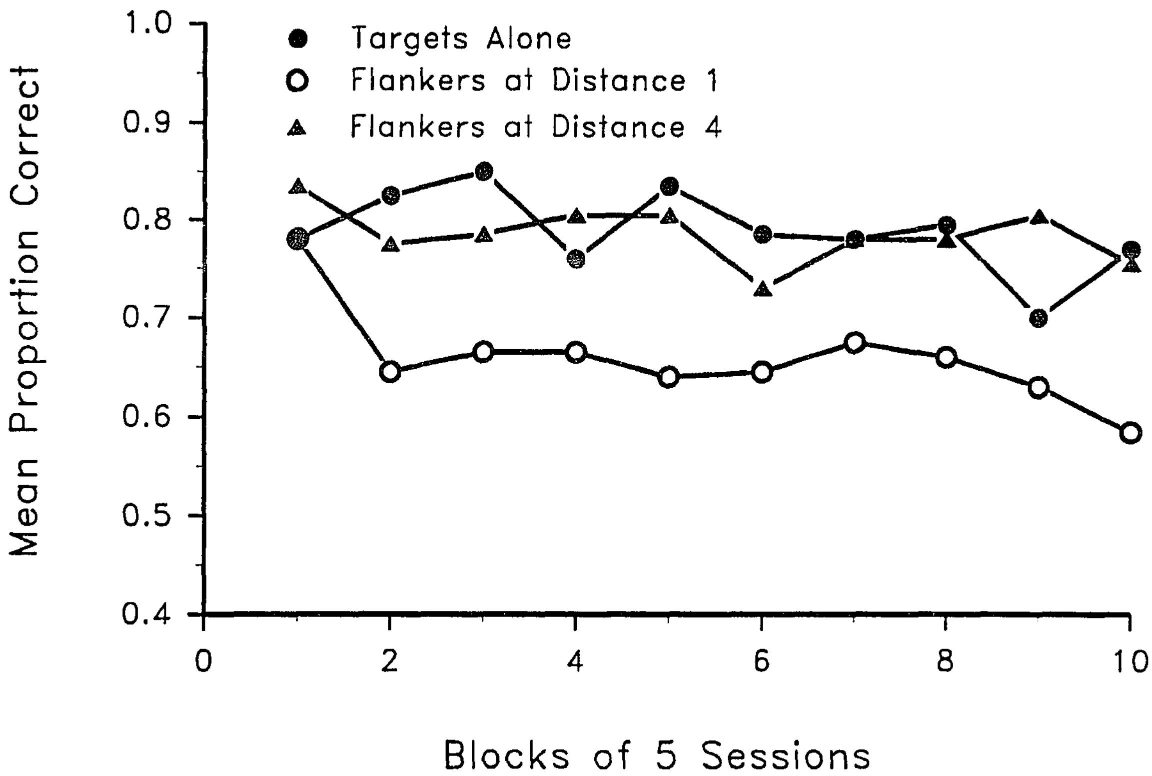

Figure 2. Mean learning curves for the two subjects of Experiment 1a. To avoid overcrowding only the curves for the three most informative conditions are shown.

pigeon (Goodale and Graves,1982; McFadden,1989). Despite this, the task was extremely difficult for the subjects. It took one of the subjects 78 sessions and the other 80 sessions to reach the criterion in phase 1.

The Heinemann and Chase model predicted that at the beginning of phase 2, subjects' performance would be affected when the target stimuli were presented with the flankers but not when the targets continued to be presented alone. The reason for this is that the subjects' LTMs contained records of the target patterns acquired during acquisition training but not of the targets with flankers. The flankers should distract if they fell within the area of focal attention, mainly at target-flanker separations 1 and 2, but no so much at separation 3. It was expected that the flankers at target-flanker separation 4 would have little or no effect on the discrimination of the targets. The results shown in figure 1 clearly confirmed these expectations. The results of the regression analysis also confirmed the linear relationship between the independent and dependent variables. It was also predicted that the flankers would continue to distract even after extensive phase 2 training, when subjects' LTMs contained records of targets-with-flankers patterns. The reason for this is that the flankers add noise during the comparison process without adding any informative value. Figure 2 clearly shows that the distractor effect did not decrease even at the end of training.

Experiment 1b

In Experiment 1a it was demonstrated that adding flankers to already known patterns produces a distractor effect. According to the Heinemann and Chase model this is a consequence of the fact that during the assumed decision process, the comparison of these flankers to their representations in memory contributes to the variability of the outcome without contributing to the discrimination. It follows that the addition of another redundant set of flankers to the ones already used, should produce even greater impairment of the discrimination.

Experiment 1b examines the effect of an additional pair of flankers placed above and below the targets.

Method

Subjects

The subjects were the same ones who met the criterion for Experiment 1a. They were kept in the same colony room and under the same conditions as in Experiment 1a.

Apparatus and Stimuli

The apparatus and stimuli were the same ones used in Experiment 1a, except that extra flankers were added. These added flankers consisted of isosceles triangles placed above and below the target patterns. The length of their bases was 9 mm and the legs measured 5 mm (see figure 2b, Appendix B). These flankers will also be referred to as "vertical flankers".

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. There was a pair of vertical flankers together with a pair of horizontal flankers at each of the four target-flanker separations used in Experiment 1a (see figure 2b, Appendix B, for samples of these stimuli). The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

The subjects began their participation in this experiment immediately after the end of Experiment 1b. The procedure was the same as the one used in phase 2 of Experiment 1a, except that four flankers were used instead of two. The subjects were tested for 15 sessions.

Results

The data for the 15 sessions of training were converted to proportions for each of the five conditions in the experiment. The Arcsine transformation was then applied as described in the results section of Experiment 1a. The Analysis of the Regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations showed that there is a linear relationship between the independent and dependent variables [$F(1,6) = 6.88$, $p < .0395$]. The untransformed proportion data were also analyzed yielding comparable results [$F(1,6) = 7.17$, $p < .0366$]. The data for all the individual subjects were included in the regression analysis. The Arcsine transformations for the fifteen sessions were compared to those for the last fifteen sessions of training during phase 2 of Experiment 1a to test the hypothesis that the difference between the slopes is zero. Using the formula proposed by Kerlinger and Pedhazur (1973), this analysis showed no difference between the slopes [$F(1,12) = .054$, $p > .05$] which indicates that it is possible to use a common slope for the two sets of data. Using the formula proposed by Kerlinger and Pedhazur (1973), a significant linear relationship between the independent variables and the dependent variable for the common slope was found [$F(1,13) = 11.806, p < .01$]. However, the regression analysis using the formula proposed by Kerlinger and Pedhazur (1972) for testing the hypothesis that the difference between the intercepts of the two regression lines is equal to zero was not significant [$F(1,13) = 1.306, p > .05$].

The proportions from the individual subjects were converted to mean proportion correct scores to provide indexes of discrimination of the target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. Figure 3 shows these mean proportions for the two subjects.

Discussion

As shown in Figure 3, there is a greater distractor effect in Experiment 1b as compared to the last 15 sessions of Experiment 1a. This additive distractor effect may be attributed to the additional set of flankers used in Experiment 1b. The greater distractor effect was at target-flanker separations 1 and 2, while discrimination between targets with flankers at separation 4 continued to be mostly unaffected; however, comparison of the intercepts was not significant. The failure to find a significant difference between the intercepts may be due to one of two reasons: (1) a ceiling distractor effect reached at the end of Experiment 1a, or (2) a lack of power as a result of the small number of subjects used in these experiments.

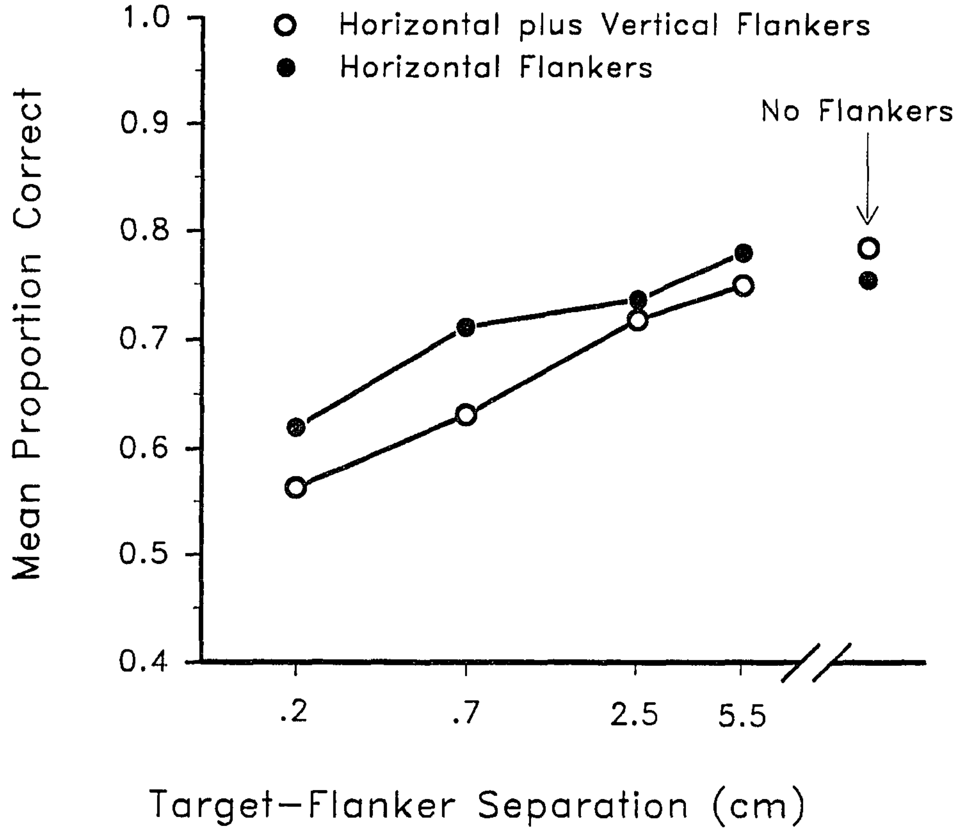

Figure 3. Mean proportion correct as a function of target-flanker separation. Each mean is based on data from 15 sessions of training and two subjects. The mean proportions correct from the last 15 sessions of training of experiment 1a, during which only horizontal flankers were used, are shown for comparison. Horizontal axis scaled logarithmically.

Experiment 2

It is possible that the effect of adding flankers to target patterns may vary with the discriminability of the targets. If the target patterns alone can be discriminated from each other, then adding flankers may only impair the discrimination. The Heinemann and Chase model assumes that, under these circumstances, any extra element that is added to target patterns will distract. However, if the targets alone cannot be discriminated from each other, then the net effect of adding flankers may be to facilitate the discrimination because the compound patterns consisting of targets with flankers can be discriminated from each other. Thus, adding the same flankers might result in either enhancement or distractor effects, depending on the discriminability of the target patterns.

If subjects were demanded to discriminate successively between a target pattern consisting of two squares placed one above the other along an imaginary vertical line, and a target pattern that differs from the first only in that the squares have been shifted horizontally by 5 mm, the discrimination would probably prove to be impossible without some frame of reference or context. According to the center of gravity rule described in the introduction, when subjects compare templates stored in memory to the pattern presented for discrimination, they compute, from the coordinates of all the pixels in the pattern, the *centroid* or center of gravity, to be superimposed on the *centroids* of the remembered patterns. If the *centroid* is computed for one of the two-square targets described above and superimposed on the *centroids* of the templates that a subject has stored for these targets, there will always be a perfect match, making discrimination impossible.

The effects of breaking up the continuous lines that made up the U shapes used in Experiments 1a, and 1b will be investigated in Experiment 2. The contours of these U shapes will now consist of seven small squares. It is expected that the subjects will still be able to discriminate between these targets when presented alone, and that adding flankers will still distract. However, if we use the two-square patterns that differ only in that one has been shifted horizontally by 5mm, it is predicted that the flankers will have the opposite effect from the one obtained in Experiment 1a. The reason for this expected superiority effect is that, as noted, the compound target-flanker patterns can be discriminated from each other. According to the Heinemann and Chase model, the nearer the flankers are to the target patterns the easier it will be to discriminate between the target-flanker compounds. As the distance of the flankers to the targets increases, performance should eventually decrease to chance level.

Method

Subjects

The subjects in this experiment were the same ones used in Experiment 1a. This includes the two subjects who failed to meet the criterion for advancement to phase 2. The subjects were kept in the same colony room, and under the same conditions as in Experiment 1a.

Apparatus and stimuli

The apparatus used in this experiment was exactly the same as that used in Experiment 1a.

Two pairs of targets were used. One pair consisted of U shapes of the same size as those used in Experiment 1a. The only difference was that instead of continuous lines, the contour of the patterns was made up of seven small squares. Each little "square" was produced by illuminating two pixels that were next to each other in the horizontal direction. The second pair of targets consisted of two pairs of squares. One pair of squares consisted of the two squares at the ends of the left-side leg of the modified U shapes, and the other pair of squares consisted of the two squares at the ends of the right-side leg. The flankers were the same as the ones used in Experiment 1a (see figures 3b and 4b, Appendix B).

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. These target-flanker separations were the same ones used in Experiment 1a. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

The subjects were divided into two groups of two each. Those in Group A were shown the modified U shapes described above as targets, whereas those in Group B were shown the two-square patterns. From the beginning of training, subjects were presented on each trial with one of the ten stimuli. Initially, the patterns included a color cue to facilitate learning. For Group A, the two pixels of the square that distinguished the two U shapes (the squares between the two legs) were made yellow. When subjects had acquired a good discrimination, one of the yellow pixels in each U shape was made red. The subjects had to meet a criterion of at least 2 consecutive sessions of 80% correct responses before the remaining yellow pixel was also changed to red. For Group B, one pair of target squares was made yellow while the other target pair remained red. When subjects had acquired a good discrimination, one yellow pixel in each of the yellow squares was made red. The criterion for advancing to the second phase (i.e., pattern recognition phase with no color cues) of the experiment for Group B was the same as the one for Group A. It should be noted that, in the first phase of training, subjects in Group A could not base their discrimination on color since both targets contained a yellow square. Instead, they had to base their discrimination on the location of the color cue. Subjects in Group B, however, could use color in their discrimination of the target patterns since one color cue was red while the other cue was yellow. There were ten presentations of each stimulus for a total of 100 trials per daily session. Those subjects who met the criterion were tested for 50 sessions.

Results

The data for the last 30 sessions of training were converted to proportions for each of the five conditions in each of the two groups. The Arcsine transformation was then applied as described in the general method section. Only the proportions for the last 30 sessions of training were so transformed because these proportions appeared to have stabilized at asymptotic values during these sessions. The statistical analysis will be concerned only with these asymptotic data. Analysis of the Regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations, for the only subject who met the criterion in Group A, showed that there is a linear relationship between the independent and dependent variables [$F(1,2) = 36.57$, $p < .0263$]. The untransformed proportion data were also analyzed yielding comparable results [$F(1,2) = 37.95$, $p < .0254$]. Analysis of the regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations for the two subjects in Group B also showed a linear relationship [$F(1,6) = 11.66$, $p < .0142$]. The proportion data for Group B were also analyzed yielding comparable results [$F(1,6) = 11.64$, $p < .0143$]. The data for all the individual subjects who met the criterion in each group were included in the regression analyses. The proportions from the individual subjects were converted to mean proportion correct scores for the last 30 sessions of training to provide indexes of discrimination of the target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. However, Figure 4 shows only the proportions for the one subject in Group A who met the specified criterion.

Figure 5 shows the learning curves for this subject. Only the learning curves for the target patterns alone and the target patterns with flankers at target-flanker separations 1 and 4 are shown.

Figure 6 shows the mean proportions for the two subjects in Group B.

Figure 7 shows the mean learning curves of the two subjects in Group B. For the sake of clarity, only the curves for the target patterns alone and the target patterns with flankers at target-flanker separations 1 and 4 are shown.

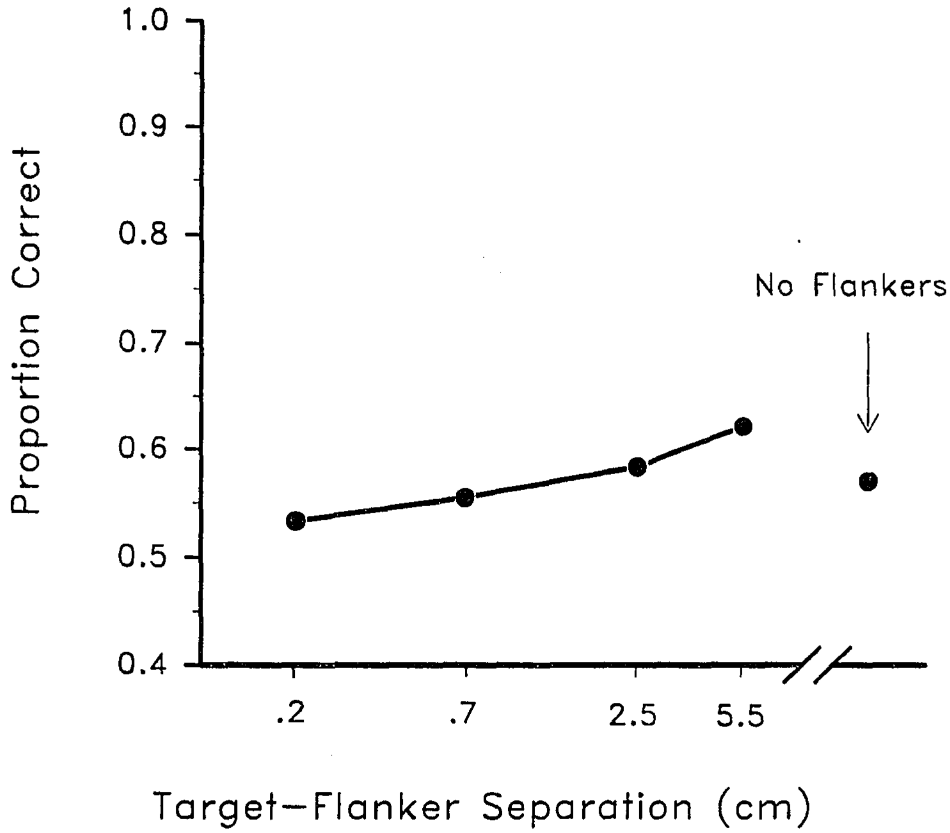

Figure 4. Proportion correct as a function of target-flanker separation. Each Proportion is based on data from the last 30 sessions of training and the only subject of Group A who met the criterion. Distances along the horizontal axis are scaled logarithmically.

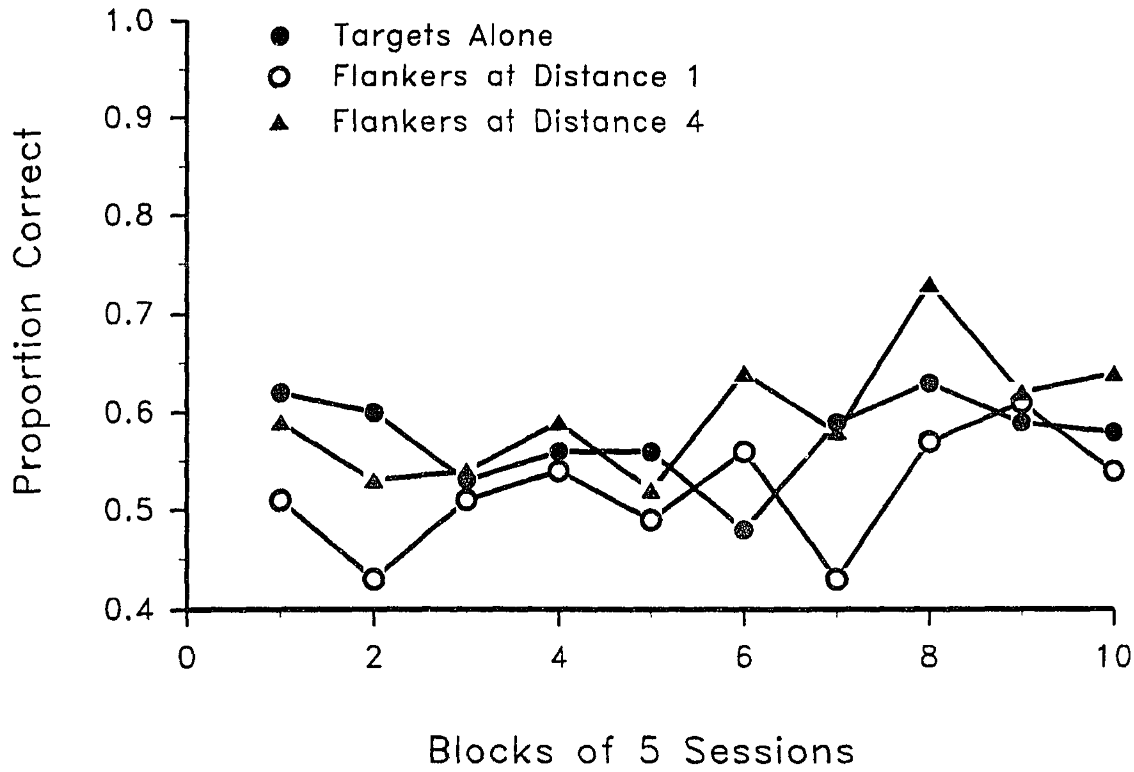

Figure 5. Learning curves for the only subject of Group A who met the criterion. To avoid overcrowding only the curves for the three most informative conditions are shown.

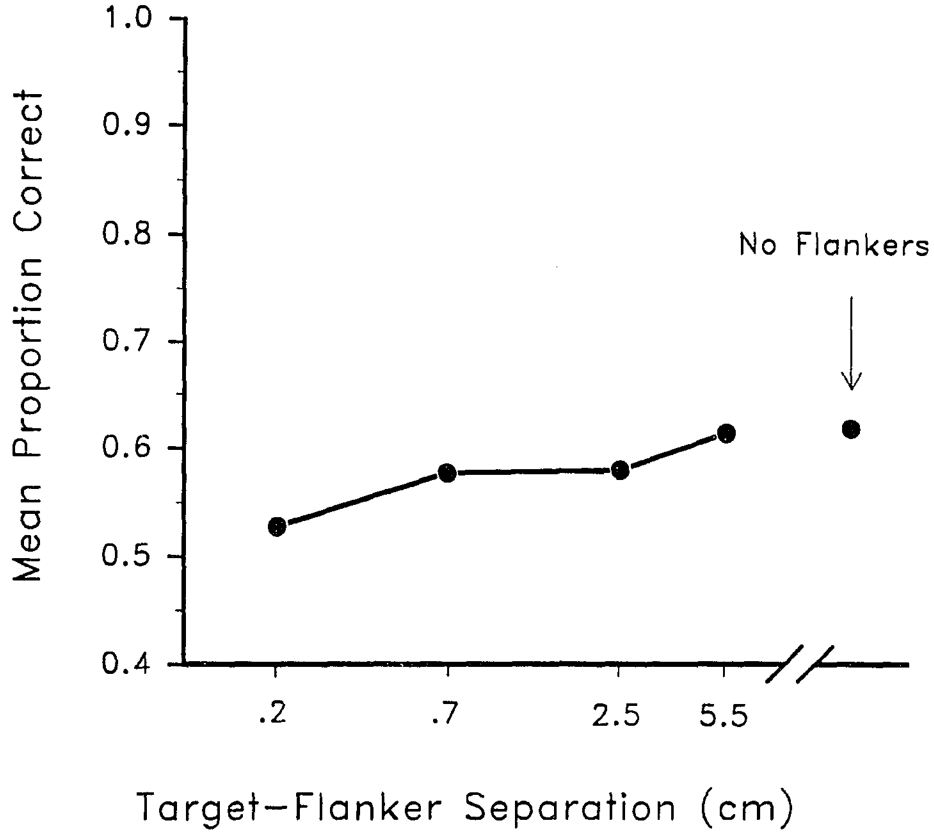

Figure 6. Mean proportion correct as a function of target-flanker separation. Each Mean is based on data from the last 30 sessions of training and two subjects. Distances along the horizontal axis are scaled logarithmically.

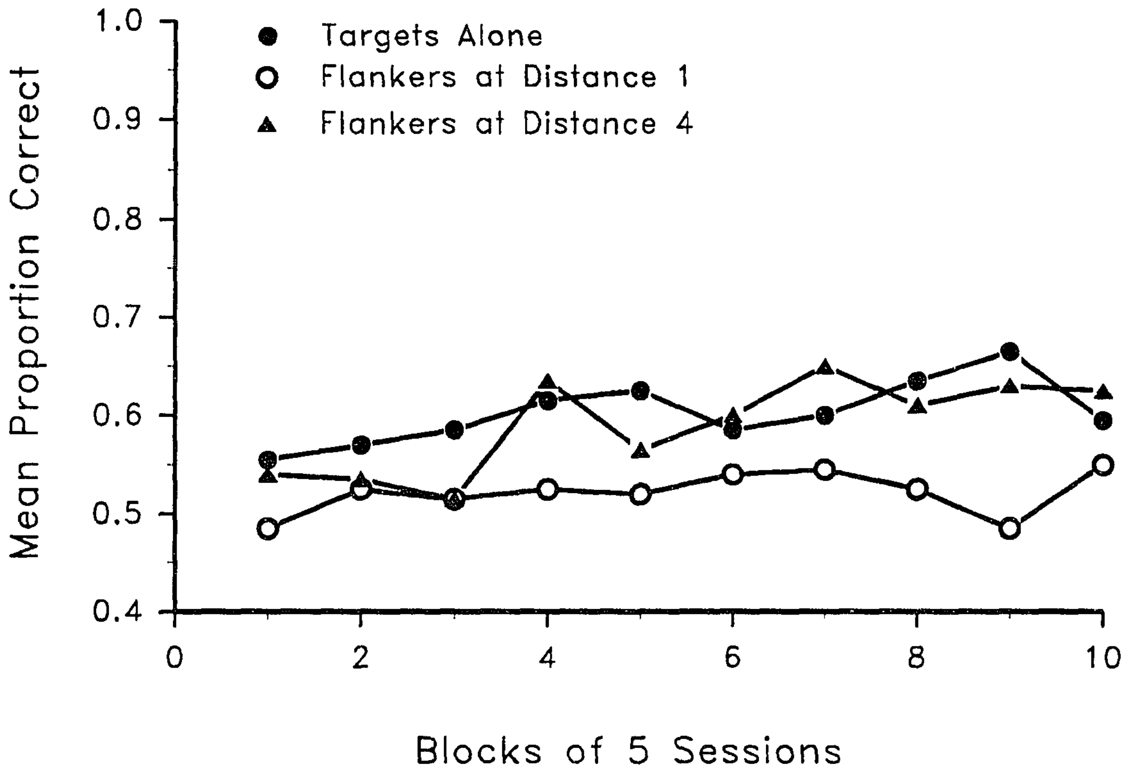

Figure 7. Mean learning curves for the two subjects of Experiment 2b. To avoid overcrowding only the curves for the three most informative conditions are shown.

Discussion

The regression analyses showed that there is a linear relationship between the independent and dependent variables for both groups in this experiment. The results of Group A, shown in figure 4, confirm the prediction that the nearer the flankers are to the target patterns, the more detrimental they will be to the discrimination. The distractor effect diminished with increasing target-flanker separation, and the flankers at separation 4 produced no distractor effects. The break-up of the contours of the U shapes may have had a deleterious effect on the discrimination since the percentages of correct responses were much lower than those obtained in Experiment 1a.

The results for Group B were somewhat surprising. As figure 6 shows, in this group the flankers also produced a distractor effect, and this effect was stronger the nearer the flankers were to the target patterns. This is contrary to the predictions derived from the Heinemann and Chase model. One possible explanation for these results is that the subjects used the center circle, a peck on which initiated the presentation of the stimuli, as a reference point in estimating the location of the targets. Another possible explanation is that the presentation of the center circle followed by exposure of the small square patterns created the perception of apparent motion, which then governed the subjects' responses. Either of these explanations would lead to the behavior actually observed because, if something other than the flankers were used as context, the flankers would act as distractors, according to the Heinemann and Chase model.

Experiment 3

The center key used to initiate a trial in Experiment 2 might possibly have played a key role in the failure to obtain the predicted results. To check on the possible role of the center key in Experiment 2, this key was eliminated from the procedure in Experiment 3. If subjects in Group B of Experiment 2 were indeed using this center circle as context, then its removal should result in a context superiority effect instead of a distractor effect.

Method

Subjects

The subjects were the same ones who participated in Group B of Experiment 2. They were kept in the same colony room and under the same conditions.

Apparatus and Stimuli

The apparatus was the same one that was used in Experiment 1a. The stimuli used in the present experiment were the same as the ones used in Group B of Experiment 2. The only difference was that the center circle was eliminated.

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

One month after the end of Experiment 2, subjects began their participation in the present experiment. Because the center circle that had to be pecked to initiate the trial in previous experiments was eliminated, subjects were trained to peck on the target stimuli. A beep signaled a successful peck on a target stimulus and, after two such pecks, the simulated response keys were presented on the display screen. The rest of the procedure was identical to that used for Group B in Experiment 2. The subjects were tested for only 35 sessions.

Results

The data for the 35 sessions were converted to proportions for each of the five conditions of the experiment. The Arcsine transformation was then applied as described in the general method section. An analysis of the regression of the Arcsine transformations of *P* on the logarithm of the four target-flanker separations showed that there is a linear relationship between the independent and dependent variables [$F(1,6) = 22.79$, $p < .0031$]. The proportion data were also analyzed yielding comparable results [$F(1,6) = 22.93$, $p < .0030$]. The data for all the individual subjects were included in the regression analysis.

The proportions from the individual subjects were converted to mean proportion correct scores for the 35 sessions to provide indexes of discrimination of the target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. Figure 8 shows these mean proportions for the two subjects.

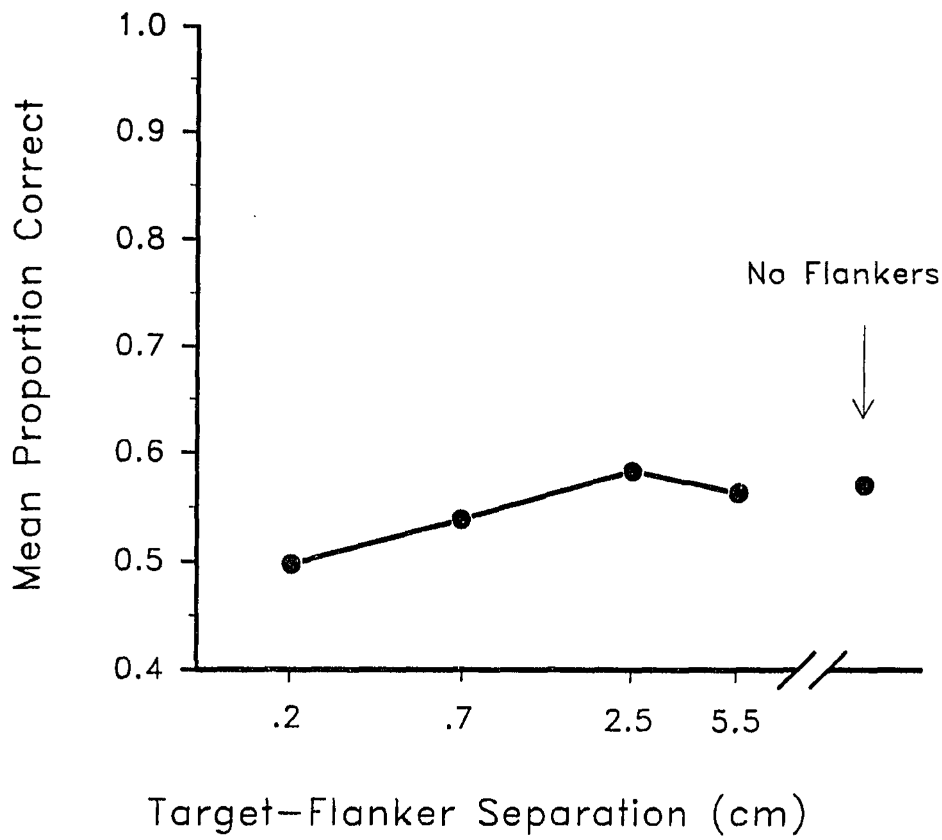

Figure 8. Mean proportion correct as a function of target-flanker separation. Each Mean is based on data from 35 sessions of training and two subjects. Distances along the horizontal axis are scaled logarithmically.

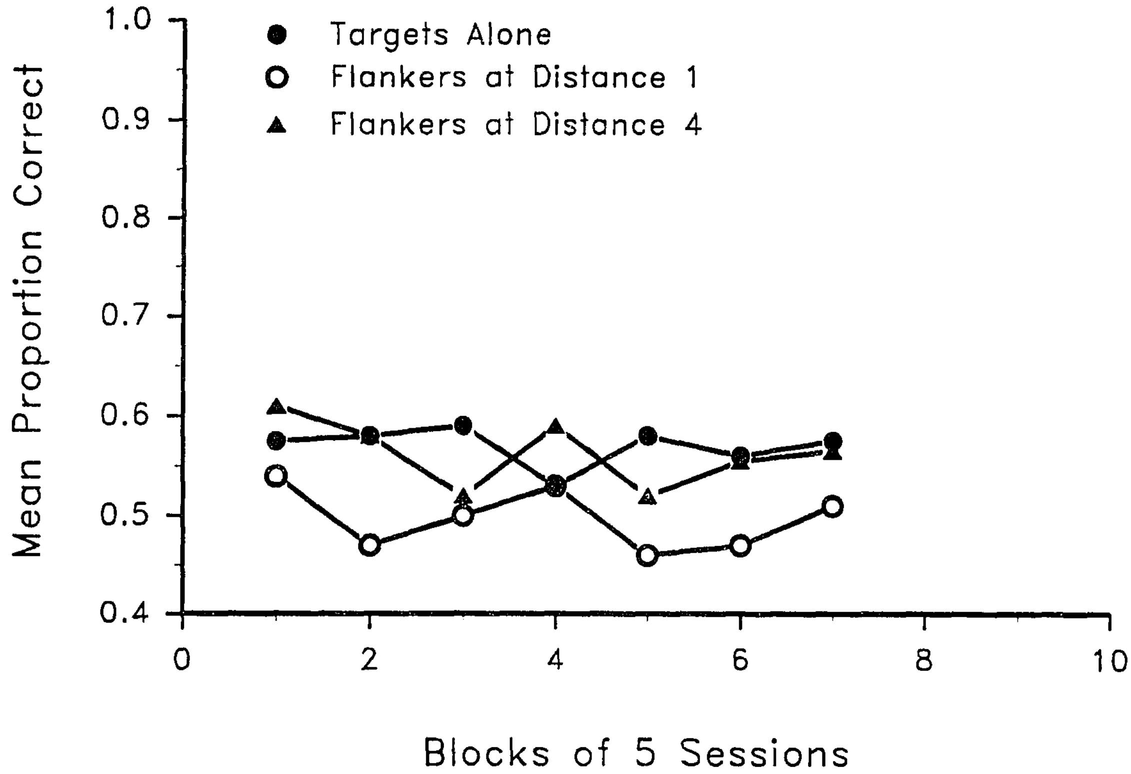

Figure 9. Mean learning curves for the two subjects of Experiment 3. To avoid overcrowding only the curves for the three most informative conditions are shown.

Figure 9 shows the mean learning curves for the two subjects. Only the curves for the patterns alone and the patterns with flankers at target-flanker separations 1 and 4 are shown.

Discussion

The regression analysis of the transformed data showed a linear relationship between the independent and dependent variables. However, a distractor effect instead of a context superiority effect was obtained contrary to the prediction of the Heinemann and Chase model. The results, shown in figures 8 and 9, clearly show a distractor effect rather than a context superiority effect. Overall, the proportions of correct responses are lower than the ones of Group B in experiment 2 (shown in figures 6 and 7). This may indicate that the center circle was being used to some extent by the subjects in Experiment 2. However, the existence of a distractor effect in the absence of the center key can only mean one of two things: (1) the Heinemann and Chase Model is wrong in its prediction, or (2) the subjects were still using reference marks other than the flankers in order to estimate the position of the target patterns.

Experiment 4a

Fixed flankers have been shown to increase discriminability of target patterns in human subjects. For example, Pomerantz and Schwaitzberg (1975) presented subjects with cards that had to be sorted into one of two piles according to the patterns on them. The subjects had to discriminate between the target patterns) and (. In one condition the non-informative flanker (was added to the left of both target patterns which resulted in the compounds ( ) and ((. In another stimulus set the non-informative flanker) was added to the left of the same target patterns which resulted in the compounds)) and) (. In both sets the discrimination could only be based on) versus (. The non-informative flankers were presented at distances from the targets that varied from a half space to 16 spaces on the typewriter. This task called for selective attention of the right-side stimulus while ignoring the one on the left. The results of the Pomerantz and Schwaitzberg (1975) study showed that when the non-informative flankers were near to the targets, subjects had no difficulty in the discrimination of the target patterns. However, as the distance of the flankers to the targets increased so did the subjects' reaction time. These results demonstrated that subjects failed to attend to the target patterns selectively. It may be that they perceptually grouped the flankers and the target patterns when they were close together, and that as the distance of the flankers to the target patterns increased this grouping became more difficult to achieve.

Why did subjects in Group B of Experiment 2 and those in Experiment 3 fail to show a context superiority effect similar to that shown by the subjects in the Pomerantz and Schwaitzberg (1975) study? Is it that the Heinemann and Chase Model is wrong in the predictions made for Group B of Experiment 2 and Experiment 3? It certainly cannot be said that pigeons cannot use contexts in pattern recognition because it is clear that they were using some kind of context in Experiment 2 (Group B) and in Experiment 3. But, if the subjects were using some contexts other than the flankers, what were these contexts?

There still exists the plausible alternative hypothesis that subjects were using either the edges of the display screen or those of the touch screen as context. In Experiment 4a, I attempted to create a Ganzfeld condition by presenting white stimuli on a totally black background. In this situation all possible contexts, other than the flankers under investigation, were eliminated. It is hypothesized that, in this near-ganzfeld, subjects will be forced to use the flankers in their discrimination of the target patterns under investigation, so that a context superiority instead of a distractor effect should be obtained.

Method

Subjects

The subjects were four female White Carneaux pigeons (*Columba Livia*). The subjects were kept in the same conditions as in previous experiments. One of the subjects had participated in previous experiments of the present study.

Apparatus and Stimuli

The apparatus was the same one used in Experiment 1a. The only difference was that all of the interior of the operant chamber was painted flat-black.

The stimuli used were the same as the ones used for Group B of Experiment 2. The one difference was that, in the present experiment, the target patterns and flankers were white shown on a black background.

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

Except for the following modifications, the procedure was the same as the one used for Group B of Experiment 2. The pecking response was conditioned using an autoshaping procedure (Brown and Jenkins, 1968). A large illuminated circle was presented in the area where the stimuli would be subsequently presented. When the subjects were readily responding to this circle, the size was successively reduced until it was the size of two pixels on the monitor screen. When the actual stimuli were presented to the subjects, there was an initial color discrimination in which one two-square pattern was shown in light red color and the other pattern in white. There was no fading procedure. Instead, after the subjects met the criterion of at least two consecutive sessions with 80% correct responses in this color discrimination, the red squares were changed to white. Because pecking on the small white targets on a totally dark background was very difficult for the subjects, they were required to peck only once on the targets in order for the simulated response keys to be presented.

Despite the use of a correction method in the previous experiments, some subjects developed key biases. In order to control for this, and in an attempt to speed up learning, a 15 sec ITI came after an incorrect response and a 9 sec ITI after a correct response. After a correct response, the screen became white to provide enough illumination so that subjects could find the food pellets. After an incorrect response, the screen became dark and remained so for the duration of the ITI.

There were ten trials per stimulus for a total of 100 trials per daily session. Subjects were tested for 50 sessions.

Results

All four subjects met the criterion in the color-discrimination phase, but only three learned the discrimination during the pattern recognition phase. The data for the last 30 sessions were converted to proportions for each of the five conditions in the experiment. The Arcsine transformation was then applied as described in the general method section. An analysis of the regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations showed that there is a linear relationship between the independent and dependent variables [$F(1,14) = 9.83$, $p < .0073$]. The untransformed proportion data were also analyzed yielding comparable results [$F(1,14) = 9.55$, $p < .0080$]. The data for all the individual subjects, including the subject who did not learn the discrimination, were included in the regression analysis.

The proportions from the individual subjects were converted to mean proportion correct scores for the last 30 sessions to provide indexes of discrimination of the target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. Figure 10 shows these mean proportions for only the three subjects who learned the discrimination, and the results of a simulation in which the *spacing*, and *viewing distances* parameters of the Heinemann and Chase model were varied.

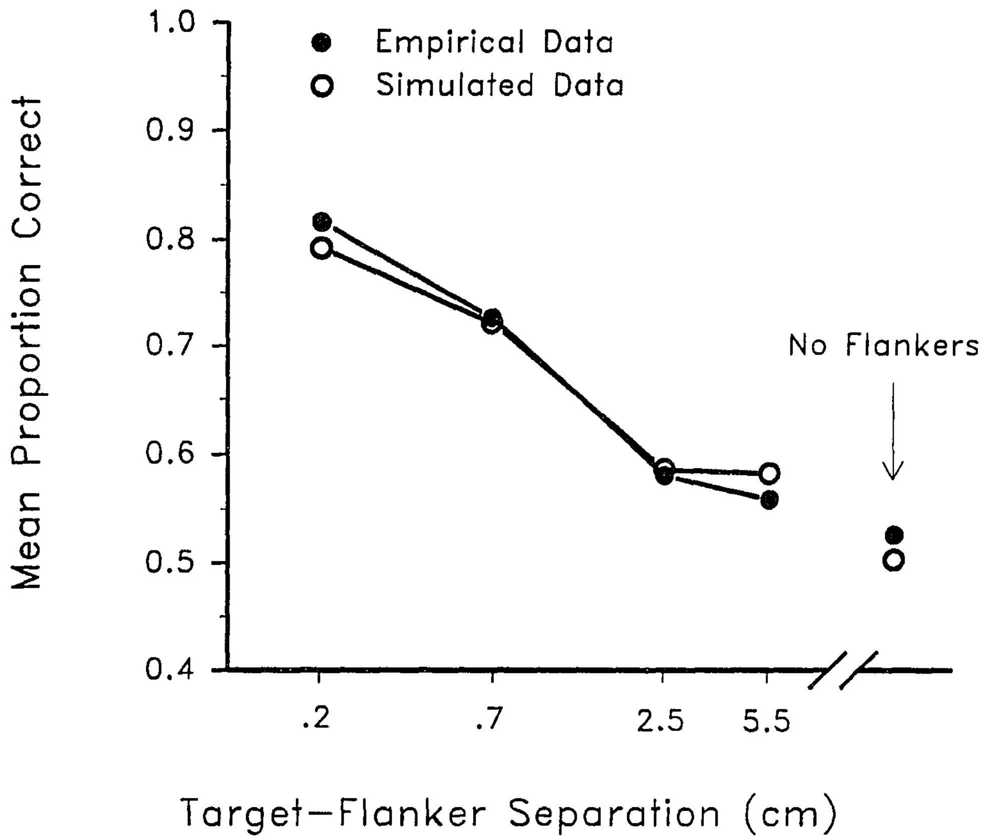

Figure 10. Mean proportions correct based on data from the last 30 sessions of training and three subjects (filled circles), together with results of a computer simulation (open circles). Horizontal axis scaled logarithmically.

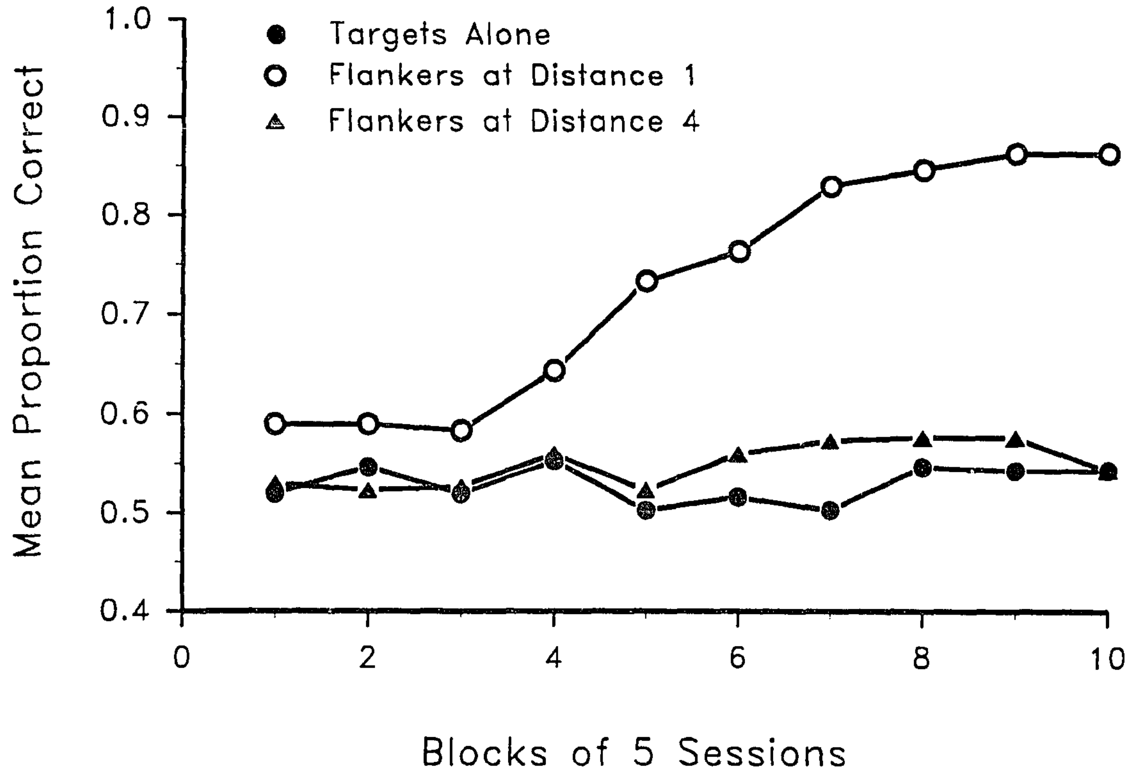

Figure 11. Mean learning curves for the three subjects of Experiment 4a. To avoid overcrowding only the curves for the three most informative conditions are shown.

These parameter values were: 3.52, and 1.35, respectively. The *resamplings* parameter was kept at zero.

Figure 11 shows the mean learning curves for the three subjects who learned the discrimination. Only the curves for the target patterns alone, and the target patterns with flankers at target-flanker separations 1 and 4 are shown.

Discussion

The results shown in figures 10 and 11 demonstrate, in a very clear way, a context superiority effect as was predicted. It can be seen that the most dramatic effect takes place when the flankers are at the nearest distance from the target patterns. As the flankers are moved further away from the target patterns, the discrimination is impaired to the point that, at target-flanker separation 4, the flankers provide very little help in the discrimination. Figure 10 also shows that the results of the simulations are very close to the empirical results. This simulation, with the parameter values mentioned above, shows that the simulated pigeon makes a large number of guesses and that the number of guesses increases as the target-flanker separations increase.

The fact that the pigeons performed at chance level in the absence of flankers confirms that the subjects of Experiment 2 (Group B) and Experiment 3 were indeed using contexts other than the flankers. This is interesting since it shows the remarkable ability of pigeons to use contexts in this artificial environment.

Experiment 4b

Experiment 4a showed that, though the two target stimuli were not discriminated from each other when there was no visual context, the compounds formed by combining the target patterns with the flankers were readily discriminated.

The purpose of Experiment 4b was to find out whether the addition of a set of non-informative flankers to the above mentioned compound would result in a distractor effect or would produce a further improvement in the discrimination. Experiment 4b tries to answer this question by making the two-square patterns with horizontal flankers at target-flanker separation 1 the target patterns, and adding vertical flankers at each of the four different target-flanker separations.

Method

Subjects

The subjects used in this experiment were the three pigeons who learned the discrimination in Experiment 4a. The subjects were kept as in previous experiments.

Apparatus and Stimuli

The apparatus was the same one used in Experiment 4a. The stimuli consisted of the two-square patterns with the horizontal flankers at target-flanker separation 1, and the vertical flankers used in Experiment 1b.

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

Immediately after the conclusion of experiment 4a, subjects began their participation in experiment 4b. There was no initial color discrimination. The procedure was the same as the one used in Experiment 4a except that now the target patterns consisted of the two-square patterns with the horizontal flankers at target-flanker separation 1. The "distractors" were the vertical flankers used in Experiment 1b placed above and below the target patterns at each of the four different target-flanker separations. There were ten trials per stimulus for a total of 100 trials per daily session. The subjects were tested for 30 sessions.

Results

The data for the 30 sessions were converted to proportions for each of the five conditions in the experiment. The Arcsine transformation was then applied as described in the general method section. An analysis of the Regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations showed that there is a linear relationship between the independent and dependent variables [$F(1,10) = 7.02$, $p < .0244$]. The untransformed proportion data were also analyzed yielding comparable results [$F(1,10) = 7.21$, $p < .0229$]. The data for all the individual subjects were included in the regression analysis. The proportions from the individual subjects were converted to mean proportion correct scores to provide indexes of discrimination of the

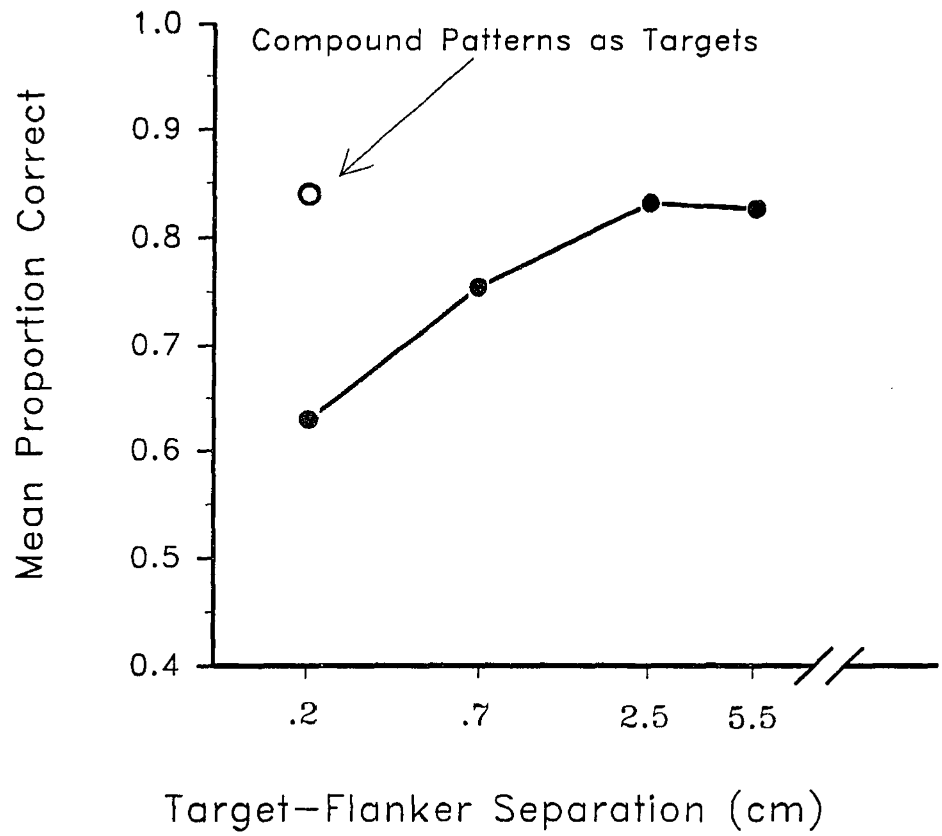

Figure 12. Mean proportion correct as a function of target-flanker separation. Each Mean is based on data from 30 sessions of training and three subjects. Distances along the horizontal axis are scaled logarithmically.

target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. Figure 12 shows these mean proportions for the three subjects who participated in this experiment.

Discussion

The regression analysis showed a linear relationship between the independent and dependent variables. Figure 12 shows a relationship that is a dramatic reversal from the context superiority effect obtained in Experiment 4a to a distractor effect in Experiment 4b. It can be seen that the greatest distractor effect was obtained when the vertical flankers were presented at target-flanker separation 1. As the vertical flankers were moved further from the target patterns, the distractor effect decreased to the point that, at target-flanker separations 3 and 4, there was no impairment of the discrimination. It can also be seen that subjects continued to perform well when the squares were presented with the horizontal flankers alone.

Experiment 5

In Experiments 1a, 1b, and 4b, it was demonstrated that non-informative elements added to discriminable visual patterns impairs the discriminative performance, and this effect is greater the nearer these elements are to the target patterns. Finally, in Experiment 4a, it was demonstrated that non-informative flankers can produce a context superiority effect, if all visual reference marks have been removed from the display screen and the target patterns alone are not discriminated. Furthermore, this effect was stronger the nearer the flankers were to the target patterns. But what would happen if discriminable patterns are embedded in non-informative patterns?

Pomerantz, et al. (1977), working with human subjects, showed that it is possible to enhance discrimination by adding constant non-informative elements to the target patterns. In experiment 3 of Pomerantz, et al., subjects had to discriminate between two diagonal lines (one with a positive slope and the other with a negative one). Mean reaction time for the discrimination was 1884 msec. However, when a constant non-informative right angle (L-shape) was added to the diagonal lines the mean reaction time was reduced by more than half to 749 msec.

Weisstein and Harris (1974) and Enns and Prinzmetal (1984) also found that lines embedded in contexts are easier to discriminate than lines presented alone. Using diagonal lines and a right angle like the ones used by Pomerantz et al., (1977), Treisman and Paterson (1984) found that subjects had "Illusionary Conjunctions" of the diagonal lines and L-shape elements (the combined elements result in an arrow and a triangle) even when these elements were presented in a tachistoscopic display simultaneously but spatially separated from one another.

The Heinemann and Chase Model, on the other hand, predicts that, in the above situation, the non-informative elements will distract because they will add to the variance without adding informative value to the pattern recognition.

Experiment 5 tests the hypothesis derived from the Heinemann and Chase Model with essentially the same patterns as those used by Pomerantz et al. (1977).

Method

Subjects

The subjects were four male and four female White Carneaux pigeons (*Columba Livia*). The subjects were kept as in previous experiments. Four of the subjects had participated in previous experiments of the present study.

Apparatus and Stimuli

The apparatus was the same one used in Experiment 4a. The stimuli consisted of two target diagonal lines each one measuring 10 mm in length. The constant non-informative element consisted of a right angle whose legs measured 10 mm in length. The stimuli were white and they were presented on black background (see Figure 5b, Appendix B).

Design and Procedure

A within-subjects design was used in which the independent variable was the embedding context pattern. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

Because there was a possibility that subjects would show a preference for making a response on the right-side response key when presented with a positive-slope diagonal line and for making a response on the left-side response key when presented with a negative-slope diagonal line, but not show this preference when presented with diagonal lines embedded in the constant non-informative context, I decided to counterbalance the correct keys. Four subjects were assigned to Group A and four to Group B. For Group A, whenever the negative-slope diagonal line (with or without context) was presented, the correct response was a peck on the left-side response key; for a presentation of the positive-slope diagonal line (with or without context) the correct response was a peck on the left-side response key. For Group B the correct responses to stimuli were to the opposite side response keys than the ones for Group A.

The pecking response was conditioned as described in Experiment 4a. When the actual stimuli were presented to the subjects, there was an initial color discrimination which consisted of making the two patterns containing the negative-slope-line white, and the ones containing the positive-slope-line light red. The criterion for advancement to the pattern recognition phase was performance at 80% correct or better for two consecutive sessions. No fading procedure was used. Each stimulus was presented to the subjects for 25 trials which resulted in 100 trials per daily session. The pattern recognition phase continued for 50 sessions. The rest of the procedure was the same as the one employed in Experiment 4a.

Results

All eight subjects met the specified criterion. The data for the last 30 sessions of training for the two groups were combined to produce mean proportions for the lines-alone, and lines-in-context patterns. The Arcsine transformation was then applied as described in the general method section. A correlated *t*-test of the transformed data was highly significant [$t(7) = 4.05$, $p < .005$]. A correlated *t*-test of the untransformed mean proportion data for the last thirty sessions was also highly significant [$t(7) = 3.79$, $p <$

.007]. The mean proportions for the lines-alone and lines-in-context patterns were .8592, and .7208 respectively, while the proportions from one simulated pigeon subject were .8987, and .7130. This simulation was done with a *spacing* of 1.5, and *viewing distances* of 1.8.

Figure 13 shows the mean learning curves of the lines-alone, and lines-in-context conditions for the eight subjects in the experiment.

Discussion

This discrimination proved to be an easy one. All eight subjects in the experiment met the criterion and also learned the discrimination in the pattern recognition phase. The statistical results, and those presented in figure 13, confirm the hypothesis derived from the Heinemann and Chase Model. These results clearly show the superiority of the lines-alone over the lines-in-context patterns. Furthermore, as seen in figure 13, this superiority is very stable and does not decrease with training. The results of individual subjects show that seven did better on the lines-alone task whereas the remaining subject did equally well on the lines-alone and on the lines-in-context patterns.

The simulated data are very close to the empirical data. Various simulations were made in which the *spacing* and *viewing distances* parameters were varied. But no matter what values were used for these parameter the results were always the same: a robust lines-alone superiority over the lines-in-context patterns.

The results obtained in Experiment 5 differ from those obtained in experiments that have used human subjects (e.g., Pomerantz et al., 1977; Enns and Prinzmetal, 1984). The

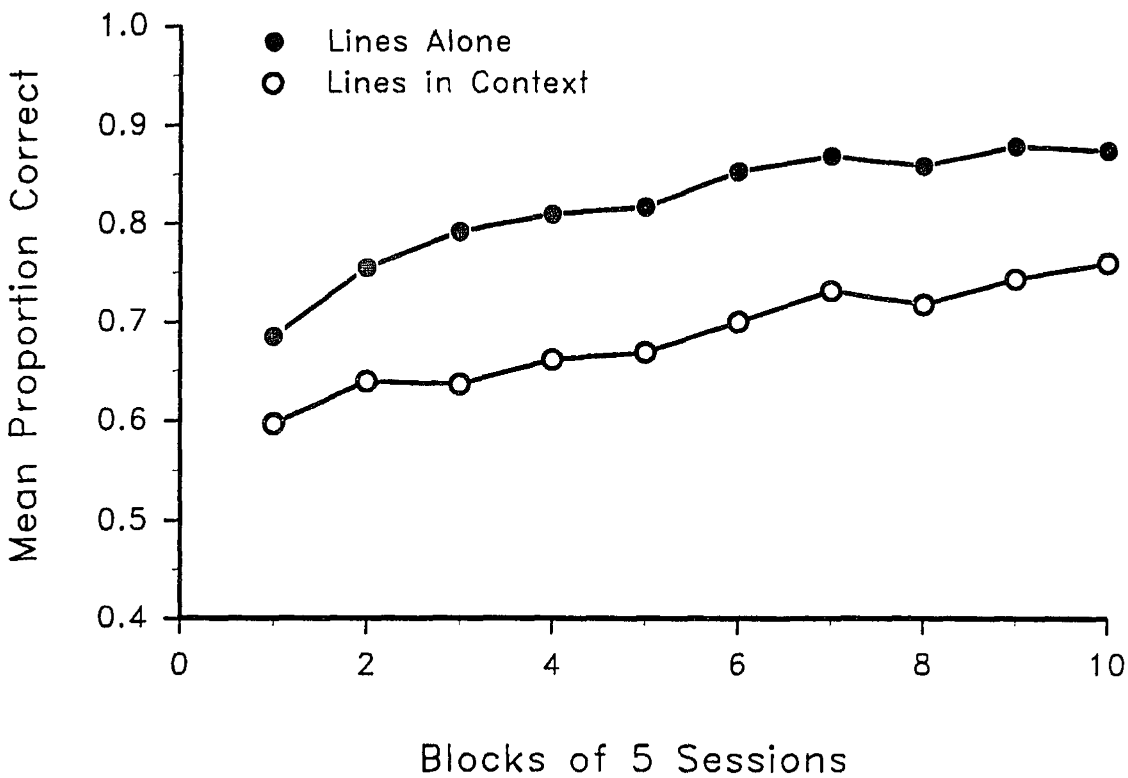

Figure 13. Mean learning curves for the eight subjects of Experiment 5. Filled circles: diagonal lines alone. Open circles: diagonal lines in context.

difference may be that pigeons use simple mental processes in the pattern recognition tasks usually employed in this type of experiments, while human subjects may be using higher mental processes. If this explanation is true, it will have a profound significance for experimental results on human pattern recognition. Because diagonal lines, arrows, and triangles probably do not have any ecological significance for pigeons, these subjects do not bring a knowledge of these shapes and their associations to the experimental situation. Thus, the results obtained with pigeons may be uncontaminated by processes that may affect human subjects. It should also be pointed out that in the experiments that have used human subjects (e.g., Pomerantz et al., 1977; Enns and Prinzmetal, 1984), the dependent variable has usually been reaction times, while in all the experiments of the present study the dependent variable was proportion correct.

Experiment 6a

The results of Experiment 4a confirmed that if templates for target patterns are indistinguishable when their *centroids* are matched, then their discrimination will be nearly impossible. However, adding flankers to the target pattern will result in compound patterns that are discriminable when their *centroids* are matched. But in Experiment 5 it was found that adding a context to patterns which were already discriminable produced a distractor effect.

In Experiment 6 it is attempted to construct discriminable target patterns, like the ones used in Experiment 5, from the two pairs of vertical squares used as targets in Experiment 4a. If we take the upper square from one pair of vertical squares and the lower square from the other pair, the result will be a pair of squares oriented diagonally (diagonally aligned squares), the pair of squares left over will result in another set of diagonally aligned squares (see Figure 6b, Appendix B). These diagonally aligned squares can also be described as the end points of two oblique short lines (e.g., the end points of the target lines used in Experiment 5). These two pairs of diagonally aligned squares will constitute discriminable patterns. In the terminology of the Heinemann and Chase model: subjects should make one response if the input matches a stored template representing one orientation, and the alternative response if it matches the orthogonal orientation. If flankers were added to these target patterns, it is hypothesized that the results will be exactly the opposite of those obtained in Experiment 4a. That is, subjects are expected to do well when presented with the diagonally aligned squares alone, but their performance will be impaired when these targets are presented with flankers. This distractor effect will be stronger the nearer the flankers are to the target patterns. Experiment 6a tests the hypothesis stated above.

Method

Subjects

The subjects were two male and two female White Carneaux pigeons (*Columba Livia*). The subjects were kept as in previous experiments. None of the subjects had participated in any of the previous experiments of the present study.

Apparatus and Stimuli

The subjects were trained and tested in a Large Environment Cubicle (Model LEC-006, BRS/LVE) with the same dimensions and modified as specified in the general method section. However, the infra-red-emitter-detector screen was eliminated in experiment 6a. Instead, an AccuTouch™ Touchscreen (Model E270, Elographics, Inc.; Oak Ridge, TN) was used. The touchscreen was placed on a convex glass sheet whose convexity matched closely that of the monitor screen. The glass with the touchscreen was mounted on the aluminum panel that divides the instrument and operant chambers. A thin clear plastic sheet was placed over the touch screen to prevent damage from the subjects' pecks. Also mounted on the panel were two dark brown Universal Seed and Water Cups (Penn Plax), and two High-Brightness Amber Led lamps (Approximately, 3 cm above the seed cups). Pigeon food pellets were delivered by two motor driven dispensers. The visual stimuli were presented on a color monitor like the one used in Experiment 1a. It was necessary to cut off part of the monitor's front bezel in order for it to fit flush against the glass on which the touchscreen was attached. A PC Board Buzzer (Cat. No. 273-065A; Radio Shack) was also installed. The interior of the operant chamber was painted flat black, except for the display screen which was darkened independently.

The stimuli were constructed from the two-square targets used in Experiment 4a. They were constructed by pairing each upper square with its opposite-pair lower square. The resulting targets were two pairs of squares diagonally aligned to be referred to simply as "diagonal squares". The flankers were the same ones used in experiment 4a (see figure 6b, Appendix B).

A personal computer (Model No. 1000; Tandy Corp.), using a program in Basic language, controlled the presentation of the stimuli, and the delivery of reinforcement. The computer also provided data storage.

Interfacing of the computer to the experimental box was accomplished through an A-Bus Card (Model MB-120; Alpha Products), a Relay Card (Model RE-140; Alpha Products), and an IBM Compatible A-Bus Adapter (Model AR-133; Alpha Products). Interfacing of the computer to the touchscreen was accomplished through an IBM Compatible AccuTouch™ PC-Bus Touchscreen Controller (Model E271-141, Elographics, Inc.).

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. The dependent variable was the proportion of correct responses made in the presence of each of the stimulus patterns.

Responses were sensed by pressure-sensitive detectors in the touchscreen. These sensors in selected sub-areas of the screen were enabled by specifying their X-Y coordinates in the computer program. Despite the use of a correction method and 15 sec. long ITIs after incorrect responses, some subjects still developed a preference for the left-response-key. It is possible that the subjects preferred this key because that is on the side where reward was received after a correct response in the previous experiments. In order to control for this possibility, I decided to use two seed cups, one on either side of the display screen. Reward was delivered to the same side where a correct response was required on any given trial. The rest of the procedure was exactly like the one used for experiment 4a.

Results

All four subjects met the specified criterion. The data for the last 30 sessions of training were converted to proportions for each of the five conditions in the experiment. The Arcsine transformation was then applied as described in the general method section. An analysis of the regression of the Arcsine transformations of P on the logarithm of the four target-flanker separations showed no linear relationship between the independent and dependent variables [$F(1,14) = 2.55, p > .132$]. However, this lack of relationship was the result of including in the analysis the data of the one subject who failed to learn the discrimination. A regression analysis for only the three subjects who learned the discrimination showed a statistically significant linear relationship [$F(1,10) = 5.60, p < .0395$]. A regression analysis of the proportion data also revealed comparable results [$F(1,10) = 5.75, p < .0375$]. The data for all the individual subjects were included in the regression analyses.

The proportions from three subjects who learned the discrimination were averaged to provide indexes of discrimination of the target patterns without flankers, and of the target patterns with flankers at each of the four different target-flanker separations. Figure 14 shows these mean proportions together with the results of a simulation in which the *spacing*, *viewing distances*, and *resamplings* parameters of the Heinemann and Chase model were varied. These parameter values were: 2.5, 1.49, and 10, respectively

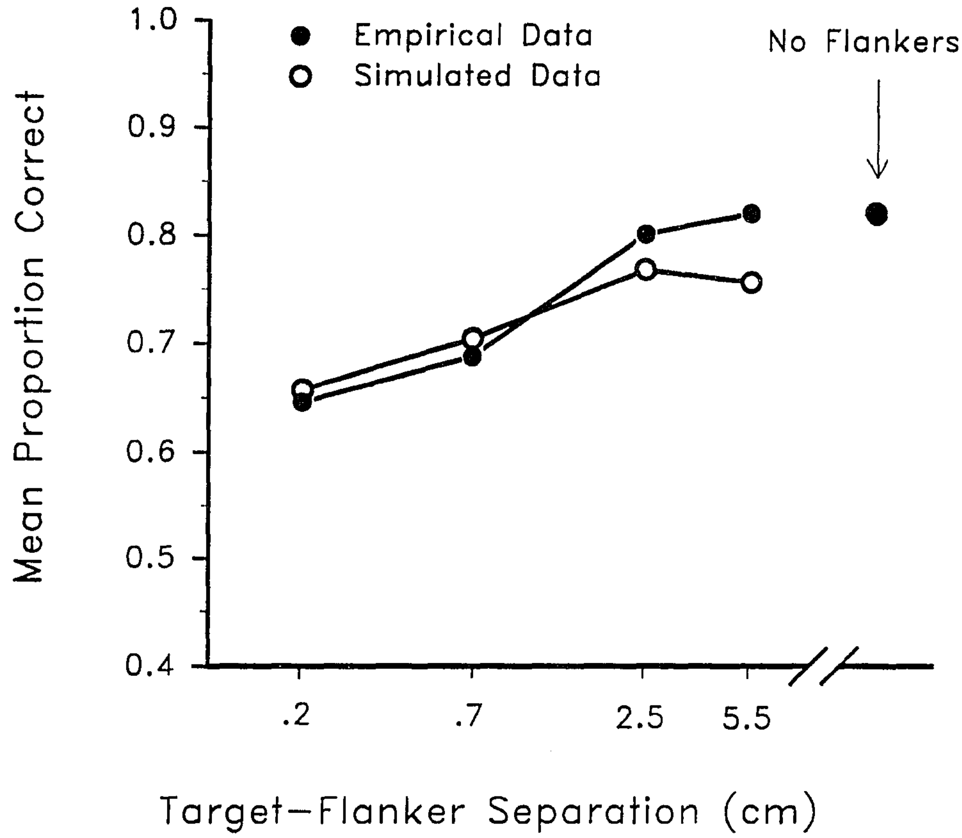

Figure 14. Mean proportions correct based on data from the last 30 sessions of training and three subjects (filled circles), together with results of a computer simulation (open circles). Distances along the horizontal axis are scaled logarithmically.

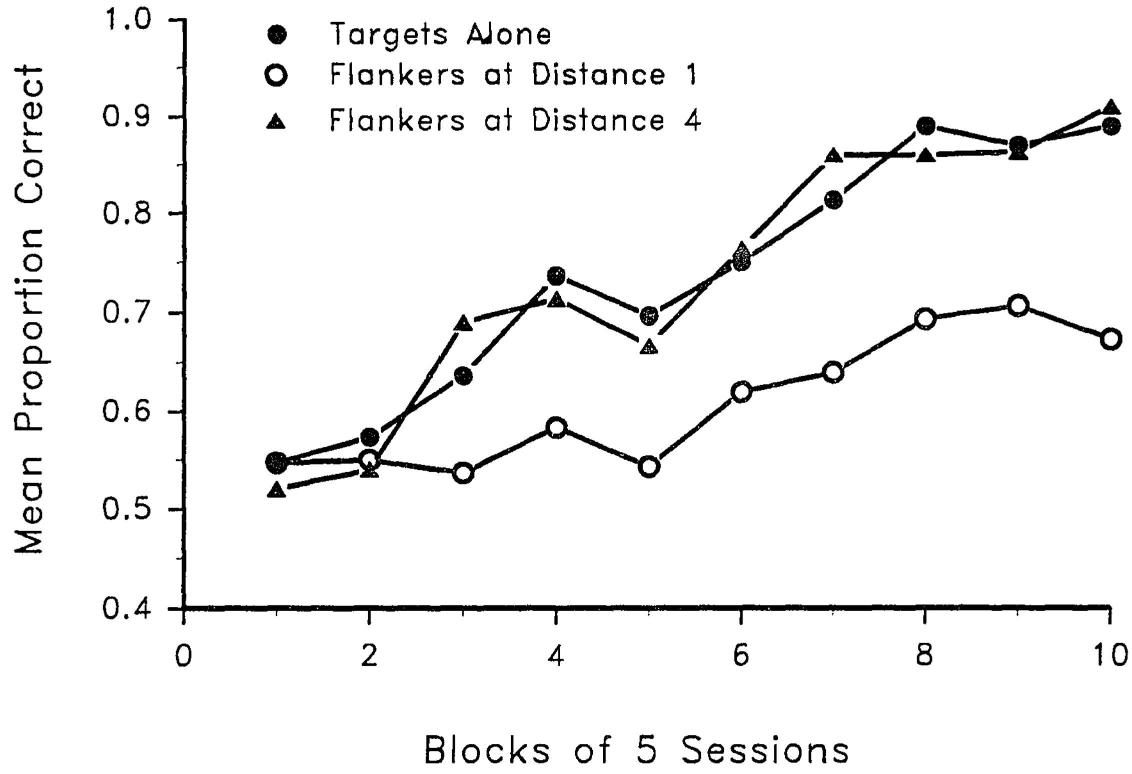

Figure 15. Mean learning curves for the three subjects of Experiment 6a. To avoid overcrowding only the curves for the three most informative conditions are shown.

Figure 15 shows the mean learning curves for the three subjects who learned the discrimination. Only the learning curves for the target patterns alone, and the target patterns with flankers at target-flanker separations 1 and 4 are shown.

Discussion

The results shown in figures 14 and 15 confirm the prediction made about the expected results. The greatest distractor effect was observed when the flankers were at target-flanker separation 1. As the flankers were moved further from the target patterns, the distractor effect diminished to the point that, at target-flanker separation 4, performance was as good as the discrimination of the target patterns alone. The results of the regression analysis also show that this effect is linear. These results are opposite of those obtained in Experiment 4a (see figures 10 and 11) as predicted.

Figure 15 also shows that the results of the simulation are very close to the empirical results. This simulation, with the parameter values mentioned above, shows that the simulated pigeon did not make a large number of guesses as was required by the simulated pigeon in Experiment 4a. For this, it was necessary for the simulated pigeon in Experiment 6a to draw ten samples from its LTM.

Experiment 6b

In Experiment 1b it was demonstrated that adding one set of flankers to another increased the distractor effect on target pattern recognition, although the difference between the intercepts was not statistically significant. In Experiment 6b I try to test the effect of using two sets of flankers as in Experiment 1b. Both vertical and horizontal flankers will be presented at target-flanker separations 1 to 4. The extra vertical flankers should produce their largest effect when presented near the target patterns, but they are expected to have little or no effect when presented at separation 4.

Method

Subjects

The subjects were the same three who learned the discrimination in Experiment 6a. The subjects were kept as in previous experiments.

Apparatus and Stimuli

The apparatus and stimuli were the same ones that were used in Experiment 6a. The extra vertical flankers were the same ones used in Experiment 4b (see figure 7b, Appendix B, for samples of these stimuli).

Design and procedure

A within-subjects design was used in which the independent variable was the vertical and horizontal target-flanker separation. The dependent variable was the proportion of correct responses made in the presence of each of the stimulus patterns.

At the conclusion of Experiment 6a, subjects began their participation in Experiment 6b. There was no color discrimination. The rest of the procedure was the same as the one used in Experiment 6a, except that subjects were tested for only 30 sessions.

Results

The data for the 30 sessions were converted to proportions for each of the five conditions of the experiment. The Arcsine transformation was then applied as described in the general method section. An analysis of the regression of the Arcsine transformations of *P* on the logarithm of the four target-flanker separations showed that there is a linear relationship between the independent and dependent variables [$F(1,10) = 10.53, p < .0088$]. The untransformed proportion data were also analyzed yielding comparable results [$F(1,10) = 9.83, p < .0106$]. The data for all the individual subjects were included in the regression analyses. The Arcsine transformations for the thirty sessions were compared to those for the last thirty sessions of training in Experiment 6a to test the hypothesis that the difference between slopes is zero. Using the formula proposed by Kerlinger and Pedhazur (1973), this analysis showed no difference between the slopes [$F(1,20) = .855, p > .05$] which indicates that it is possible to use a common slope for the two sets of data. Using the formula proposed by Kerlinger and Pedhazur (1973), a significant linear relationship between the independent variables and the dependent variable for the common slope was found [$F(1,21) = 14.998, p < .01$]. However, the regression analysis using the formula proposed by Kerlinger and Pedhazur (1972) for testing the hypothesis that the difference between the intercepts of the two regression lines is equal to zero was not significant [$F(1,21) = .580, p > .05$]. A correlated *t*-test for the difference between the Arcsine transformations of *P* for the last ten sessions of Experiment 6a and the first ten sessions of Experiment 6b (for target-flanker separation 1) revealed no significant difference [$t(2) = 1.996, p > .05$].

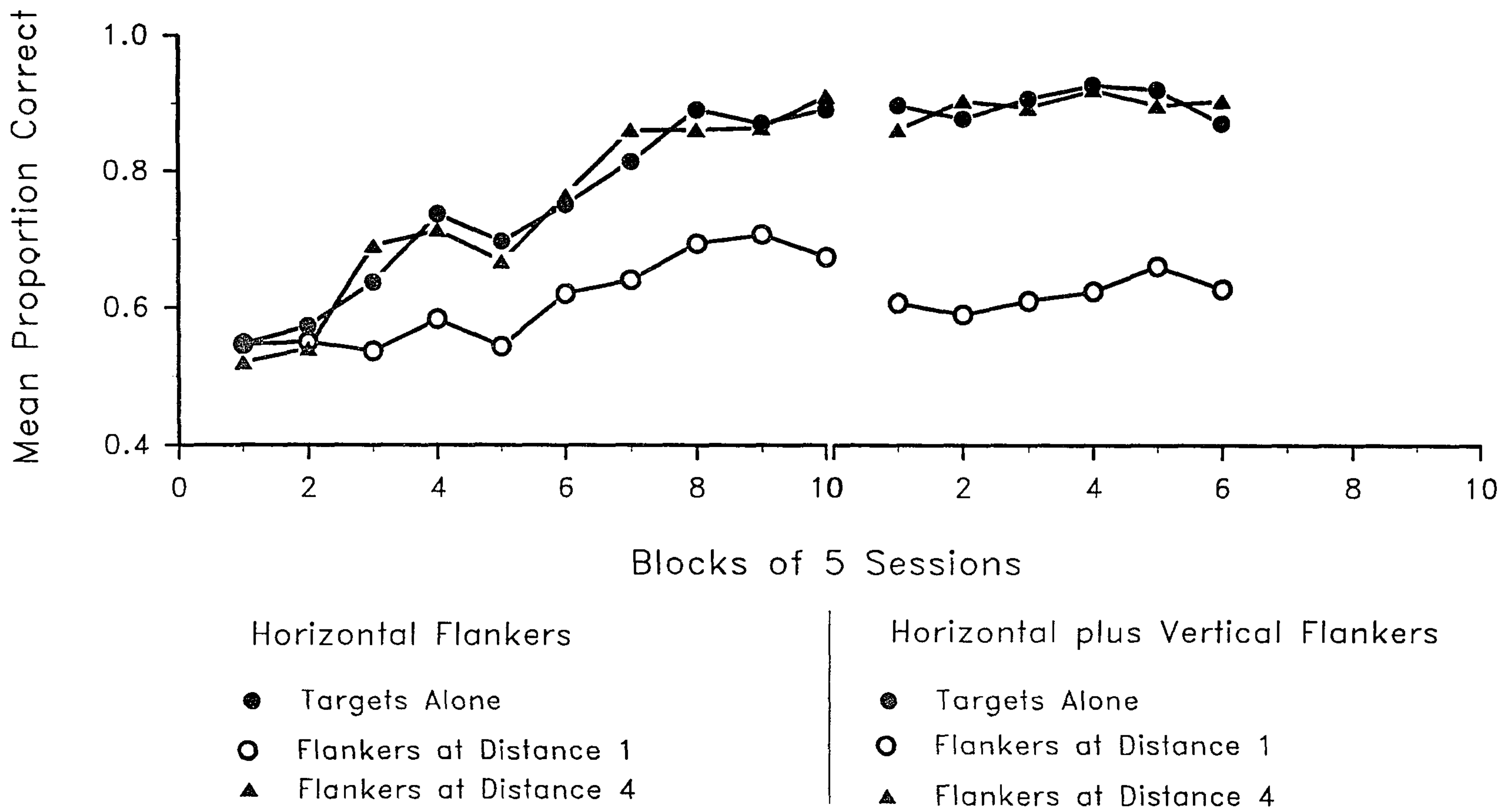

Figure 16. Mean learning curves for the three subjects of Experiment 6b. To avoid overcrowding only the curves for the three most informative conditions are shown. The mean learning curves from Experiment 6a, shown in Figure 15, are presented here for comparison.

Figure 16 shows the mean learning curves from Experiments 6a and 6b based on results of the three subjects who participated in these experiments. Only the curves for the targets alone, and targets with flankers at target-flanker separations 1 and 4 are shown. These separations are for horizontal flankers in Experiment 6a, and horizontal and vertical flankers in Experiment 6b.

Discussion

Figure 16 shows that there is no difference between the learning trend for the target patterns alone and target patterns with flankers at target-flanker separation 4 in Experiment 6a to Experiment 6b. There is a difference in the learning trend for the target patterns with flankers at separation 1, although this difference was not statistically significant. The failure to find a significant difference between the intercepts of the regressions of the data from Experiments 6a and 6b may be due to the existence of a strong distractor effect in Experiment 6a. If a near asymptotic distractor effect had been reached in Experiment 6a, it would be very difficult to find a true difference, if there is one, in Experiment 6b. The regression analysis shows a linear relationship of the target-flanker separations and the dependent variable.

Experiment 7

It was demonstrated in Experiments 4a and 6a that, depending on the arrangement of the pairs of squares used as targets, flankers will either impair or enhance discriminative performance. However, these two phenomena were shown in separate experiments using different groups of subjects.

In Experiment 7, I test two hypotheses within-subjects: The first states that if the target patterns are discriminable from each other, then adding any extra non-informative patterns will make the targets more difficult to discriminate. The second states that if the target patterns are not discriminable from each other, then adding extra non-informative patterns may result in compound patterns that are easier to discriminate than the targets alone. The target patterns used in Experiments 4a and 6a were used (see figure 8b, Appendix B). Because it has been demonstrated in all previous experiments of the present study that the flankers exert their greatest effect when they are nearest to the target patterns, only the flankers at target-flanker separation 1 will be used. It is expected that the subjects will perform at about chance when presented with the vertical squares alone, but will perform significantly better than chance when presented with the diagonal squares alone. The addition of the flankers to the vertical squares should result in a context superiority effect, but performance is not expected to be as good as that for the diagonal squares alone because although the flankers will add informative value, they will also distract. However, the addition of the flankers to the diagonal squares is expected to distract from the discrimination so much that performance should be lower than that for the vertical squares with flankers. This is expected because the vertical squares carry informative value while the horizontal squares do not.

Method

Subjects

The subjects were two female and one male White Carneaux pigeons (*Columba Livia*), none of which had participated in any of the previous experiments. The subjects were kept as in previous experiments.

Apparatus and Stimuli

The subjects were trained and tested in a Large Environment Cubicle (Model LEC-006, BRS/LVE) which was designed to the last detail like the one used in Experiments 6a and 6b.

The stimuli consisted in the vertical-squares used in Experiment 4a, and the diagonal-squares used in Experiment 6a. Only the flankers at target-flanker separation 1 used in Experiments 4a and 6a were utilized in Experiment 7 (see figure 8b, Appendix B).

Design and Procedure

A within-subjects design was used in which the independent variable was target-flanker separation. There were four conditions which consisted of (1) the diagonal-squares alone, (2) the diagonal-squares with flankers, (3) the vertical-squares alone, and (3) the vertical-squares with flankers. The dependent variable was the proportion of correct responses made in the presence of each stimulus pattern.

The procedure was exactly like the one used in Experiments 4a and 6a except that in Experiment 7 there were only eight stimuli instead of ten. There were ten trials per stimulus for a total of 80 trials per daily sessions. The subjects were tested for 60 sessions instead of fifty because this task was expected to be more difficult for subjects to learn.

Results

All the subjects met the criterion for advancement to the pattern recognition phase. The data for the last 30 sessions of training were converted to proportions for each of the four conditions in the experiment. The Arcsine transformation was then applied as described in Experiment 1. The Arcsine transformations for the vertical-squares alone and vertical-squares with flankers were submitted to a correlated t-test indicating no significant difference [$t(2) = -1.50$, $p > .05$]. A comparison of the vertical-squares alone and the vertical-squares with flankers also proved to be not significant [$t(2) = 2.21$, $p > .05$]. However, this may be due to the fact that one of the subjects failed to learn all the discriminations. On the basis of the binomial approximation, the analysis of the cumulative proportions of the total correct responses of all trials for each discrimination (30 sessions $\times$ 20 daily trials = 600 trials) revealed that one of the subjects failed to perform significantly better than chance on all the discriminations (subject 13, Table 1). These binomial approximation analyses also showed that each of the three subjects, and all three combined, failed to perform significantly better than chance in the discrimination of the vertical-squares alone. However, when these vertical-squares were accompanied by flankers, two of the subjects, and all three combined, performed significantly better than chance ($p < .00005$, $p < .0048$, and $p < .00005$ respectively). Two of the subjects, and all three combined, performed significantly better than chance in their discrimination of the diagonal-squares alone ($p < .00005$). Only one of the subjects, and all three combined, performed better than chance in their discrimination of the diagonal-squares when they were accompanied by flankers ($p < .00005$, and $p < .0001$ respectively).

Summary Table for Experiment # 7

Bird #	Vertical Squares Alone			Vertical with Flankers		
	# Correct	Proportions	*P*	# Correct	Proportions	*P*
12	303	.5050	.8383	376	.6267	.0000
13	311	.5183	.3913	305	.5083	.7133
17	299	.4983	.9674	335	.5583	.0048
Group	913	.5072	.5557	1016	.5644	.0000
Bird	Diagonal Squares Alone			Diagonal with Flankers		
12	468	.7800	.0000	366	.6100	.0000
13	321	.5350	.9420	300	.5000	1.000
17	363	.6050	.0000	317	.5283	.1779
Group	1152	.6400	.0000	983	.5461	.0001

Table 1. Number and proportion of correct responses for each subject and group. These proportions are based on the last 30 sessions of training. There were 20 daily trials for each discrimination per subject, for a total of 600 trials. The proportions for the combined subjects were based on 60 daily trials, for a total of 1800 trials per discrimination.

Figure 17 shows the mean learning curves for the two subjects who learned the discrimination.

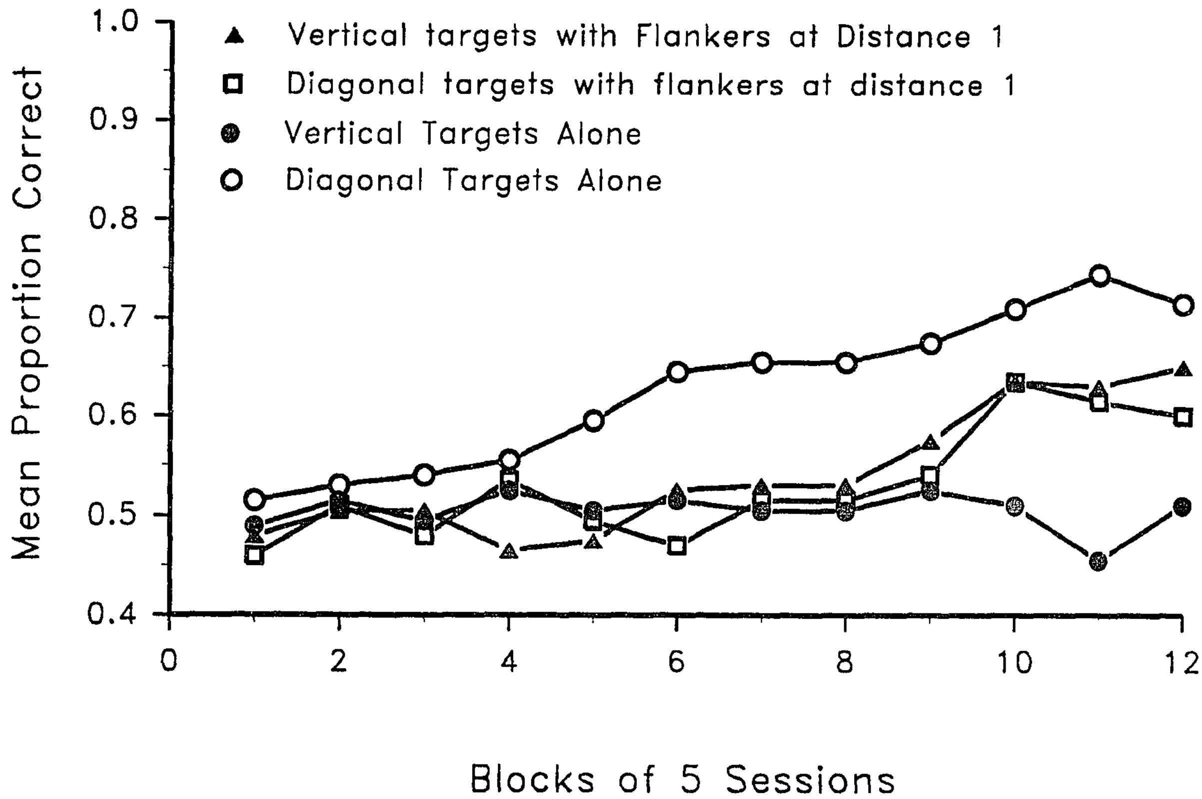

Figure 17. Mean learning curves for the two subjects of Experiment 7 who learned the discrimination. The mean learning curves for the four conditions in the experiment are shown.

Discussion

The results obtained in Experiment 7 demonstrate that it is possible to obtain context superiority and distractor effects within-subjects. As predicted, subjects were able to perform well when the diagonal-squares were presented alone, but their performance was impaired considerably when these targets were presented with flankers. The subjects were unable to discriminate between the vertical-squares when presented alone in different positions, but their performance was greatly enhanced when the targets were presented with the flankers. When the flankers were added to the targets, subjects did better on the vertical-squares than on the diagonal ones, although this difference was not a large one.

These results lend support to the view that anything that is added to target patterns will distract. Whether or not the positive effects of added elements offset the distraction so that the net result will be a superiority effect will depend on the configuration of the target patterns.

General Discussion

The research described above examined how discrimination between patterned visual stimuli is affected by the presence of common elements in the patterns presented for discrimination. It was found that the presence of such common elements may impair the discrimination (distractor effect) or may facilitate it (context superiority effect). The magnitude of both effects was strongly affected by the distance from the target elements to the common (non-informative) elements. Similar effects have been reported by other investigators. With respect to distractor effects, Blough (1984), and Steele (1990), working with pigeons, also found that the nearer the non-informative elements were to the target patterns, the more they disrupted the discrimination between the targets. Similar findings were reported for human subjects by Estes (1972, 1974) and Eriksen and Eriksen (1974). Eriksen and Eriksen (1974) attributed this effect to the inability of subjects to attend selectively to the target patterns. According to Eriksen and Eriksen, we have a "Minimum Channel Capacity ". This "Minimum Channel Capacity " can be thought of as the "light beam" of a flashlight. When the flankers are very near to the targets, these flankers will be within the region of the "light beam" and the subject cannot help but process the flankers as well. Thus, the processing of these redundant patterns may slow down the identification of the target patterns. Eriksen and Eriksen's (1974) possible explanation of this distractor effect does not deal with the question of why flanker proximity results in faster target identification in some cases (e.g., Pomerantz, et al., 1977).

Context superiority effects have been shown in a number of experiments done with human subjects. For example, Pomerantz et al., (1977) demonstrated that two diagonal lines accompanied by identical L-shaped patterns are discriminated faster than the diagonal lines alone (see Figure 5b, Appendix B). Pomerantz et al., proposed an "Emergent Feature Theory" to account for this effect. According to this theory, when identical elements are added to some simple target patterns, the resulting compound may have new features that make the compounds easier to discriminate than the target patterns in isolation. However, so far Pomerantz and his collaborators have not been able to state under what conditions new features will emerge, and under what conditions the emergence of new features will improve the discrimination (e.g., Pomerantz, 1981, 1986).

The problem with the theories that have been proposed to explain the distractor and superiority effects is that they try to explain either one or the other effect. They assume that the addition of a given context will either distract or enhance discrimination. They have failed to explain under what circumstances a given context will produce a distractor effect and under what circumstances the same context will produce a superiority effect.

If the emergent feature theory is correct then lines embedded in contexts which have been shown to produce context superiority effects when shown separately, should produce the same effect when presented in the same experiment. However, this is not so. Enns and Prinzmetal (1984) demonstrated that various contexts which had produced superiority effects when presented separately, were detrimental to line recognition when presented in the same experiment. According to Enns and Prinzmetal, the superiority effect will be obtained when the lines in context are more dissimilar from one another than the lines alone. But if the added contexts do not produce more line dissimilarity, then the contexts will distract instead. The problem with this explanation is that Enns and Prinzmetal did not specify which contexts will produce more line dissimilarity and under what conditions.

Theories of pattern recognition which are derived from Gestalt theories (e, g., Pomerantz, et al., 1977) seem to explain phenomena only post hoc. Although we cannot deny the importance of Gestalt theories in having generated research in pattern recognition, it is also obvious that other approaches are necessary if we wish to advance our understanding of the processes that underlie pattern recognition.

The relation of the data to the Heinemann and Chase model will be considered next. Figures 10 and 15 show that, for some parameter values, that model can produce excellent fits to the data from the experiments that yielded either distractor or context superiority effects. The trouble is that the parameter values required to fit the data from these two classes of experiments are quite different. Before pursuing this matter any further, it is necessary to describe some important features of the curve-fitting procedures that were used. The most important point is that the fits of theoretical points to the data are not, strictly speaking, best fits. One difficulty in the way of using a conventional curve-fitting procedure is that the Heinemann and Chase model involves stochastic processes that result in predicted behavioral outcomes that vary from trial to trial. The predictions yielded by the simulations become relatively stable when simulations involve a large number of trials, such as the 3000 used in the simulations on which the theoretical curves shown in figures 10 and 15 are based. Still, the simulated results that yield the least sum of squared deviations from the empirical ones will vary somewhat from simulation to simulation. A second matter that must be considered is that the parameter space that needs to be searched is vast. For practical reasons, we selected an area of this space for detailed examination after a crude examination of a much larger region.

Though the fits shown in Figures 10 and 15 are very good, whether or not they are "best", the fact that they required different values for all three parameters raises problems for the Heinemann and Chase model. On the other hand, the finding of different parameter values is not really surprising if one considers (a) that there is variability in both the empirical and simulated data, and that the data from experiments 4a and 6a were fit separately and independently, and (b) that the number of subjects in the two experiments was very small. In the hope of finding some reasonable "compromise" parameters, I did some more simulations in which two of the three parameters, *spacing* and *viewing distances*, were held constant at 2.5 and 1.49, respectively, and only the *resamplings* parameter was varied. "Best fits" required a *resamplings* value of 3 for the data from Experiment 4a, and a value of 10 for Experiment 6a. The resulting fits are shown in figure 18. The values assigned to the *spacing* and *viewing distances* parameters are those that had yielded the "best fit" to the results of Experiment 6a. The theoretical curve shown for Experiment 6a is identical to the one shown in Figure 14. Though the fit to the data from Experiment 4a is far from impressive, the theoretical curve shows a clear context superiority effect having a magnitude that falls off with increasing target-flanker separation. It is possible that a continued search might have yielded a somewhat better fit, but it seems clear that a definitive answer to the question "Can the Heinemann and Chase model fit data showing distractor or superiority effects without changing parameter values?" requires experiments with a much larger number of subjects, so that effects of possible individual differences may be ruled out.

Several researchers have pointed out that there are many similarities between pattern recognition and visual concept formation by pigeons and humans (e.g., Blough, 1984, 1985; Herrnstein, 1984). The results of Experiment 5 of the present study bring out an interesting difference between pattern recognition by pigeons and humans. Pigeons showed a very clear distractor effect in a situation in which humans show a clear context superiority effect (Pomerantz et al., 1977). A possible explanation for this species difference may be that human performance in this situation is affected by processes other than visual ones. For example, in those experiments which have shown superiority effects, the lines embedded

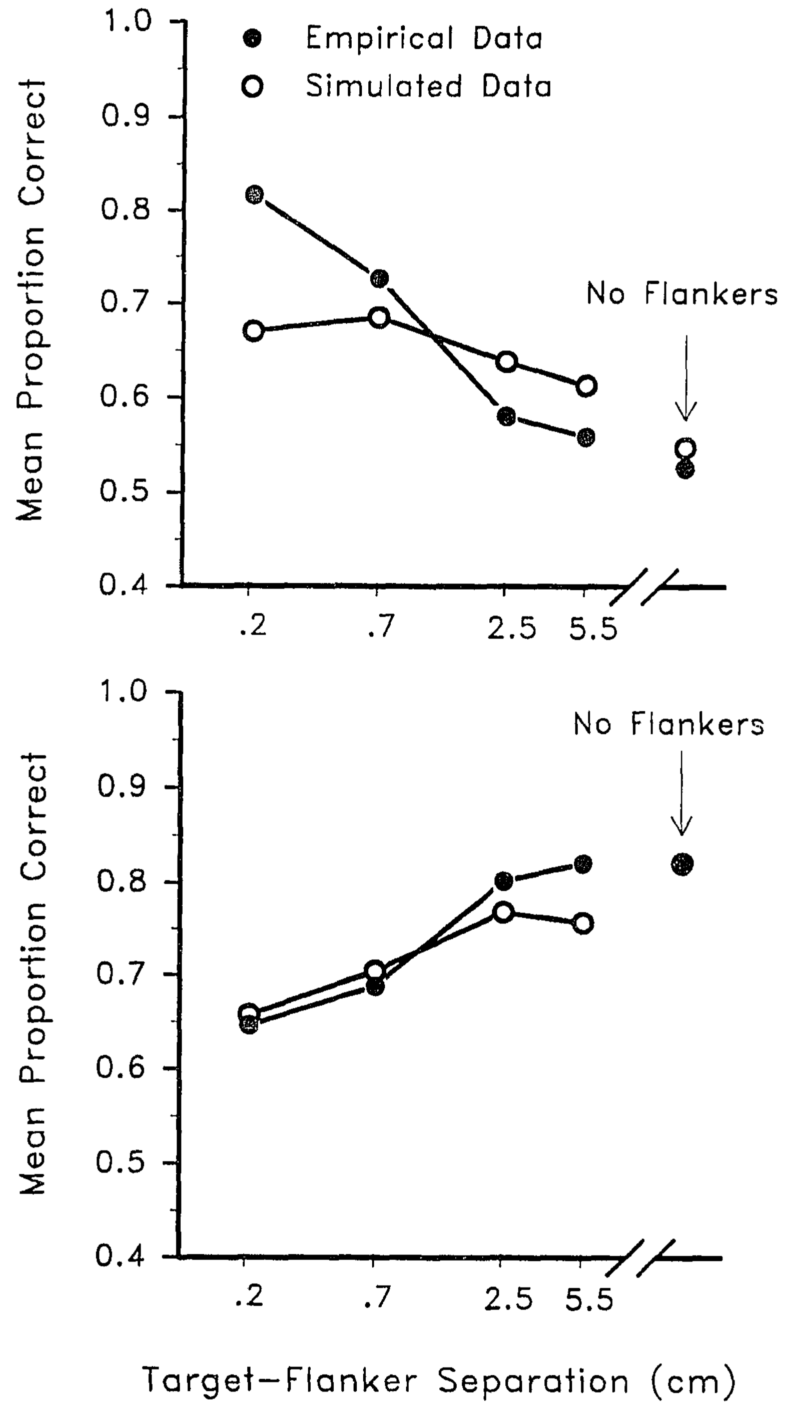

Figure 18. The upper figure shows the data from Experiment 4a (filled circles, previously shown in Figure 10) together with the results of a simulation (open circles) which was based on the same values for the *spacing*, and *viewing distances* parameters that were used to fit the data from Experiment 6a. The lower figure shows the data from Experiment 6a and the simulation of that data. This figure is exactly the same as Figure 14.

in non-informative contexts resulted in compound patterns that were nameable by humans (e.g., arrows versus triangles; Pomerantz et al., 1977), but when the lines embedded in non-informative contexts resulted in compound patterns that were unnameable (e.g., diagonal lines embedded in the same non-informative contexts but in a different location; Pomerantz et al., 1977), the result was a distractor effect. It has been shown that, for humans, meaning will enhance discrimination and speed up learning. For example, working with strings of letters such as ICBMPHDCIAFM, Bower and associates (e.g., Bower and Winzenz, 1969; and Bower and Springston, 1970) found that such strings were learned more accurately if they were presented in optimal units. These units can be created by inserting spacers such as blank spaces or zeroes (e.g., ICBM PHD CIA FM). The resulting meaningful units can then activate their representations in long term memory easing the load on short term memory (Bower, 1972). No such benefits result when the strings are marked off as non-optimal units (e.g., IC BMP HDC IAFM).

The context superiority effects obtained by Pomerantz et al., and Enns and Prinzmetal might possibly be explained by the meaningfulness of the resulting compound patterns. When a pattern is constructed in an optimal way, so that the compound is more meaningful than its separate components, the contact with its representations in the brain will be facilitated because it can use "Dual Codes" to decode the information. If the compound is nameable, then this pattern is going to be represented in the linguistic-verbal system and in the pictorial-imagery system. Working with paired-associates, Paivio (1971, 1977, 1978) demonstrated that it is easier to process information which has been encoded in multiple codes.

Since the diagonal lines and the lines embedded in the non-informative elements are arbitrary ones for pigeons, their recognition of these patterns is probably a purely visual process not confounded with verbal or other processes that may be utilized by humans in pattern recognition. Although the study of what these processes are is very interesting, it is not the goal of the present study and is better left for those who are interested in pursuing the subject.

Appendix A

$$\frac{1}{2}\left(\sin^{-1}\sqrt{\frac{x}{n+1}} + \sin^{-1}\sqrt{\frac{x+1}{n+1}}\right)$$

Formula 1. This averaged angular transformation formula is the one proposed by Freeman and Tukey (1950) for variance stabilization of binomial data. In this formula "x" is the number of successes and "n" the total number of observations that went into the computation.

Appendix B

Figure Captions

Figure 1b. The figure shows in ascending order, from top to bottom, the ten stimuli that were used in experiment 1a. The target patterns and the target-flanker separations were drawn close to scale. The legs of the "horizontal" triangles used as flankers are a little shorter than the ones used in the experiment.

Figure 2b. The figure shows stimuli number 1, and 10 that were used in experiment b. The bases of the "vertical" triangles used as flankers are a little shorter than the ones used in the experiment.

Figure 3b. The figure shows in ascending order, from top to bottom, the ten stimuli that were used in Group A of experiment 2.

Figure 4b. The figure shows in ascending order, from top to bottom, the ten stimuli that were used in Group B of experiment 2. The same stimuli were also used in experiments 3, and 4a.

Figure 5b. The figure shows the four stimuli used in experiment 5.

Figure 6b. The figure shows in ascending order, from top to bottom, the ten stimuli used in experiment 6a.

Figure 7b. The figure shows stimuli 3, and 10 that were used in experiment 6b. Stimuli 1, and 2 were the same ones used in experiment 6a.

Figure 8b. The figure shows in ascending order, from top to bottom, the 8 stimuli that were used in experiment 7

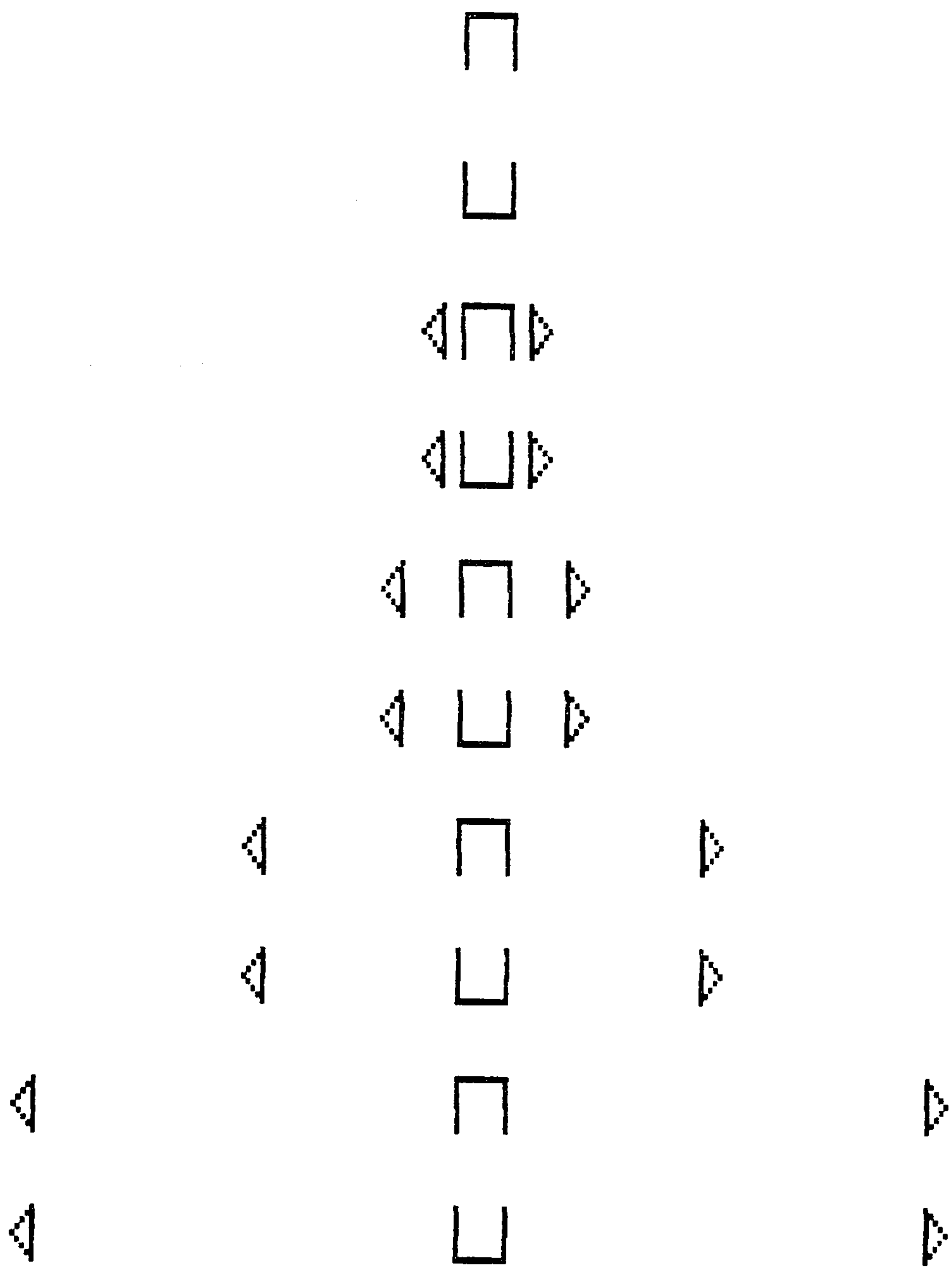

FIGURE 1b

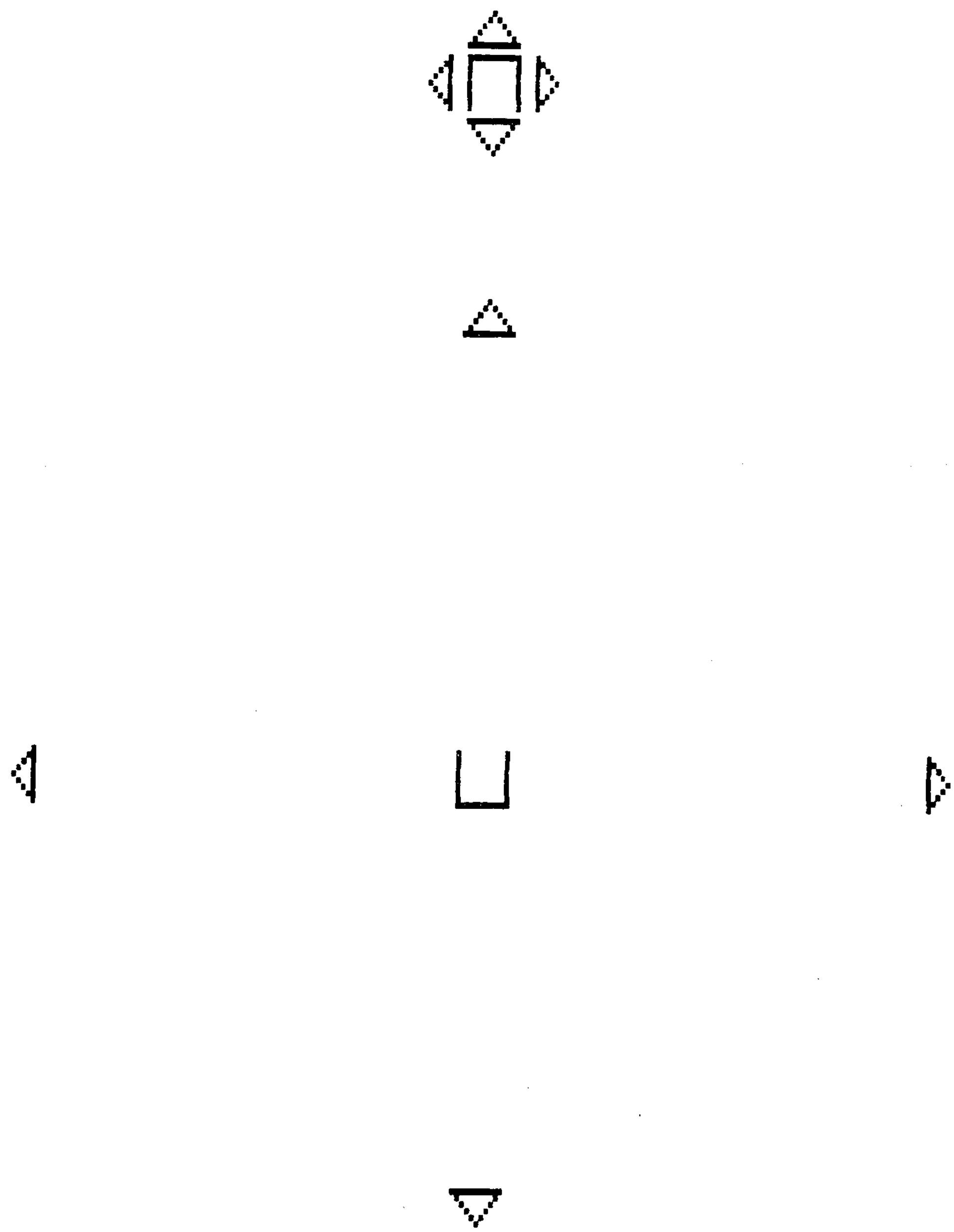

FIGURE 2b

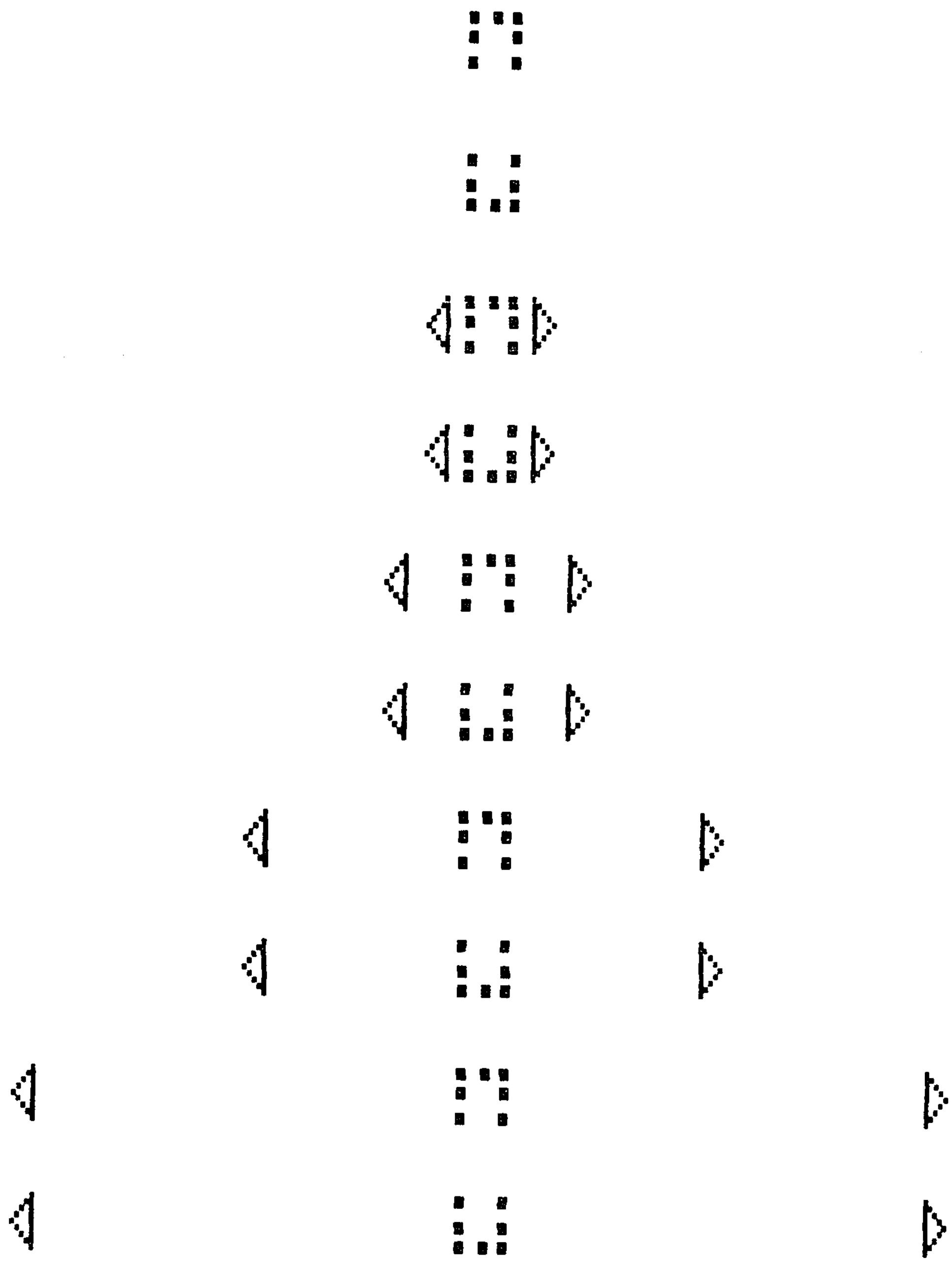

FIGURE 3b

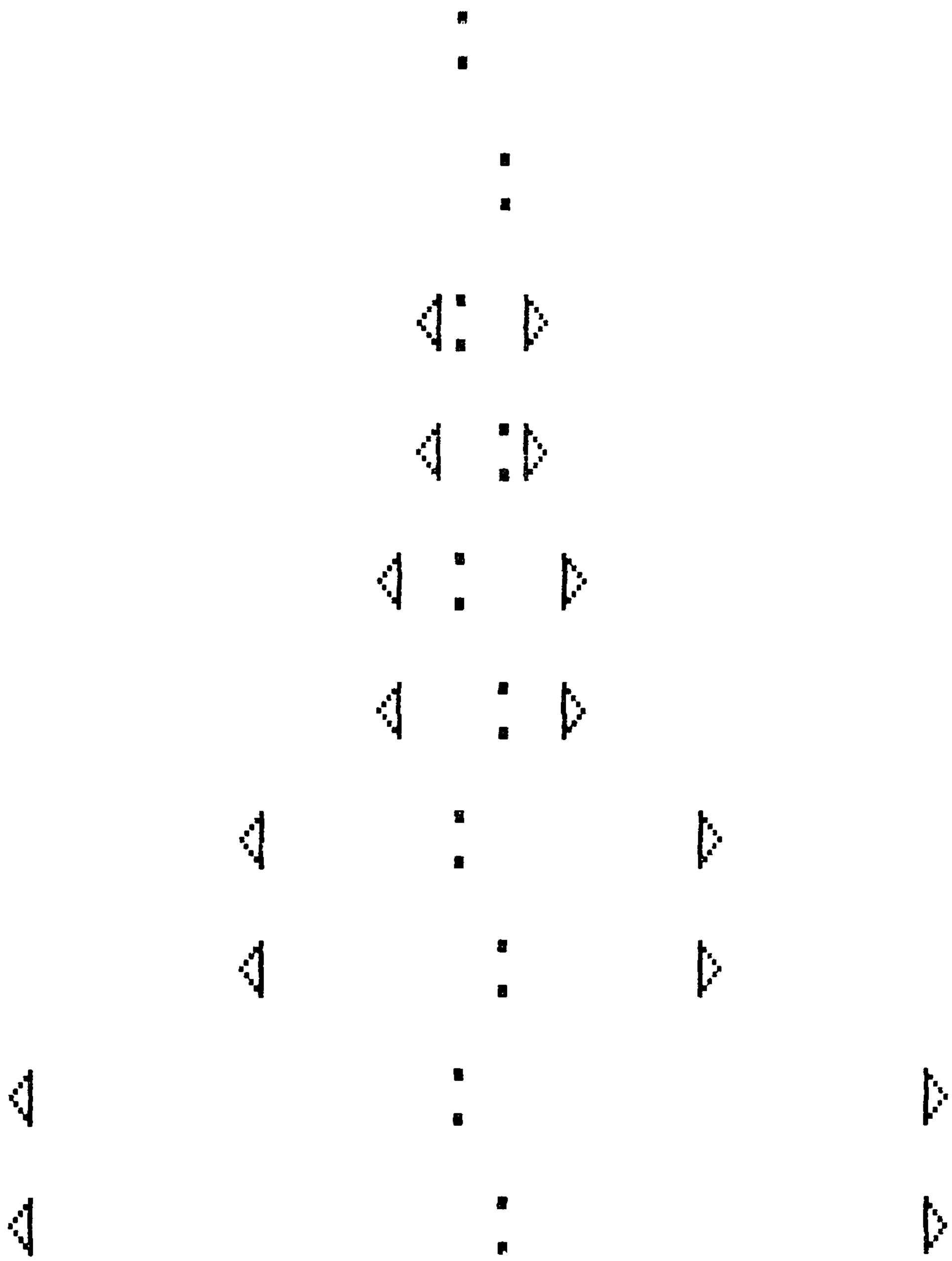

FIGURE 4b

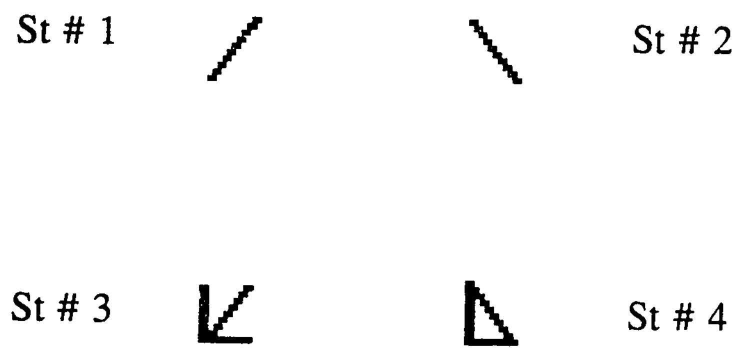

FIGURE 5b

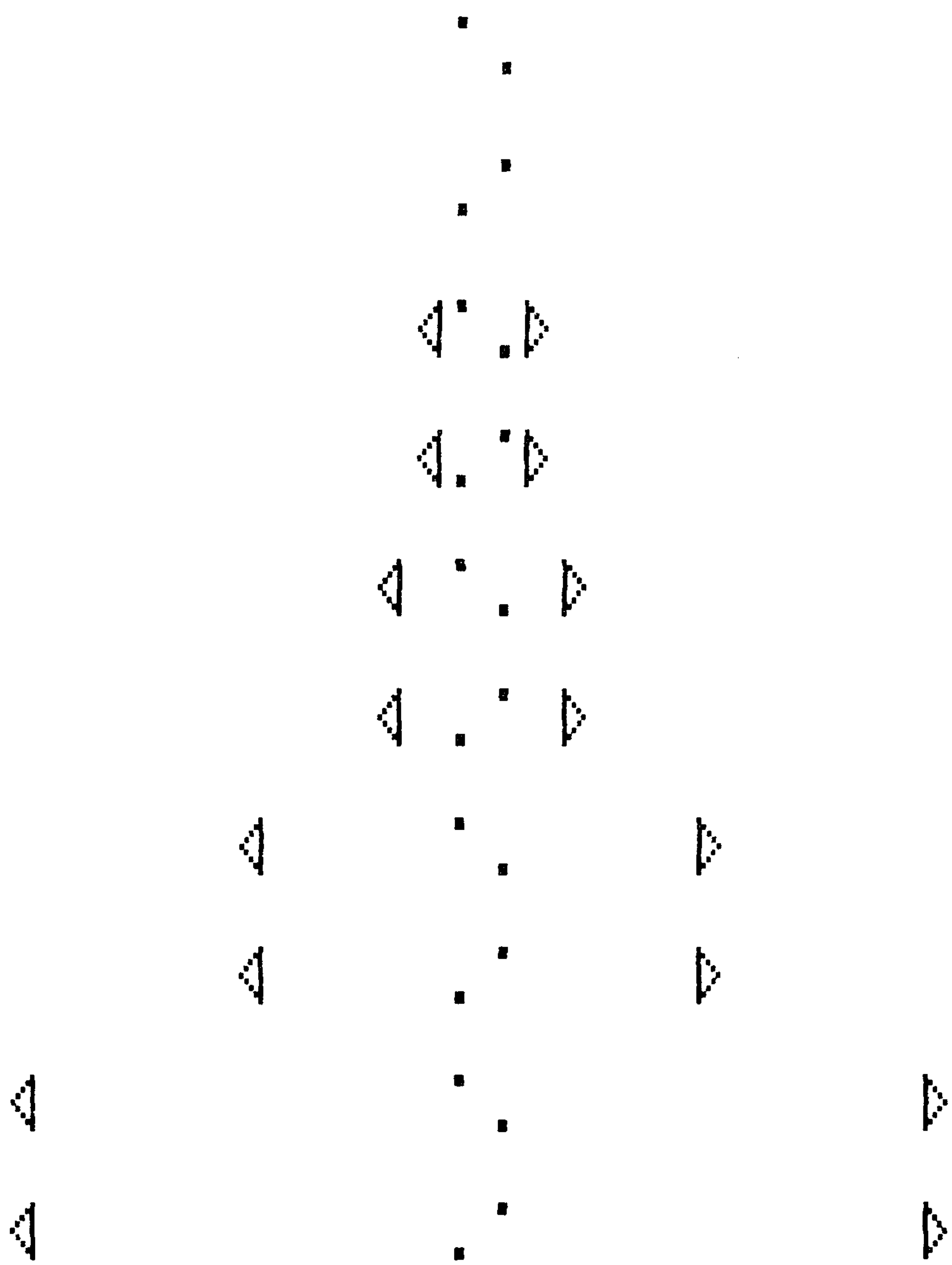

FIGURE 6b

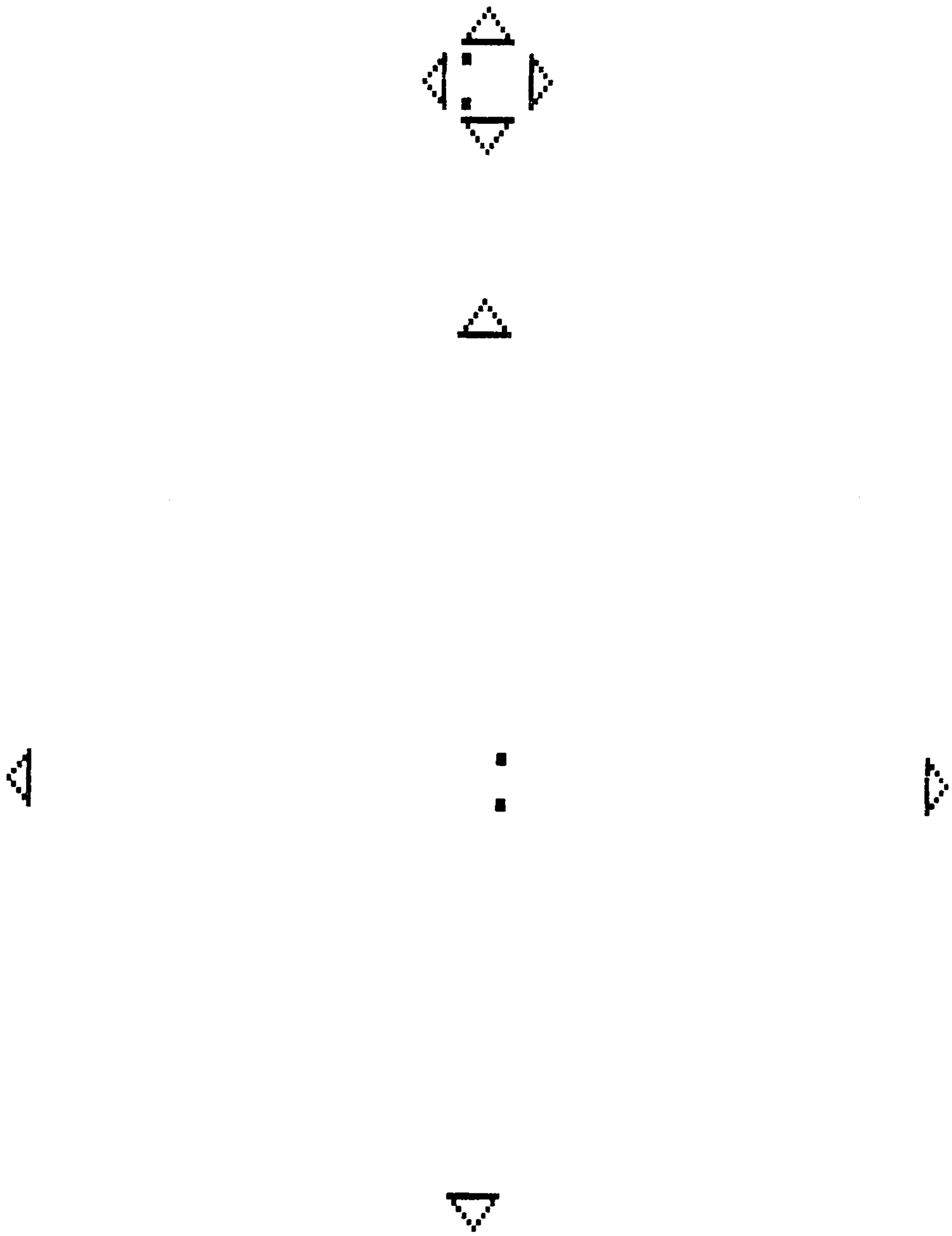

FIGURE 7b

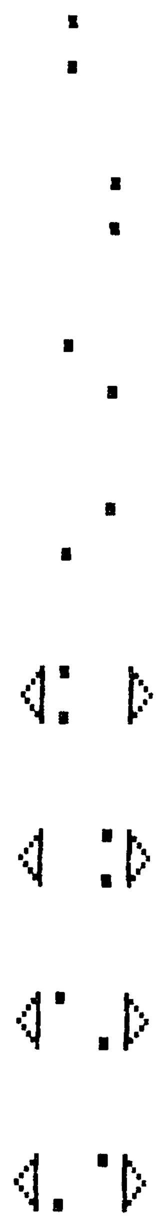

FIGURE 8b

Appendix C

Data presented in Appendix C is the proportion correct raw data of each subject in the experiments. Each collum is the proportion correct for each stimulus for all the sessions of each experiment. Each row corresponds to proportion data of all individual stimuli for any one session.

Experiment # 1a

Proportion correct for subject # 1

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.7	0.9	0.5	0.9	0.4	1.0	0.7	0.9	0.9	0.8
0.4	0.9	0.6	0.9	0.9	0.4	0.6	0.8	0.9	0.8
0.7	0.7	0.9	0.8	0.3	0.6	0.7	1.0	0.8	0.8
0.8	1.0	0.6	0.9	0.8	0.8	0.5	1.0	1.0	0.7
0.8	1.0	0.5	0.8	0.7	0.9	0.6	0.9	0.8	0.9
0.8	0.9	0.6	0.8	0.6	0.8	0.7	0.9	0.8	1.0
1.0	0.8	0.5	0.6	0.6	0.6	0.5	1.0	0.8	0.7
0.8	0.9	0.5	0.6	0.7	0.7	0.5	1.0	0.6	0.7
0.9	0.8	0.5	0.8	0.7	0.7	0.5	0.8	0.6	0.9
0.8	0.8	0.4	0.6	0.7	0.9	0.4	0.7	0.7	0.7
0.7	0.9	0.7	0.7	0.7	0.6	0.4	0.7	0.8	0.9
0.8	0.7	0.6	0.7	0.6	0.8	0.7	1.0	0.6	0.8
0.8	1.0	0.5	0.8	0.5	0.9	0.8	0.8	0.7	0.8
0.8	0.7	0.7	0.5	0.9	0.6	0.7	1.0	0.8	0.9
0.9	1.0	0.4	0.6	0.8	0.4	0.9	1.0	0.7	0.8
0.8	0.7	0.3	1.0	1.0	0.9	1.0	0.9	0.6	0.9
0.7	0.9	0.3	0.9	0.5	0.8	0.6	0.9	0.7	1.0
0.9	0.9	0.6	0.9	0.4	0.8	0.6	0.8	0.8	0.8
0.6	0.6	0.7	0.8	0.7	0.8	1.0	0.8	0.8	0.7
0.5	0.8	0.4	0.8	0.5	0.8	0.6	0.9	0.9	0.9
0.6	0.9	0.6	0.6	0.6	0.9	0.8	0.8	0.4	0.7
0.7	1.0	0.1	0.7	0.7	0.8	0.7	0.9	0.7	1.0
0.7	0.9	0.2	0.6	0.5	0.9	0.6	1.0	0.5	0.9
1.0	0.9	0.3	0.8	0.9	0.9	0.7	0.6	1.0	0.8
0.7	0.6	0.4	0.9	0.4	0.9	0.6	0.7	0.7	0.7
0.9	0.7	0.4	0.6	0.3	0.9	0.8	0.8	0.5	0.8
0.8	0.8	0.5	0.8	0.5	0.9	0.7	0.8	0.7	0.8
0.5	1.0	0.6	0.7	0.6	0.6	0.7	0.7	0.8	1.0
0.7	1.0	0.5	0.4	0.6	0.8	0.4	0.4	0.6	0.7
0.5	0.9	0.7	0.6	0.9	1.0	0.7	0.8	0.7	0.6
0.8	0.6	0.5	0.8	0.7	0.7	0.6	0.7	0.8	0.5
0.8	0.7	0.6	0.7	0.6	0.8	0.7	0.9	0.6	0.8
0.7	0.8	0.6	0.8	0.7	0.8	0.6	0.8	0.9	0.6
0.6	0.9	0.7	0.9	0.9	1.0	0.6	0.7	0.6	0.8
0.8	0.7	0.2	0.5	0.6	0.9	0.4	0.9	0.8	0.9
0.8	0.7	0.7	0.7	0.8	0.8	0.1	0.8	0.8	0.7
0.8	0.9	0.7	0.9	0.6	0.7	0.5	0.7	0.5	0.8
0.7	0.5	0.6	0.7	0.8	0.6	0.7	1.0	0.6	0.8
0.5	0.9	0.4	0.9	0.3	0.5	0.5	0.5	0.7	0.8
0.8	0.9	0.2	0.6	0.4	0.8	0.9	0.7	0.7	0.5
0.6	0.5	0.6	0.9	0.3	0.7	0.6	0.5	0.6	0.9
0.5	0.6	0.1	1.0	0.8	0.8	0.9	0.6	0.8	1.0
0.7	0.4	0.1	0.8	0.4	0.8	0.6	0.6	0.7	0.8
0.7	0.7	0.3	0.6	0.6	0.8	0.7	0.7	0.8	0.8
0.4	0.8	0.4	0.3	0.4	0.9	0.6	0.8	0.6	1.0
0.6	0.9	0.3	0.7	0.4	0.8	0.6	0.9	0.6	0.9
0.7	0.6	0.5	0.8	0.7	0.9	0.6	0.9	0.6	0.7
0.6	0.8	0.4	0.9	0.4	0.8	0.8	0.7	0.7	0.6
1.0	0.9	0.4	0.7	0.8	0.8	0.6	0.7	0.9	0.7
0.6	0.8	0.3	0.3	0.5	1.0	0.8	0.7	0.6	0.7

Experiment # 1a
Proportion correct for subject # 4

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.5	0.7	0.7	0.9	0.4	0.3	0.7	0.8	0.8	0.9
0.7	0.6	0.6	0.9	0.8	0.9	0.9	0.9	0.8	1.0
0.8	0.5	0.8	0.7	0.9	0.9	0.6	0.8	0.8	0.7
1.0	1.0	0.9	1.0	0.5	0.9	0.7	0.9	1.0	0.8
1.0	0.9	0.7	1.0	0.6	0.6	1.0	1.0	0.9	0.6
0.9	1.0	0.6	0.9	0.7	0.6	0.9	0.8	1.0	0.9
0.8	0.6	0.6	0.8	0.7	0.5	0.6	0.8	1.0	0.6
0.8	0.5	0.7	0.7	0.6	0.7	0.7	0.9	0.8	0.6
0.8	0.9	0.8	0.9	0.7	0.9	0.9	0.9	0.9	0.7
0.9	0.8	0.4	0.6	0.6	0.9	0.8	0.7	0.8	0.7
1.0	0.9	0.6	0.9	0.8	0.8	0.7	0.9	0.8	0.8
0.9	0.8	0.8	1.0	0.8	0.9	0.7	0.9	0.8	0.8
0.6	0.9	0.5	0.7	0.8	0.7	0.8	1.0	0.7	0.9
1.0	0.8	0.3	0.9	0.3	1.0	0.5	0.7	0.8	0.7
0.9	0.9	0.6	0.8	0.6	0.8	1.0	0.8	0.9	0.7
0.7	0.8	0.3	1.0	0.7	1.0	0.7	0.9	0.9	0.9
0.6	0.7	0.6	0.9	0.4	0.8	0.9	0.8	0.7	1.0
0.9	0.8	0.4	0.9	0.6	0.8	0.7	0.9	0.7	0.9
0.7	0.9	0.3	1.0	0.6	0.9	0.7	0.9	0.4	0.7
0.9	0.8	0.5	0.7	0.8	0.7	0.8	0.8	0.8	1.0
1.0	1.0	0.8	1.0	0.8	0.9	0.5	1.0	0.9	0.9
0.9	0.9	0.5	0.6	0.6	1.0	0.9	0.9	1.0	0.8
0.9	0.9	0.8	1.0	0.6	1.0	0.8	0.8	1.0	1.0
0.9	0.7	0.6	0.9	0.6	0.7	0.8	0.8	0.9	0.8
0.6	0.9	0.4	1.0	0.4	0.7	0.5	0.9	0.5	0.9
0.8	0.9	0.6	0.9	0.6	0.9	0.8	0.8	0.7	0.7
0.8	0.8	0.5	0.8	0.5	0.7	0.6	0.8	0.6	0.8
0.5	1.0	0.8	0.8	0.4	1.0	1.0	1.0	0.6	0.8
0.6	1.0	0.7	0.8	0.9	0.7	0.7	0.8	0.9	0.9
0.5	1.0	0.5	0.7	0.7	0.9	0.5	0.9	0.5	0.9
0.7	1.0	0.8	1.0	0.8	0.8	0.7	0.7	0.6	0.9
0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.9	0.8	0.8
0.6	0.8	0.4	0.8	0.5	1.0	0.7	0.8	0.7	1.0
0.8	0.9	0.4	1.0	0.5	1.0	0.7	0.8	0.5	1.0
0.7	0.9	0.2	1.0	0.5	0.9	0.5	1.0	1.0	1.0
0.4	1.0	0.2	0.7	0.5	1.0	0.8	1.0	0.7	1.0
1.0	0.8	0.8	0.6	0.7	0.9	0.9	0.9	0.8	0.8
0.9	0.8	0.7	1.0	0.4	0.9	0.8	0.8	0.9	0.9
0.9	0.7	0.8	0.8	0.7	0.9	1.0	0.8	0.8	1.0
0.9	1.0	0.5	0.7	0.9	0.7	1.0	0.8	0.8	1.0
0.7	0.8	0.6	1.0	0.8	0.9	0.6	1.0	0.9	0.7
0.8	0.9	0.8	0.5	0.9	0.6	0.9	0.8	0.8	0.9
0.9	0.9	0.7	0.7	0.6	0.8	0.6	0.4	0.8	1.0
0.9	0.8	0.8	0.7	0.7	0.8	0.7	0.6	0.8	0.8
0.5	0.9	0.7	1.0	0.5	1.0	0.9	0.9	0.6	0.8
0.7	0.8	0.6	0.6	0.8	0.9	0.6	0.9	0.9	0.8
0.9	0.6	0.4	0.9	0.6	0.6	1.0	0.9	0.8	0.7
0.9	0.7	0.4	0.9	0.8	0.8	0.6	0.8	0.9	0.8
0.6	0.8	0.7	0.5	0.8	1.0	0.7	0.8	0.7	0.8
0.9	1.0	0.6	0.8	0.6	0.7	0.5	0.9	0.8	0.9

Experiment # 1b

Proportion correct for subject # 1

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.2	0.9	0.4	0.4	0.6	0.8	0.7	0.9	0.3	0.8
0.5	0.9	0.2	0.8	0.6	0.7	0.5	0.5	0.7	0.9
0.7	1.0	0.5	0.9	0.2	0.9	0.4	0.8	0.1	0.8
0.7	0.9	0.4	1.0	0.3	1.0	0.6	0.8	0.4	0.7
0.5	0.9	0.4	0.6	0.3	0.9	0.5	0.9	0.7	0.8
0.4	0.9	0.3	0.8	0.5	0.7	0.6	1.0	0.4	0.7
0.5	0.8	0.6	0.8	0.2	0.8	0.5	0.5	0.6	0.9
0.6	0.9	0.1	0.6	0.2	0.1	0.6	0.6	0.6	0.7
0.4	1.0	0.3	0.7	0.3	0.9	0.4	0.7	0.7	0.4
0.4	0.8	0.4	0.6	0.2	1.0	0.8	0.8	0.6	0.7
0.6	0.9	0.2	0.6	0.6	0.7	0.5	0.7	0.9	0.8
0.6	0.8	0.2	0.6	0.3	0.6	0.4	0.6	0.7	0.7
0.5	0.7	0.5	0.6	0.4	0.7	0.6	0.9	0.6	0.8
0.5	0.9	0.5	0.9	0.3	0.8	0.6	0.7	0.9	0.8
0.6	0.9	0.3	0.8	0.4	0.8	0.7	0.8	0.4	0.8

Experiment # 1b

Proportion correct for subject # 4

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
1.0	0.9	0.2	0.7	0.7	0.8	0.8	0.7	0.8	0.9
0.8	0.7	0.4	0.8	0.7	0.8	0.8	0.7	0.8	0.8
0.8	0.8	0.8	0.8	0.5	0.7	0.8	0.8	0.9	0.9
0.9	0.9	0.3	0.6	0.5	0.8	0.7	0.8	0.8	0.9
0.9	0.9	0.3	0.7	0.6	0.8	0.7	0.9	0.8	1.0
0.8	0.9	0.6	0.7	0.6	0.8	0.6	0.9	0.8	0.9
0.7	0.8	0.5	0.6	0.7	0.8	0.7	0.8	0.7	0.9
0.9	1.0	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9
0.9	0.9	0.6	0.8	0.5	0.8	0.7	0.9	0.7	0.8
0.8	0.8	0.4	0.9	0.5	0.7	0.8	0.8	0.9	0.8
0.9	1.0	0.3	0.6	0.7	0.8	0.8	0.8	0.8	0.8
1.0	0.7	0.8	0.6	0.8	0.8	0.9	0.7	1.0	0.7
0.9	1.0	0.9	0.5	0.8	0.7	0.9	0.8	1.0	0.7
1.0	0.8	0.3	0.6	0.7	0.8	0.9	0.9	0.9	0.7
1.0	0.8	0.8	0.4	0.7	0.5	0.9	0.4	0.9	0.8

Experiment # 2a
Proportion correct for subject # 1

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.7	0.7	0.6	0.4	0.5	0.6	0.5	0.5	0.7	0.7
0.5	1.0	0.5	0.6	0.5	0.6	0.4	0.8	0.4	0.8
0.5	0.5	0.3	0.4	0.2	0.6	0.2	0.9	0.3	0.8
0.3	0.9	0.5	0.6	0.3	0.7	0.6	0.7	0.5	0.8
0.5	0.6	0.8	0.4	0.5	0.7	0.6	0.5	0.3	0.6
0.5	0.8	0.6	0.4	0.6	0.7	0.6	0.8	0.4	0.5
0.6	0.6	0.2	0.4	0.4	0.3	0.4	0.5	0.6	0.7
0.4	0.8	0.5	0.5	0.5	0.9	0.5	0.6	0.3	0.3
0.6	0.6	0.5	0.5	0.5	0.8	0.6	0.6	0.6	0.7
0.2	0.9	0.4	0.3	0.3	0.8	0.3	0.6	0.5	0.7
0.2	0.4	0.3	0.7	0.2	0.8	0.5	0.4	0.2	0.6
0.5	0.7	0.2	0.7	0.5	0.8	0.4	0.7	0.5	0.7
0.4	0.8	0.2	0.8	0.4	0.7	0.6	0.8	0.7	0.7
0.4	0.7	0.3	0.9	0.4	0.9	0.4	0.7	0.3	0.6
0.3	0.9	0.3	0.7	0.2	0.8	0.5	0.8	0.5	0.6
0.1	0.9	0.0	0.9	0.2	1.0	0.4	0.6	0.3	0.7
0.3	0.9	0.1	0.9	0.5	0.8	0.3	0.5	0.5	0.6
0.2	0.8	0.4	0.9	0.7	0.7	0.1	0.6	0.2	0.9
0.5	0.7	0.4	0.8	0.6	0.9	0.3	0.9	0.5	0.8
0.4	0.8	0.3	0.7	0.3	0.7	0.1	0.6	0.5	0.8
0.4	0.5	0.3	0.4	0.4	1.0	0.3	0.8	0.4	0.5
0.5	0.7	0.1	0.6	0.5	0.6	0.1	0.4	0.4	0.7
0.2	1.0	0.2	0.8	0.4	0.8	0.6	0.7	0.1	0.9
0.2	0.9	0.4	0.9	0.6	0.6	0.4	0.7	0.5	0.8
0.4	0.8	0.4	0.8	0.4	0.7	0.4	0.8	0.2	0.7
0.1	0.9	0.3	0.7	0.1	0.9	0.6	0.7	0.6	0.8
0.0	1.0	0.2	1.0	0.0	0.7	0.1	0.6	0.3	0.8
0.2	0.6	0.2	0.9	0.5	0.8	0.4	0.7	0.5	0.9
0.1	0.6	0.4	0.7	0.5	0.7	0.4	0.9	0.2	0.8
0.3	1.0	0.4	0.8	0.7	0.3	0.4	0.6	0.7	0.8
0.3	0.8	0.3	0.7	0.4	0.6	0.4	0.7	0.6	0.9
0.3	0.8	0.5	0.4	0.7	0.4	0.8	0.6	0.5	0.5
0.3	1.0	0.2	0.5	0.6	0.5	0.4	0.7	0.3	0.8
0.4	0.7	0.3	0.8	0.7	0.8	0.3	0.6	0.4	0.7
0.4	0.9	0.1	0.5	0.3	0.6	0.5	0.8	0.4	0.7
0.6	0.7	0.6	0.6	0.3	0.4	0.7	0.7	0.4	0.9
0.3	0.8	0.4	0.5	0.7	0.5	0.7	0.6	0.6	0.7
0.6	0.7	0.4	0.6	0.7	0.5	0.3	0.6	0.8	0.5
0.5	0.8	0.6	0.8	0.2	0.6	0.6	0.8	0.8	0.8
0.4	0.9	0.5	0.7	0.5	0.5	0.4	0.3	0.8	1.0
0.7	0.7	0.2	0.8	0.6	0.8	0.4	0.6	0.2	0.6
0.5	0.7	0.6	1.0	0.7	0.7	0.7	0.9	0.5	0.8
0.3	0.7	0.3	0.9	0.5	0.9	0.6	0.6	0.7	0.8
0.3	0.6	0.5	0.7	0.7	0.8	0.4	0.8	0.5	0.8
0.4	0.9	0.5	0.6	0.5	0.6	0.4	0.6	0.5	0.8
0.5	0.7	0.5	0.8	0.5	0.3	0.8	0.5	0.5	0.8
0.5	0.7	0.4	0.6	0.8	0.5	0.6	0.7	0.8	0.7
0.4	0.6	0.4	0.8	0.3	0.5	0.7	0.9	0.6	0.6
0.8	0.6	0.4	0.6	0.4	0.6	0.5	0.7	0.6	0.3
0.5	0.5	0.3	0.6	0.6	0.3	0.7	0.8	0.8	0.7

Experiment # 2b
Proportion correct for subject # 3

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.2	0.8	0.5	0.4	0.5	0.7	0.4	0.8	0.2	0.8
0.3	0.8	0.6	0.9	0.8	0.8	0.3	0.8	0.3	0.8
0.5	0.8	0.1	0.6	0.4	0.7	0.5	0.7	0.4	0.4
0.1	0.9	0.1	0.6	0.2	1.0	0.1	1.0	0.0	0.8
0.2	0.7	0.3	0.9	0.4	0.9	0.6	0.5	0.3	0.8
0.4	0.7	0.4	0.7	0.6	0.7	0.3	0.6	0.3	0.4
0.2	0.8	0.1	1.0	0.3	0.9	0.3	0.8	0.3	0.9
0.1	1.0	0.1	1.0	0.3	0.9	0.1	1.0	0.4	0.9
0.3	1.0	0.2	0.8	0.0	0.7	0.2	0.9	0.1	0.9
0.2	0.9	0.4	1.0	0.1	0.9	0.1	1.0	0.2	0.7
0.4	1.0	0.1	1.0	0.1	1.0	0.2	1.0	0.1	0.7
0.2	0.8	0.2	0.6	0.1	0.8	0.2	0.9	0.3	0.9
0.1	0.9	0.4	1.0	0.2	0.7	0.2	0.9	0.1	0.9
0.4	0.6	0.0	0.8	0.0	1.0	0.2	0.8	0.6	0.8
0.5	0.9	0.1	0.9	0.1	0.8	0.1	0.8	0.4	0.7
0.3	0.9	0.2	1.0	0.0	0.8	0.4	0.7	0.7	0.8
0.3	0.9	0.0	0.9	0.2	0.8	0.1	1.0	0.4	0.9
0.2	0.9	0.0	0.8	0.0	1.0	0.1	0.8	0.4	0.6
0.1	0.9	0.0	1.0	0.1	0.8	0.2	1.0	0.3	0.9
0.3	0.9	0.0	0.9	0.1	1.0	0.3	1.0	0.4	0.9
0.2	0.8	0.0	0.8	0.1	1.0	0.1	0.9	0.2	1.0
0.7	0.8	0.0	1.0	0.1	1.0	0.2	1.0	0.2	0.8
0.3	0.8	0.2	1.0	0.3	0.9	0.2	1.0	0.0	0.9
0.2	0.9	0.1	0.7	0.4	1.0	0.1	0.9	0.3	0.9
0.3	0.9	0.1	0.9	0.2	0.9	0.4	0.8	0.4	0.9
0.0	0.8	0.1	1.0	0.2	0.9	0.1	1.0	0.6	0.9
0.3	0.9	0.1	1.0	0.0	0.9	0.3	0.8	0.1	0.7
0.1	0.7	0.1	1.0	0.2	1.0	0.3	1.0	0.3	0.9
0.2	1.0	0.1	1.0	0.3	0.9	0.1	0.8	0.2	1.0
0.1	1.0	0.1	0.6	0.1	1.0	0.1	1.0	0.3	0.8
0.2	1.0	0.0	0.9	0.3	0.7	0.1	0.9	0.5	0.9
0.4	0.9	0.1	0.9	0.4	0.9	0.3	0.8	0.3	0.9
0.2	0.9	0.0	0.8	0.4	1.0	0.1	1.0	0.3	0.9
0.0	1.0	0.0	1.0	0.2	1.0	0.1	1.0	0.2	1.0
0.1	1.0	0.2	1.0	0.1	0.9	0.3	1.0	0.2	1.0
0.0	1.0	0.2	0.9	0.2	1.0	0.1	1.0	0.2	1.0
0.4	0.9	0.1	0.9	0.2	1.0	0.3	1.0	0.6	0.8
0.1	0.9	0.0	1.0	0.2	0.9	0.1	0.9	0.1	1.0
0.2	1.0	0.0	1.0	0.0	1.0	0.0	0.9	0.7	0.7
0.2	1.0	0.0	1.0	0.2	1.0	0.1	0.9	0.7	1.0
0.2	1.0	0.1	1.0	0.2	0.9	0.1	1.0	0.2	0.9
0.3	1.0	0.2	1.0	0.2	0.8	0.1	1.0	0.1	1.0
0.5	0.9	0.3	0.9	0.0	1.0	0.4	0.9	0.3	0.9
0.3	1.0	0.1	0.8	0.1	0.9	0.3	0.9	0.4	1.0
0.2	1.0	0.1	0.9	0.2	0.9	0.2	1.0	0.4	0.9
0.2	0.9	0.3	1.0	0.0	1.0	0.1	1.0	0.3	0.8
0.1	1.0	0.0	0.9	0.2	0.9	0.2	0.8	0.2	0.8
0.4	0.9	0.1	1.0	0.0	1.0	0.0	0.9	0.4	1.0
0.3	1.0	0.2	1.0	0.2	0.9	0.2	1.0	0.5	0.8
0.2	0.9	0.0	0.9	0.3	0.9	0.1	0.9	0.2	1.0

Experiment # 2b
Proportion correct for subject # 4

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.7	0.7	0.3	0.7	0.2	0.8	0.4	0.6	0.8	0.5
0.7	0.5	0.6	0.5	0.5	0.7	0.6	0.5	0.8	0.7
0.4	0.7	0.3	0.6	0.2	0.9	0.7	0.9	0.7	0.6
0.5	0.6	0.4	0.7	0.3	0.7	0.5	0.8	0.5	0.4
0.4	0.6	0.3	0.3	0.3	0.8	0.4	0.7	0.6	0.4
0.7	0.6	0.4	0.5	0.4	0.5	0.9	0.9	0.5	0.6
0.8	0.8	0.1	0.7	0.6	0.5	0.5	0.7	0.5	0.4
0.5	0.6	0.7	0.3	0.5	0.6	0.3	0.6	0.6	0.6
0.4	0.5	0.9	0.3	0.5	0.3	0.4	0.5	0.4	0.9
0.3	0.6	0.5	0.4	0.7	0.3	0.3	0.7	0.5	0.6
0.5	0.6	0.9	0.2	0.6	0.8	0.4	0.3	0.6	0.5
0.4	0.4	0.8	0.3	0.5	0.6	0.7	0.8	0.2	0.8
0.8	0.7	0.7	0.2	0.7	0.5	0.7	0.6	0.4	0.6
0.8	0.6	0.5	0.8	0.5	0.4	0.7	0.9	0.6	0.3
0.7	0.4	0.2	0.6	0.2	0.6	0.6	0.6	0.5	0.3
0.7	0.8	0.5	0.5	0.6	0.9	0.4	0.5	0.8	0.5
0.8	0.5	0.6	0.7	0.4	0.8	0.8	0.5	0.7	0.7
1.0	0.4	0.6	0.4	0.6	0.7	0.8	0.7	0.8	0.7
0.6	0.7	0.5	0.7	0.6	0.6	0.8	0.7	0.6	0.6
0.5	0.6	0.6	0.6	0.5	0.7	0.7	0.1	0.3	0.7
0.6	0.7	0.4	0.7	0.5	0.8	0.5	0.6	0.7	0.5
0.8	0.6	0.4	0.8	0.6	0.5	0.8	0.4	0.3	0.6
0.6	0.6	0.3	0.5	0.6	0.5	0.7	0.7	0.8	0.6
0.8	0.8	0.8	0.7	0.4	0.2	0.5	0.7	0.7	0.3
0.6	0.5	0.6	0.4	0.9	0.6	0.5	0.7	0.4	0.8
0.5	1.0	0.5	0.4	0.6	0.2	0.4	0.5	0.7	0.5
0.7	0.5	0.7	0.4	0.7	0.7	0.6	0.3	0.5	0.7
0.9	0.5	0.5	0.8	0.5	0.5	0.5	0.3	0.8	0.6
0.7	0.5	0.7	0.5	0.3	0.7	0.6	0.9	0.6	0.7
0.7	0.6	0.7	0.5	0.8	0.5	0.6	0.6	0.6	0.5
0.7	0.4	0.4	0.5	0.6	0.4	0.9	0.5	0.7	0.7
0.9	0.8	0.5	0.6	0.8	0.6	1.0	0.6	0.9	0.2
0.5	0.5	0.8	0.6	0.8	0.8	0.8	0.3	0.7	0.5
0.8	0.6	0.5	0.8	0.6	0.5	0.7	0.4	0.8	0.8
0.8	0.3	0.4	0.9	0.9	0.7	0.7	0.3	1.0	0.5
0.7	0.4	0.1	0.5	0.8	0.6	0.7	0.1	0.9	0.2
0.8	0.8	0.7	0.5	0.7	0.5	0.9	0.6	0.8	0.2
0.6	0.5	0.3	0.6	0.7	0.7	0.6	0.7	0.6	0.7
0.8	0.7	0.6	0.7	0.7	0.2	0.8	0.6	0.8	0.3
1.0	0.7	0.6	0.8	0.7	0.6	0.7	0.4	0.4	0.5
0.9	0.3	0.5	0.6	0.7	0.5	0.8	0.6	0.9	0.6
0.9	0.6	0.2	0.4	0.5	0.5	0.4	0.6	0.7	0.3
0.8	0.7	0.3	0.4	0.6	0.6	0.7	0.6	0.6	0.6
0.6	0.7	0.6	0.6	0.8	0.4	1.0	0.7	0.8	0.5
0.7	0.7	0.4	0.3	0.5	0.5	0.3	0.6	0.7	0.8
0.3	0.7	0.6	0.4	0.5	0.7	0.7	0.6	0.9	0.5
0.7	0.8	0.7	0.4	0.6	0.5	0.8	0.6	0.8	0.7
0.5	0.5	0.5	0.6	0.4	0.6	0.8	0.4	0.7	0.6
0.8	0.5	0.6	0.7	0.5	0.7	0.7	0.6	0.7	0.3
0.5	0.7	0.5	0.6	0.9	0.6	0.6	0.6	0.5	0.8

Experiment # 3

Proportion correct for subject # 3

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.2	1.0	0.1	0.8	0.2	1.0	0.2	1.0	0.5	1.0
0.0	0.9	0.0	1.0	0.0	1.0	0.5	0.9	0.1	0.9
0.3	1.0	0.3	0.6	0.1	0.9	0.3	0.9	0.6	1.0
0.1	0.9	0.2	0.9	0.3	0.9	0.5	0.9	0.3	1.0
0.1	1.0	0.3	0.7	0.4	0.8	0.3	0.9	0.4	0.9
0.4	1.0	0.1	0.9	0.2	0.9	0.3	0.7	0.3	0.8
0.4	0.7	0.3	0.6	0.2	0.9	0.5	1.0	0.2	0.9
0.3	0.9	0.3	0.9	0.0	1.0	0.2	0.8	0.1	1.0
0.5	0.6	0.4	0.4	0.1	0.9	0.4	0.9	0.4	0.6
0.2	0.9	0.3	0.8	0.4	0.7	0.3	1.0	0.2	0.8
0.3	0.8	0.4	0.8	0.6	0.6	0.4	0.8	0.4	0.6
0.2	0.7	0.2	0.7	0.3	0.7	0.4	0.9	0.1	0.9
0.2	1.0	0.2	0.7	0.3	1.0	0.2	1.0	0.3	0.5
0.6	0.9	0.3	0.8	0.1	0.9	0.1	1.0	0.1	0.9
0.4	0.9	0.2	0.9	0.4	0.8	0.0	0.9	0.1	0.8
0.1	0.9	0.3	0.9	0.5	0.8	0.3	0.7	0.4	0.9
0.1	1.0	0.1	0.7	0.1	0.9	0.2	1.0	0.3	0.9
0.1	1.0	0.2	0.9	0.2	0.8	0.2	1.0	0.0	1.0
0.1	0.9	0.3	0.8	0.4	0.8	0.3	0.8	0.3	0.8
0.1	1.0	0.1	0.9	0.1	0.9	0.2	0.8	0.2	0.8
0.6	0.8	0.2	0.9	0.3	0.6	0.5	0.9	0.1	0.9
0.1	0.7	0.1	1.0	0.1	0.9	0.2	0.8	0.1	1.0
0.4	1.0	0.0	0.9	0.4	1.0	0.1	0.9	0.2	1.0
0.3	0.8	0.2	0.7	0.4	0.8	0.4	0.9	0.4	0.9
0.1	1.0	0.2	0.7	0.1	1.0	0.3	0.9	0.3	0.6
0.5	0.7	0.2	0.6	0.1	0.9	0.0	0.9	0.3	0.7
0.3	1.0	0.0	1.0	0.1	1.0	0.0	0.9	0.1	0.8
0.5	0.8	0.0	0.8	0.1	1.0	0.5	0.9	0.3	0.7
0.2	0.6	0.1	0.9	0.1	0.8	0.1	0.9	0.4	0.8
0.3	0.8	0.1	0.9	0.3	0.8	0.2	0.9	0.3	0.9
0.1	0.7	0.1	0.8	0.3	1.0	0.5	0.8	0.6	0.9
0.4	0.8	0.2	0.8	0.3	0.8	0.1	1.0	0.0	0.7
0.6	0.9	0.1	1.0	0.1	0.7	0.1	0.9	0.6	0.8
0.3	0.9	0.2	0.7	0.1	0.7	0.2	0.8	0.5	0.8
0.4	0.7	0.2	0.8	0.3	0.7	0.2	0.9	0.4	0.9

Experiment # 3

Proportion correct for subject # 4

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.5	0.8	0.3	0.4	0.3	0.9	0.3	0.9	0.3	0.4
0.8	0.5	0.5	0.8	0.4	0.8	0.4	0.5	0.7	0.6
0.4	0.6	0.7	0.7	0.1	0.8	0.7	0.8	0.7	0.6
0.3	0.6	0.6	0.7	0.5	0.5	0.5	0.8	0.3	0.6
0.7	0.8	0.7	0.5	0.3	0.7	0.5	0.7	0.6	0.7
0.8	0.5	0.5	0.4	0.2	0.7	0.1	0.8	0.5	0.9
0.6	0.7	0.1	0.7	0.4	0.4	0.6	0.6	0.6	0.8
0.8	0.2	0.2	0.8	0.3	0.8	0.2	0.5	0.8	0.7
0.6	0.4	0.5	0.4	0.2	0.7	0.5	0.7	0.6	0.7
0.6	0.5	0.2	0.6	0.4	0.5	0.6	0.8	0.4	0.3
0.6	0.5	0.2	0.7	0.4	0.8	0.6	0.7	0.5	0.7
0.7	0.7	0.6	0.4	0.5	0.6	0.8	0.6	0.5	0.7
0.5	0.8	0.5	0.5	0.4	0.6	0.7	0.7	0.1	0.7
0.6	0.3	0.5	0.4	0.4	0.2	0.3	0.8	0.7	0.7
0.5	0.6	0.6	0.4	0.6	0.6	0.6	0.9	0.6	0.5
0.3	0.5	0.6	0.9	0.5	0.7	0.4	0.7	0.5	0.4
0.5	0.5	0.4	0.6	0.4	0.6	0.3	0.3	0.5	0.8
0.3	0.7	0.1	0.8	0.2	0.8	0.4	0.8	0.6	1.0
0.3	0.6	0.6	0.6	0.5	0.7	0.3	0.7	0.5	0.6
0.7	0.9	0.1	0.7	0.5	0.6	0.7	0.8	0.6	0.7
0.6	0.6	0.3	0.7	0.3	0.8	0.4	0.6	0.3	0.3
0.4	0.7	0.2	0.4	0.3	0.5	0.3	0.8	0.4	0.4
0.6	0.3	0.1	0.6	0.3	0.7	0.6	0.4	0.9	0.3
0.7	0.6	0.3	0.7	0.5	0.7	0.7	0.9	0.6	0.5
0.7	0.6	0.3	0.7	0.5	0.3	0.8	0.5	0.6	0.6
0.4	0.5	0.4	0.6	0.5	0.7	0.6	0.6	0.6	0.7
0.6	0.7	0.3	0.8	0.2	0.5	0.7	0.7	0.5	0.4
0.4	0.7	0.1	0.7	0.5	1.0	0.4	0.4	0.8	0.4
0.3	0.6	0.3	0.5	0.4	0.8	0.5	0.6	0.5	0.7
0.6	0.7	0.7	0.4	0.5	0.7	0.6	0.9	0.5	0.7
0.6	0.6	0.5	0.3	0.6	0.7	0.6	0.6	0.3	0.5
0.7	0.9	0.4	0.8	0.4	0.8	0.7	0.6	0.5	0.3
0.7	0.4	0.6	0.5	0.6	0.8	0.2	0.7	0.9	0.4
0.6	0.4	0.5	0.4	0.6	0.7	0.4	0.7	0.7	0.5
0.2	0.6	0.4	0.9	0.4	0.7	0.4	0.7	0.6	0.4

Experiment # 4a
Proportion correct for subject # 3

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.3	0.5	0.2	1.0	0.7	0.9	0.6	0.7	0.6	0.4
0.7	0.5	0.6	0.9	0.6	0.2	0.7	0.5	0.4	0.4
0.0	0.5	0.4	0.9	0.6	0.7	0.4	0.8	0.3	0.8
0.5	0.9	0.4	1.0	0.5	0.9	0.5	0.7	0.5	0.5
0.1	0.9	0.0	1.0	0.3	1.0	0.4	0.9	0.5	0.7
0.1	0.9	0.1	1.0	0.0	1.0	0.1	0.8	0.1	0.8
0.0	1.0	0.0	1.0	0.0	1.0	0.1	0.9	0.3	0.8
0.0	1.0	0.1	1.0	0.0	1.0	0.0	1.0	0.1	0.9
0.1	1.0	0.4	1.0	0.1	1.0	0.2	0.9	0.1	0.8
0.0	1.0	0.6	1.0	0.0	1.0	0.0	1.0	0.0	1.0
0.0	1.0	0.3	1.0	0.2	0.9	0.0	1.0	0.0	1.0
0.1	0.8	0.1	1.0	0.2	1.0	0.0	1.0	0.1	1.0
0.0	1.0	0.4	1.0	0.2	1.0	0.0	0.9	0.1	1.0
0.0	1.0	0.2	1.0	0.7	1.0	0.3	1.0	0.2	0.7
0.1	0.9	0.2	1.0	0.0	0.9	0.0	1.0	0.1	1.0
0.0	1.0	0.2	1.0	0.0	1.0	0.0	1.0	0.0	1.0
0.1	1.0	0.3	1.0	0.0	1.0	0.0	1.0	0.2	1.0
0.0	1.0	0.2	1.0	0.0	1.0	0.0	1.0	0.1	0.9
0.0	1.0	0.2	1.0	0.2	1.0	0.1	1.0	0.0	1.0
0.2	0.9	0.3	1.0	0.1	0.9	0.0	1.0	0.0	0.9
0.0	1.0	0.6	1.0	0.0	0.9	0.0	1.0	0.0	0.9
0.0	1.0	0.7	1.0	0.4	0.9	0.1	1.0	0.1	1.0
0.1	1.0	0.5	1.0	0.4	1.0	0.1	1.0	0.0	1.0
0.0	1.0	0.7	1.0	0.2	1.0	0.0	1.0	0.0	1.0
0.1	1.0	0.9	1.0	0.4	1.0	0.2	1.0	0.1	1.0
0.0	1.0	0.7	1.0	0.3	1.0	0.0	1.0	0.0	1.0
0.2	1.0	0.6	0.9	0.3	1.0	0.1	0.9	0.1	0.9
0.1	0.7	0.6	0.9	0.5	1.0	0.1	0.9	0.1	1.0
0.1	0.7	0.8	1.0	0.3	1.0	0.2	0.9	0.1	0.8
0.1	0.8	0.9	1.0	0.2	1.0	0.0	0.9	0.3	0.9
0.3	0.6	0.6	1.0	0.6	0.9	0.3	0.9	0.3	0.8
0.1	0.9	0.7	1.0	0.5	1.0	0.2	1.0	0.1	0.9
0.2	0.6	0.4	1.0	0.6	0.7	0.2	1.0	0.1	0.8
0.0	1.0	1.0	1.0	0.8	0.7	0.3	1.0	0.0	1.0
0.2	0.9	0.9	1.0	0.9	0.3	0.5	1.0	0.1	0.9
0.1	1.0	0.8	1.0	0.7	0.7	0.1	1.0	0.0	1.0
0.0	1.0	0.6	1.0	0.8	0.6	0.2	0.9	0.1	1.0
0.1	1.0	0.8	1.0	0.7	0.9	0.1	0.9	0.2	0.9
0.0	1.0	0.9	1.0	0.6	0.9	0.0	1.0	0.2	0.9
0.2	1.0	0.8	0.9	0.6	1.0	0.1	1.0	0.1	0.9
0.1	1.0	0.9	1.0	0.8	0.9	0.1	0.9	0.1	1.0
0.3	0.9	0.9	1.0	0.6	1.0	0.2	1.0	0.1	1.0
0.5	0.8	0.7	1.0	0.7	1.0	0.3	0.9	0.1	1.0
0.0	0.9	0.8	1.0	0.2	1.0	0.1	1.0	0.0	1.0
0.0	0.9	0.9	1.0	0.7	1.0	0.1	1.0	0.0	1.0
0.0	1.0	1.0	1.0	1.0	1.0	0.1	1.0	0.1	0.9
0.0	1.0	0.8	1.0	0.3	0.9	0.0	1.0	0.0	0.9
0.2	0.9	1.0	1.0	0.5	1.0	0.1	0.9	0.0	1.0
0.1	1.0	0.9	1.0	0.5	0.9	0.0	1.0	0.0	0.9
0.0	1.0	0.9	0.9	0.7	1.0	0.1	1.0	0.1	1.0

Experiment # 4a
Proportion correct for subject # 6

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.2	0.8	0.2	0.7	0.5	0.7	0.5	0.6	0.2	0.6
0.4	0.8	0.4	0.6	0.7	0.6	0.6	0.4	0.6	0.4
0.9	0.1	0.9	0.5	1.0	0.2	0.9	0.2	0.9	0.1
0.9	0.2	1.0	0.3	0.9	0.2	0.8	0.3	0.9	0.2
0.6	0.4	0.7	0.3	0.7	0.3	0.8	0.0	0.8	0.2
0.6	0.4	0.7	0.6	0.7	0.4	0.7	0.4	0.8	0.3
0.7	0.6	0.7	0.9	0.6	0.3	0.8	0.4	0.6	0.4
0.1	0.8	0.5	0.6	0.6	0.7	0.3	0.8	0.2	0.7
0.5	0.5	0.3	0.9	0.4	1.0	0.7	0.7	0.7	0.7
0.6	0.6	0.4	0.9	0.3	0.9	0.8	0.8	0.4	0.7
0.4	0.5	0.2	0.6	0.5	0.8	0.6	0.4	0.5	0.5
0.2	0.9	0.1	0.9	0.4	1.0	0.2	0.8	0.2	0.8
0.0	1.0	0.1	1.0	0.5	0.9	0.5	0.7	0.1	0.9
0.2	0.8	0.1	1.0	0.1	0.8	0.2	0.7	0.0	0.7
0.2	1.0	0.1	1.0	0.3	0.8	0.1	0.7	0.1	0.8
0.3	0.8	0.3	0.9	0.1	0.9	0.1	0.9	0.3	0.8
0.3	0.3	0.5	1.0	0.7	0.8	0.4	0.7	0.8	1.0
0.6	0.6	0.4	0.6	0.6	0.5	0.4	0.8	0.3	0.7
0.5	0.7	0.8	0.8	0.4	1.0	0.7	0.7	0.5	0.8
0.7	0.7	0.4	0.8	0.8	0.6	0.7	0.5	0.4	0.8
0.3	0.7	0.3	0.9	0.5	0.9	0.5	0.6	0.2	0.8
0.3	0.6	0.3	0.6	0.5	1.0	0.4	0.7	0.4	0.8
0.4	0.4	0.6	0.9	0.7	0.8	0.5	0.8	0.4	0.7
0.5	0.4	0.5	0.9	0.6	0.7	0.6	0.4	0.6	0.6
0.3	0.5	0.5	0.9	0.7	0.8	0.4	0.8	0.2	0.7
0.4	0.5	0.6	0.9	0.3	1.0	0.5	0.5	0.4	0.7
0.5	0.6	0.8	1.0	0.6	0.8	0.6	0.6	0.5	0.7
0.4	0.6	0.6	1.0	0.6	0.9	0.4	0.7	0.2	0.6
0.6	0.8	0.7	0.9	0.6	0.8	0.2	0.6	0.5	0.8
0.5	0.6	0.9	0.9	0.7	1.0	0.4	0.9	0.4	0.7
0.3	0.8	0.9	1.0	0.8	0.9	0.6	0.7	0.8	0.7
0.1	0.7	0.6	1.0	0.4	0.9	0.6	0.4	0.4	0.9
0.4	0.5	1.0	1.0	0.7	1.0	0.2	0.8	0.2	0.9
0.5	0.6	1.0	0.9	0.8	1.0	0.7	0.9	0.5	0.8
0.5	0.6	0.8	1.0	0.9	1.0	1.0	0.5	0.5	0.7
0.1	1.0	0.9	1.0	0.7	1.0	0.1	0.9	0.5	0.8
0.3	0.7	1.0	1.0	0.9	1.0	0.4	0.6	0.3	0.7
0.4	0.8	0.6	1.0	0.5	0.9	0.5	0.8	0.3	1.0
0.5	0.6	1.0	1.0	0.8	0.8	0.2	0.9	0.5	0.8
0.1	0.8	0.9	1.0	0.7	1.0	0.5	0.8	0.3	0.8
0.5	0.5	0.9	0.8	0.9	0.7	0.2	0.9	0.5	0.8
0.2	0.9	0.9	0.9	0.8	1.0	0.4	0.9	0.2	0.9
0.2	0.8	0.9	1.0	0.8	0.9	0.4	0.9	0.3	0.9
0.3	0.9	0.8	1.0	0.9	0.8	0.2	0.8	0.4	0.8
0.4	0.8	0.9	0.9	0.6	1.0	0.5	0.7	0.3	0.9
0.2	1.0	1.0	0.8	0.9	1.0	0.5	0.8	0.4	0.8
0.1	1.0	0.9	0.9	0.5	0.9	0.0	1.0	0.1	0.8
0.4	0.9	0.9	1.0	0.5	0.9	0.3	0.9	0.3	0.7
0.8	0.2	0.9	0.8	0.9	0.4	0.7	0.4	0.6	0.6
0.5	0.6	1.0	0.8	0.8	0.8	0.4	0.8	0.2	0.9

Experiment # 4a

Proportion correct for subject # 10

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.5	0.4	0.3	0.5	0.6	0.6	0.5	0.3	0.4	0.7
0.2	0.7	0.8	0.7	0.7	0.3	0.6	0.7	0.6	0.7
0.7	0.3	0.6	0.2	0.6	0.5	0.7	0.2	0.8	0.5
0.5	0.5	0.5	0.3	0.9	0.1	0.5	0.0	0.4	0.4
1.0	0.3	0.6	0.3	0.6	0.4	0.8	0.2	0.8	0.4
0.5	0.6	0.7	0.4	0.6	0.4	0.7	0.1	0.7	0.5
0.8	0.4	0.6	0.3	0.7	0.4	0.2	0.3	0.8	0.5
0.4	0.6	0.2	0.3	0.6	0.6	0.6	0.9	0.5	0.7
0.6	0.5	0.6	0.6	0.8	0.4	0.8	0.3	0.9	0.8
0.8	0.3	0.5	0.4	0.8	0.2	0.7	0.1	0.6	0.2
0.8	0.2	1.0	0.2	0.9	0.1	0.8	0.2	0.8	0.0
0.5	0.6	0.8	0.2	0.9	0.4	0.5	0.3	0.8	0.6
0.6	0.5	0.9	0.4	0.9	0.4	0.8	0.2	0.5	0.4
0.8	0.4	0.8	0.5	0.6	0.4	0.6	0.4	0.8	0.4
0.7	0.4	0.7	0.3	0.8	0.2	0.6	0.2	0.8	0.1
0.4	0.6	0.9	0.1	0.8	0.1	0.7	0.4	0.6	0.3
0.6	0.5	0.4	0.4	0.6	0.4	0.5	0.8	0.4	0.4
0.8	0.4	0.6	0.2	0.8	0.0	1.0	0.4	0.6	0.1
0.7	0.3	0.6	0.3	0.8	0.3	0.8	0.5	0.6	0.5
0.4	0.1	0.8	0.0	0.8	0.4	0.8	0.2	0.5	0.6
0.5	0.3	0.6	0.1	0.8	0.3	0.6	0.1	0.6	0.1
0.7	0.3	0.9	0.1	1.0	0.1	0.8	0.3	0.8	0.1
0.8	0.3	0.8	0.1	0.9	0.3	0.9	0.0	0.8	0.4
0.6	0.2	0.7	0.3	0.7	0.2	0.9	0.1	0.5	0.5
0.9	0.2	0.8	0.2	0.8	0.2	1.0	0.3	0.8	0.1
0.8	0.2	0.8	0.3	0.9	0.2	0.4	0.3	0.9	0.5
0.9	0.1	0.8	0.0	0.9	0.1	0.8	0.2	0.6	0.3
0.8	0.1	1.0	0.0	1.0	0.2	0.9	0.1	0.8	0.2
0.8	0.3	0.6	0.4	0.6	0.5	0.8	0.4	0.8	0.1
0.5	0.3	0.5	0.3	0.6	0.5	0.5	0.4	0.6	0.3
0.3	0.2	0.9	0.2	0.8	0.0	1.0	0.2	0.4	0.1
0.8	0.4	0.6	0.4	0.5	0.4	0.6	0.7	0.6	0.3
0.9	0.1	1.0	0.1	0.9	0.1	0.9	0.2	1.0	0.0
0.9	0.0	0.8	0.2	1.0	0.1	1.0	0.2	0.9	0.1
1.0	0.0	0.9	0.2	0.9	0.0	0.9	0.0	0.9	0.1
0.4	0.6	0.8	0.0	0.8	0.1	0.9	0.3	0.6	0.5
0.7	0.4	0.5	0.5	0.8	0.4	0.7	0.5	0.6	0.7
0.6	0.4	0.8	0.4	0.8	0.0	0.9	0.3	0.7	0.3
0.8	0.2	0.9	0.4	0.8	0.2	0.7	0.1	0.7	0.2
0.6	0.1	0.9	0.2	0.9	0.1	0.9	0.0	0.9	0.4
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	0.7	0.1
0.5	0.4	0.5	0.6	0.4	0.7	0.1	0.6	0.5	0.5
0.9	0.1	0.7	0.1	1.0	0.0	0.9	0.0	1.0	0.0
0.3	0.5	0.8	0.5	0.6	0.5	0.8	0.4	0.7	0.5
1.0	0.0	0.7	0.1	0.9	0.0	0.9	0.1	1.0	0.3
0.8	0.5	0.9	0.1	0.8	0.1	0.6	0.2	0.7	0.2
0.7	0.5	0.6	0.3	0.7	0.4	0.5	0.4	0.6	0.5
0.6	0.5	0.7	0.3	0.8	0.2	0.8	0.1	0.7	0.2
0.6	0.8	1.0	0.4	0.8	0.5	0.9	0.3	0.8	0.1
0.2	0.6	0.4	0.7	0.3	0.3	0.5	0.6	0.4	0.7

Experiment # 4a
Proportion correct for subject # 11

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.3	0.8	0.6	0.6	0.6	0.6	0.6	0.8	0.7	0.7
0.3	0.9	0.2	0.9	0.2	0.7	0.3	0.5	0.3	0.7
0.3	0.6	0.5	0.8	0.2	1.0	0.4	0.5	0.5	0.7
0.2	0.9	0.2	0.8	0.3	0.7	0.4	0.8	0.3	0.7
0.4	0.7	0.2	0.9	0.4	1.0	0.3	0.9	0.4	0.9
0.5	0.8	0.3	0.9	0.5	0.9	0.3	0.8	0.3	0.4
0.7	0.7	0.1	0.7	0.3	0.9	0.3	0.8	0.5	0.9
0.1	1.0	0.2	0.8	0.5	0.8	0.3	0.7	0.4	0.6
0.1	0.8	0.2	0.9	0.1	1.0	0.2	0.7	0.3	0.8
0.2	1.0	0.1	0.8	0.3	1.0	0.2	0.9	0.2	0.9
0.2	1.0	0.2	0.9	0.3	0.8	0.4	0.8	0.3	1.0
0.0	1.0	0.4	1.0	0.3	0.9	0.1	0.9	0.2	0.7
0.2	0.9	0.1	1.0	0.1	1.0	0.3	0.7	0.1	1.0
0.2	0.9	0.4	1.0	0.6	0.9	0.6	0.7	0.5	1.0
0.2	0.9	0.2	1.0	0.3	0.8	0.3	0.6	0.3	0.9
0.3	1.0	0.6	0.8	0.4	0.6	0.3	0.7	0.2	0.9
0.2	1.0	0.7	0.9	0.6	0.8	0.6	0.6	0.2	0.8
0.2	1.0	0.2	0.7	0.4	1.0	0.5	0.9	0.1	0.9
0.1	1.0	0.3	0.9	0.2	1.0	0.1	0.8	0.1	0.9
0.2	0.9	0.5	1.0	0.4	0.9	0.5	1.0	0.3	0.9
0.6	0.8	0.6	0.9	0.6	0.8	0.8	0.4	0.4	0.7
0.3	0.9	0.6	1.0	0.5	0.8	0.6	0.7	0.2	0.6
0.2	0.7	0.5	0.8	0.8	0.8	0.4	0.6	0.3	0.8
0.1	0.8	0.2	1.0	0.3	0.9	0.5	0.8	0.2	0.7
0.3	0.8	0.6	1.0	0.5	0.8	0.8	0.6	0.5	0.8
0.3	0.9	0.3	0.9	0.6	0.9	0.4	0.9	0.4	1.0
0.2	0.8	0.4	1.0	0.7	0.9	0.3	0.9	0.4	1.0
0.2	0.8	0.6	0.6	0.4	0.8	0.5	0.9	0.2	0.6
0.3	0.7	0.5	0.6	0.6	0.6	0.3	0.8	0.5	0.9
0.3	0.8	0.4	0.9	0.6	0.6	0.2	0.8	0.3	0.8
0.3	0.8	0.7	0.9	0.8	0.6	0.4	0.9	0.4	0.9
0.2	0.8	0.5	0.9	0.6	0.6	0.3	0.8	0.3	0.6
0.6	0.6	0.7	0.8	0.7	0.5	0.3	0.7	0.4	0.7
0.3	0.6	0.2	0.9	0.4	0.6	0.2	1.0	0.6	0.6
0.4	0.7	0.7	0.8	0.6	0.9	0.8	0.6	0.6	0.7
0.3	0.9	0.6	1.0	0.7	0.5	0.7	0.7	0.7	0.6
0.3	0.6	0.6	0.8	0.7	0.7	0.5	0.8	0.6	0.4
0.6	0.7	0.6	0.9	0.6	0.4	0.7	0.6	0.6	0.7
0.5	0.6	0.4	0.9	0.6	0.7	0.5	0.5	0.4	0.6
0.6	0.6	0.6	0.8	0.6	0.6	0.6	0.5	0.6	0.8
0.2	0.7	0.6	0.9	0.5	0.9	0.8	0.6	0.4	0.7
0.1	0.8	0.6	1.0	0.9	0.8	0.2	0.7	0.5	0.7
0.6	0.7	0.7	0.8	0.7	1.0	0.4	0.7	0.4	0.8
0.4	0.8	0.7	1.0	0.7	0.7	0.9	0.8	0.4	0.8
0.4	0.7	0.4	1.0	0.6	0.8	0.2	0.7	0.4	0.9
0.2	0.7	0.5	0.8	0.3	1.0	0.4	0.9	0.5	0.8
0.3	0.8	0.3	1.0	0.3	0.9	0.4	0.6	0.4	0.6
0.3	0.8	0.8	0.8	0.8	1.0	0.6	0.9	0.5	0.8
0.2	0.9	0.6	1.0	0.7	0.7	0.6	0.7	0.4	0.8
0.5	0.7	0.7	0.9	0.7	0.7	0.6	0.7	0.3	0.9

Experiment # 4b

Proportion correct for subject # 3

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.3	1.0	0.0	1.0	0.2	1.0	0.5	1.0	0.4	0.9
0.9	1.0	0.7	0.7	0.5	1.0	0.9	1.0	0.8	0.8
0.7	1.0	0.0	0.9	0.1	1.0	0.6	1.0	0.4	1.0
0.9	1.0	0.6	0.8	0.5	1.0	0.8	1.0	1.0	0.9
1.0	0.9	0.9	0.7	0.7	1.0	0.9	0.9	0.7	0.9
1.0	1.0	0.3	1.0	0.4	1.0	0.8	0.9	0.8	0.9
0.9	1.0	0.0	1.0	0.4	1.0	0.9	0.9	0.6	0.8
1.0	1.0	0.5	0.8	0.8	0.9	0.9	0.9	0.9	0.9
0.9	0.9	0.4	0.9	0.9	0.9	1.0	0.8	1.0	0.8
0.9	1.0	0.6	0.7	0.7	1.0	0.8	0.9	0.7	1.0
0.8	1.0	0.9	0.6	0.6	0.8	0.7	1.0	0.6	1.0
0.8	0.9	0.8	1.0	0.7	0.8	0.9	1.0	0.9	1.0
1.0	0.8	0.7	0.7	0.9	0.9	1.0	0.9	1.0	0.8
0.9	1.0	0.6	0.5	0.4	0.7	0.6	0.9	0.6	1.0
0.9	0.9	0.8	0.8	0.7	0.9	0.9	1.0	0.6	0.9
1.0	0.9	1.0	0.5	1.0	0.7	1.0	0.9	0.9	1.0
0.7	0.9	0.5	0.7	0.4	0.9	0.9	1.0	0.8	0.8
1.0	0.8	0.5	0.7	0.5	0.9	1.0	1.0	0.8	1.0
1.0	1.0	0.9	0.8	0.8	0.9	0.9	1.0	1.0	1.0
1.0	1.0	0.9	0.7	0.7	0.9	1.0	1.0	1.0	1.0
1.0	0.8	0.5	0.9	0.8	0.8	1.0	1.0	1.0	1.0
0.9	0.9	0.6	0.8	0.9	1.0	0.9	0.8	0.9	0.8
0.9	0.9	0.6	0.8	0.7	1.0	0.7	0.9	0.9	1.0
0.7	0.9	0.3	0.8	0.7	0.9	1.0	0.6	1.0	0.9
0.8	1.0	0.2	0.9	0.5	1.0	0.9	0.9	0.5	0.9
0.9	1.0	0.6	0.9	0.8	0.9	0.9	0.6	0.9	0.9
1.0	0.9	0.9	0.9	1.0	1.0	1.0	0.9	0.9	1.0
0.9	1.0	0.7	0.7	1.0	0.7	0.9	0.9	0.9	1.0
1.0	1.0	0.7	0.8	0.7	0.7	0.8	0.7	0.9	1.0
0.9	0.9	0.9	0.6	0.7	0.8	0.8	1.0	0.6	0.8

Experiment # 4b

Proportion correct for subject # 6

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.8	0.9	0.7	0.3	0.7	0.6	0.9	1.0	1.0	1.0
0.8	0.9	0.7	0.4	0.9	0.7	1.0	1.0	1.0	0.9
0.9	1.0	0.8	0.1	0.9	0.5	0.9	1.0	1.0	1.0
1.0	0.9	0.9	0.1	1.0	0.7	0.8	1.0	0.9	1.0
0.9	0.9	0.7	0.3	0.7	0.8	0.9	1.0	1.0	1.0
0.9	1.0	0.6	0.4	0.6	0.9	0.8	1.0	0.8	1.0
1.0	0.8	0.6	0.4	0.9	1.0	0.9	0.8	1.0	1.0
1.0	0.9	0.7	0.5	0.9	0.9	0.7	0.9	1.0	1.0
0.9	0.5	0.9	0.4	0.9	0.4	1.0	0.8	0.9	0.6
1.0	0.9	0.6	0.4	0.9	0.8	1.0	0.8	1.0	0.9
1.0	0.8	1.0	0.4	0.9	0.9	0.9	0.9	1.0	0.9
1.0	1.0	1.0	0.5	0.8	0.9	1.0	1.0	0.9	1.0
0.9	0.8	0.8	0.5	0.5	0.5	0.7	0.8	0.9	0.9
0.9	1.0	0.6	0.7	1.0	0.8	1.0	1.0	1.0	0.8
1.0	1.0	0.7	0.8	0.9	1.0	1.0	0.9	0.9	1.0
0.9	1.0	0.8	0.8	0.9	0.9	1.0	1.0	0.9	0.9
0.9	0.7	0.7	0.7	1.0	0.6	1.0	0.8	0.8	0.8
1.0	0.8	1.0	0.7	1.0	0.9	1.0	1.0	1.0	0.8
0.9	0.9	0.7	0.8	0.9	1.0	1.0	0.7	0.8	0.7
0.8	0.8	0.8	1.0	0.8	0.9	0.9	1.0	1.0	0.8
1.0	0.9	0.6	0.9	1.0	0.8	0.7	1.0	0.8	1.0
1.0	0.8	0.7	0.8	0.7	0.9	1.0	1.0	1.0	1.0
0.9	0.9	0.8	0.7	0.9	1.0	1.0	1.0	1.0	0.9
0.9	0.9	0.5	0.7	0.7	0.9	0.8	1.0	0.8	0.9
0.9	1.0	0.9	0.7	1.0	0.9	0.9	0.9	0.8	0.9
0.9	0.9	0.8	0.7	0.9	0.9	0.9	1.0	0.8	0.9
0.9	1.0	0.7	0.7	0.8	1.0	0.9	1.0	0.8	0.9
0.9	1.0	1.0	0.8	0.9	0.9	0.9	1.0	1.0	1.0
0.8	0.8	1.0	0.4	1.0	0.9	0.9	1.0	1.0	0.8
1.0	0.9	0.8	0.9	0.9	0.9	1.0	0.6	0.8	0.9

Experiment # 4b

Proportion correct for subject # 11

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.4	1.0	0.5	0.4	0.7	0.8	0.8	0.8	0.6	0.8
0.6	0.8	0.8	0.3	0.8	0.5	0.6	0.7	0.6	0.7
0.4	0.7	0.5	0.9	0.4	0.9	0.4	0.6	0.4	0.5
0.8	1.0	0.4	0.7	0.8	0.7	0.9	0.9	0.8	0.8
0.7	0.9	0.6	0.5	0.7	0.9	0.7	0.7	0.3	0.8
0.4	0.9	0.1	0.5	0.5	0.7	0.5	0.7	0.4	1.0
0.5	1.0	0.8	0.5	0.6	0.6	0.7	0.8	0.2	0.9
0.4	1.0	0.2	0.5	0.5	0.7	0.3	0.6	0.5	1.0
0.7	0.9	0.6	0.4	0.8	0.4	0.6	1.0	0.3	1.0
0.5	0.9	0.8	0.6	0.6	0.7	0.7	0.9	0.5	0.9
0.4	1.0	0.5	0.4	0.7	0.8	0.8	0.8	0.5	0.9
0.7	0.7	0.5	0.7	0.8	0.8	0.5	0.7	0.6	0.7
0.7	0.9	0.4	0.9	0.6	0.7	0.6	0.6	0.7	0.8
0.8	0.7	0.3	0.9	0.5	0.8	0.7	0.7	0.8	0.8
0.7	0.9	0.2	0.8	0.3	0.7	0.9	0.6	0.9	0.7
0.8	0.7	0.6	0.7	0.9	0.6	0.9	0.8	0.7	0.9
0.7	0.8	0.5	0.5	0.7	0.4	0.9	0.6	0.9	0.9
0.6	0.5	0.6	0.4	0.7	0.5	0.8	0.8	0.7	0.9
0.9	0.7	0.8	0.2	0.8	0.5	0.8	0.8	1.0	0.7
0.7	0.4	0.8	0.3	0.9	0.2	1.0	0.5	0.8	0.4
1.0	0.4	0.6	0.5	0.7	0.8	1.0	0.5	0.9	0.7
0.9	0.7	0.7	0.6	0.5	0.3	0.4	0.2	0.8	0.5
0.6	0.7	0.5	0.5	0.9	0.5	0.8	0.7	0.7	0.5
0.5	0.6	0.3	0.3	0.8	0.3	0.8	0.4	0.8	0.9
0.5	0.6	0.7	0.2	0.5	0.7	0.3	0.8	0.5	0.8
0.6	0.6	0.6	0.2	1.0	0.2	0.8	0.7	0.5	0.6
0.8	0.8	0.6	0.5	0.5	0.6	0.5	0.7	0.5	0.8
0.6	0.9	0.6	0.1	0.7	0.8	0.8	0.4	1.0	0.7
0.5	0.7	0.8	0.3	0.4	0.7	0.7	0.5	0.8	0.7
0.8	0.4	0.6	0.7	0.7	0.6	1.0	0.5	0.6	0.7

Experiment # 4c

Proportion correct for subject # 3

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St12	St13	St14
0.1	1.0	0.8	1.0	0.9	0.9	0.5	1.0	1.0	0.7	0.9	0.9	0.8	0.8
0.5	0.7	0.9	1.0	0.7	1.0	0.7	1.0	0.8	1.0	0.7	1.0	0.8	0.9
0.4	0.6	0.9	1.0	0.8	0.9	0.6	1.0	0.8	0.9	0.8	0.9	0.8	0.8
0.3	0.7	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.9
0.1	0.9	0.7	1.0	0.5	1.0	0.7	1.0	0.7	0.9	0.7	1.0	0.6	0.9
0.4	0.8	1.0	1.0	0.9	1.0	0.8	1.0	0.9	1.0	0.9	1.0	0.9	1.0
0.5	0.7	0.9	0.8	0.9	1.0	0.8	1.0	1.0	1.0	0.8	0.9	1.0	1.0
0.3	0.9	0.9	0.9	0.8	1.0	0.6	1.0	0.7	0.8	0.8	1.0	1.0	1.0
0.0	0.9	0.8	0.9	0.9	1.0	1.0	0.9	1.0	0.8	0.9	0.8	1.0	1.0
0.3	0.9	0.9	1.0	0.9	1.0	0.7	1.0	0.8	0.8	0.8	1.0	0.8	1.0
0.4	0.8	1.0	1.0	1.0	1.0	0.9	1.0	0.8	0.9	0.9	0.8	0.9	1.0
0.1	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	0.9	1.0	0.7	1.0
0.0	1.0	1.0	1.0	1.0	1.0	0.7	1.0	1.0	0.9	1.0	1.0	0.8	1.0
0.0	0.9	1.0	1.0	0.8	1.0	1.0	1.0	0.8	1.0	1.0	1.0	0.9	1.0
0.0	0.9	1.0	0.9	0.9	0.9	0.7	0.8	1.0	1.0	0.9	1.0	0.8	1.0
0.1	1.0	1.0	0.9	1.0	1.0	1.0	1.0	0.9	1.0	0.9	1.0	0.9	1.0
0.1	1.0	0.9	1.0	1.0	0.8	0.7	1.0	0.8	1.0	1.0	1.0	1.0	1.0
0.3	1.0	1.0	0.9	1.0	1.0	1.0	1.0	0.9	0.9	1.0	1.0	1.0	0.9
0.0	0.9	0.9	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0
0.0	1.0	1.0	0.9	0.9	1.0	0.8	0.9	0.9	1.0	0.9	1.0	0.9	1.0
0.0	1.0	1.0	1.0	0.9	1.0	0.7	1.0	1.0	1.0	0.9	1.0	1.0	0.8
0.1	0.9	0.9	1.0	1.0	0.9	0.9	1.0	0.9	1.0	1.0	1.0	1.0	1.0
0.1	0.9	1.0	0.9	0.9	0.9	0.9	1.0	0.8	1.0	1.0	0.9	1.0	1.0
0.3	0.9	0.9	0.9	0.8	1.0	0.6	1.0	0.7	0.8	0.8	1.0	1.0	1.0
0.3	0.9	0.8	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.9
0.3	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0	1.0	0.9
0.1	0.9	1.0	1.0	0.9	1.0	0.9	1.0	0.9	0.9	1.0	0.9	1.0	0.9
0.0	0.8	1.0	1.0	0.9	0.9	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9
0.0	1.0	0.9	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0
0.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0

Experiment # 4c

Proportion correct for subject # 6

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St12	St13	St14
0.0	0.7	0.9	1.0	0.2	0.6	0.9	0.7	0.4	0.4	0.8	0.1	0.5	1.0
0.4	0.4	0.8	0.8	0.3	0.7	0.7	0.6	0.5	0.4	0.5	0.8	0.5	0.8
0.4	0.4	1.0	1.0	0.3	0.7	0.6	0.5	0.6	0.8	0.2	1.0	0.6	0.4
0.4	0.4	1.0	0.6	0.2	0.6	0.8	0.4	0.5	0.7	0.5	0.8	0.5	0.6
0.6	0.5	0.8	0.8	0.5	0.7	0.6	0.4	0.7	0.4	0.2	0.7	0.4	0.5
0.1	0.7	0.8	1.0	0.0	1.0	0.7	0.8	0.2	0.8	0.0	0.8	0.0	0.9
0.4	0.7	0.9	0.7	0.5	0.5	0.7	0.4	0.4	0.7	0.5	0.6	0.6	0.5
0.3	0.4	0.8	0.9	0.4	0.7	0.4	0.9	0.3	0.4	0.4	0.6	0.1	0.7
0.3	1.0	0.9	1.0	0.2	0.9	0.4	0.9	0.3	1.0	0.3	0.9	0.1	1.0
0.5	0.5	0.9	0.9	0.5	0.7	0.7	0.7	0.4	0.7	0.5	0.9	0.4	0.9
0.4	1.0	0.9	0.9	0.2	0.9	0.6	1.0	0.2	0.9	0.1	1.0	0.1	1.0
0.2	0.7	0.9	0.6	0.6	0.7	0.8	0.6	0.3	0.7	0.2	0.8	0.7	0.7
0.2	0.6	1.0	1.0	0.1	1.0	0.7	1.0	0.0	0.9	0.1	1.0	0.0	1.0
0.6	0.5	1.0	0.3	0.3	0.3	0.7	0.7	0.6	0.3	0.7	0.4	0.3	0.6
0.2	0.9	0.8	1.0	0.2	0.9	0.5	1.0	0.2	1.0	0.2	0.9	0.1	0.9
0.7	0.7	0.9	0.8	0.2	0.9	0.6	0.7	0.5	0.8	0.8	0.7	0.1	0.9
0.7	0.5	1.0	0.7	0.5	0.8	0.8	0.7	0.4	0.7	0.4	0.7	0.6	0.9
0.8	0.5	1.0	1.0	0.7	0.9	0.7	0.8	0.7	0.9	0.6	1.0	0.6	1.0
0.6	0.5	1.0	0.7	0.8	0.6	0.9	0.4	0.8	0.5	0.8	0.4	0.7	0.9
0.6	0.6	0.9	1.0	0.9	0.7	0.6	0.7	0.9	0.6	0.5	0.7	0.9	0.5
0.4	0.7	0.9	0.9	0.4	0.9	0.3	0.9	0.4	0.9	0.6	1.0	0.3	0.8
0.8	0.5	1.0	0.9	0.9	0.8	0.6	0.9	0.8	0.8	0.8	0.9	0.8	1.0
0.7	0.6	1.0	1.0	0.8	0.9	0.7	0.9	0.5	1.0	1.0	0.9	0.8	0.8
0.6	0.8	0.9	0.9	0.9	0.9	0.6	1.0	0.7	0.8	1.0	0.7	1.0	1.0
0.4	0.5	1.0	1.0	0.8	1.0	0.7	1.0	0.6	1.0	1.0	0.9	1.0	1.0
0.6	0.5	1.0	0.9	0.9	0.9	0.7	1.0	0.6	1.0	1.0	0.8	1.0	0.9
0.7	0.5	0.9	1.0	0.9	0.7	0.7	0.8	0.9	0.9	0.8	1.0	1.0	0.9
0.7	0.6	1.0	0.9	1.0	1.0	0.9	0.9	0.8	0.9	0.8	0.8	0.7	0.9
0.8	0.5	0.7	1.0	0.9	0.7	0.8	0.9	0.9	0.8	0.9	0.7	1.0	0.7
0.7	0.2	0.9	0.8	1.0	0.4	0.9	0.7	0.8	0.6	1.0	0.6	1.0	0.6

Experiment # 4c

Proportion correct for subject # 11

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St12	St13	St14
0.8	0.8	1.0	0.7	0.4	0.6	0.4	0.5	0.7	0.6	0.3	0.8	0.4	0.5
0.4	0.7	0.9	0.8	0.2	0.6	0.6	0.5	0.7	0.9	0.6	0.6	0.5	0.4
0.8	0.4	0.8	0.8	0.7	0.4	0.4	0.5	0.6	0.5	0.5	0.6	0.5	0.4
0.6	0.4	0.9	0.8	0.6	0.4	0.6	0.5	0.6	0.4	0.6	0.5	0.6	0.4
0.8	0.2	0.9	0.8	0.7	0.3	0.6	0.6	0.6	0.5	0.4	0.6	0.5	0.4
0.4	0.7	0.6	0.9	0.4	0.3	0.2	0.8	0.6	0.7	0.4	0.6	0.7	0.5
0.6	0.5	0.8	0.8	0.4	0.6	0.2	0.7	0.4	0.5	0.4	0.5	0.7	0.7
0.3	0.8	0.5	1.0	0.5	0.5	0.1	0.9	0.4	0.8	0.6	0.5	0.7	0.6
0.5	0.5	0.7	0.8	0.9	0.7	0.4	0.6	0.6	0.5	0.8	0.7	0.5	0.8
0.6	0.5	0.8	1.0	0.6	0.5	0.4	0.3	0.6	0.7	0.8	0.6	0.5	0.5
0.4	0.8	0.9	0.6	0.7	0.5	0.4	0.8	0.2	0.5	0.3	0.4	0.5	0.5
0.8	0.6	0.9	0.3	0.7	0.7	0.9	0.3	0.5	0.5	0.5	0.3	0.7	0.0
0.6	0.5	0.9	0.7	0.7	0.5	0.8	0.6	0.7	0.2	0.7	0.6	0.6	0.7
0.4	0.6	0.9	0.7	0.9	1.0	0.8	0.6	0.6	0.6	0.8	0.5	0.6	0.7
0.7	0.6	1.0	0.6	0.4	0.8	0.2	0.5	0.4	0.4	0.5	0.9	0.6	0.8
0.7	0.6	0.9	0.9	0.6	0.7	0.3	0.7	0.8	0.3	0.6	0.8	0.5	0.8
0.5	0.5	0.9	0.7	0.8	0.8	0.4	0.7	1.0	0.4	0.5	0.6	0.5	0.7
0.4	0.8	1.0	0.6	0.9	0.6	0.9	0.2	0.7	0.7	0.9	0.2	0.9	0.8
0.2	0.6	1.0	0.6	0.7	0.8	0.6	0.5	0.7	0.8	0.7	0.9	0.9	0.9
0.3	0.7	1.0	0.6	0.8	0.8	0.7	0.5	0.7	0.7	0.8	0.4	0.9	0.8
0.4	0.8	0.9	0.8	0.6	0.6	0.7	0.2	0.9	0.7	0.8	1.0	1.0	0.7
0.2	1.0	0.7	0.6	0.7	0.9	0.7	1.0	0.6	0.9	0.7	0.6	0.7	1.0
0.7	0.4	0.9	0.7	0.8	0.7	0.4	0.7	0.6	0.9	0.9	0.7	0.8	0.9
0.7	0.3	1.0	0.8	0.8	0.9	0.6	0.4	0.8	0.8	1.0	0.8	0.9	0.9
0.8	0.2	1.0	0.5	0.9	0.8	0.5	0.5	1.0	0.7	0.9	0.8	0.8	0.6
0.6	0.6	1.0	0.2	1.0	0.9	0.9	0.6	1.0	0.6	1.0	0.6	1.0	0.5
0.7	0.4	0.9	0.6	0.8	1.0	0.6	0.5	0.8	0.7	0.9	0.9	0.6	0.8
0.4	0.8	0.9	0.5	0.6	0.8	0.4	0.8	0.8	0.7	0.8	0.7	0.9	0.7
0.7	0.6	0.9	0.6	0.7	0.6	0.4	0.8	0.9	0.9	0.8	0.8	0.7	0.6
0.6	0.4	0.9	0.4	0.8	0.7	0.6	0.7	1.0	0.7	0.9	0.8	0.9	0.5

Experiment # 5
Proportion correct, S # 1

St1	St2	St3	St4
0.68	0.60	0.64	0.88
0.64	0.64	0.52	0.92
0.60	0.56	0.76	0.80
0.72	0.52	0.68	0.76
0.48	0.72	0.56	0.88
0.52	0.52	0.76	0.96
0.32	0.76	0.56	0.88
0.52	0.84	0.44	0.96
0.72	0.76	0.72	0.84
0.60	0.64	0.72	0.92
0.68	0.48	0.72	0.96
0.84	0.40	0.92	0.92
0.96	0.36	0.92	0.84
0.72	0.48	0.84	0.92
0.72	0.28	0.76	0.80
0.80	0.56	0.88	0.88
0.84	0.40	0.84	0.80
0.84	0.56	0.96	0.76
0.80	0.44	0.88	0.84
0.88	0.52	1.00	0.80
0.76	0.52	0.88	0.84
0.96	0.44	0.96	0.96
0.88	0.44	0.96	0.76
0.84	0.64	0.92	0.96
0.68	0.52	1.00	0.80
0.72	0.56	0.92	0.96
0.68	0.64	0.88	0.92
0.76	0.56	0.92	0.84
0.80	0.52	0.92	1.00
0.84	0.60	0.96	0.92
0.72	0.68	0.96	0.96
0.68	0.72	0.88	0.92
0.72	0.56	0.88	0.80
0.72	0.80	1.00	0.96
0.84	0.84	0.84	0.84
0.64	0.80	0.80	0.96
0.72	0.72	0.92	0.96
0.76	0.60	0.76	0.92
0.84	0.68	0.92	1.00
0.60	0.52	0.96	0.96
0.84	0.76	0.88	1.00
0.84	0.76	0.84	1.00
0.88	0.72	0.96	0.96
0.80	0.64	0.96	1.00
0.60	0.56	0.92	0.96
0.56	0.52	0.92	0.80
0.72	0.68	0.88	0.96
0.84	0.84	0.96	1.00
0.84	0.76	0.92	1.00
0.64	0.80	0.92	0.96

Experiment # 5
Proportion correct, S # 7

St1	St2	St3	St4
0.52	0.52	0.56	0.64
0.68	0.48	0.68	0.52
0.56	0.32	0.80	0.36
0.64	0.68	0.68	0.64
0.44	0.72	0.44	0.88
0.56	0.72	0.44	0.76
0.36	0.52	0.52	0.72
0.72	0.64	0.48	0.76
0.60	0.68	0.48	0.56
0.76	0.48	0.60	0.60
0.60	0.60	0.56	0.84
0.44	0.60	0.44	0.80
0.48	0.72	0.72	0.68
0.44	0.72	0.44	0.84
0.44	0.64	0.76	0.76
0.60	0.60	0.84	0.80
0.56	0.48	0.68	0.84
0.76	0.76	0.72	0.80
0.84	0.52	0.88	0.64
0.80	0.60	0.80	0.84
0.80	0.40	0.88	0.72
0.76	0.32	0.72	0.80
0.76	0.56	0.56	0.76
0.72	0.68	0.68	0.92
0.64	0.68	0.68	0.76
0.56	0.52	0.80	0.88
0.68	0.64	0.68	0.88
0.72	0.64	0.60	0.84
0.64	0.60	0.84	0.92
0.84	0.52	0.96	0.96
0.68	0.80	0.92	0.88
0.84	0.44	0.76	0.92
0.68	0.56	0.92	0.92
0.72	0.48	0.76	0.72
0.56	0.64	0.84	0.88
0.88	0.64	0.96	0.80
0.72	0.64	0.92	0.76
0.88	0.52	0.84	0.88
0.84	0.44	0.92	0.84
0.84	0.40	0.96	0.88
0.88	0.44	0.84	0.84
0.68	0.48	0.96	0.80
0.84	0.64	0.88	0.80
0.84	0.80	0.96	0.84
0.80	0.60	0.88	0.84
0.88	0.76	0.72	0.88
0.80	0.64	0.92	0.84
0.52	0.80	0.92	0.96
0.88	0.68	0.96	0.96
0.80	0.56	0.84	0.92

Experiment # 5
Proportion correct, S # 10

St1	St2	St3	St4
0.84	0.20	0.72	0.72
0.84	0.28	0.64	0.72
0.96	0.28	0.92	0.48
0.80	0.20	1.00	0.48
0.60	0.28	0.80	0.72
0.76	0.32	0.80	0.76
0.80	0.32	0.92	0.76
0.76	0.32	0.84	0.72
0.80	0.48	0.80	0.96
0.44	0.52	0.68	0.84
0.72	0.52	0.80	0.64
0.76	0.36	0.96	0.88
0.84	0.20	0.92	0.84
0.80	0.16	0.92	0.76
0.84	0.24	0.76	0.80
0.60	0.44	0.72	0.96
0.80	0.24	0.92	0.88
0.80	0.28	0.92	0.88
0.96	0.28	0.92	0.88
0.88	0.36	0.80	1.00
0.76	0.32	0.92	0.80
0.84	0.16	0.96	0.80
0.96	0.16	1.00	0.84
0.80	0.20	0.88	0.88
0.88	0.40	0.88	0.88
0.88	0.28	0.88	0.88
0.96	0.08	1.00	0.88
0.88	0.32	1.00	0.88
0.92	0.20	0.96	0.92
0.84	0.12	0.88	0.80
0.96	0.36	0.96	0.80
0.84	0.40	0.92	0.92
0.88	0.48	0.80	1.00
0.72	0.40	0.84	0.88
0.92	0.36	0.96	0.92
0.88	0.68	0.88	0.88
0.56	0.60	0.80	1.00
0.84	0.56	0.84	0.96
0.88	0.36	0.92	0.92
0.76	0.40	0.80	0.96
0.72	0.36	0.88	0.96
0.84	0.64	0.88	0.96
0.68	0.72	0.88	0.92
0.68	0.60	0.72	0.96
0.44	0.88	0.92	1.00
0.68	0.76	0.64	0.92
0.56	0.80	0.76	0.92
0.52	0.76	1.00	1.00
0.88	0.76	1.00	1.00
0.64	0.84	0.84	0.96

Experiment # 5
Proportion correct, S # 11

St1	St2	St3	St4
0.52	0.84	0.68	0.64
0.64	0.56	0.72	0.72
0.64	0.68	0.72	0.96
0.84	0.68	0.88	0.68
0.84	0.36	0.68	0.72
0.92	0.64	0.84	0.80
0.80	0.64	0.80	0.88
0.80	0.76	0.84	1.00
0.80	0.80	0.88	0.88
0.88	0.84	0.96	0.96
0.68	0.84	0.88	0.96
0.84	0.96	0.88	0.92
0.84	0.96	0.92	1.00
0.84	0.88	0.88	1.00
0.92	0.88	0.88	1.00
0.96	0.92	0.96	0.88
0.84	1.00	0.88	0.96
0.68	0.88	0.80	1.00
0.76	0.76	0.96	0.80
0.80	0.68	0.88	0.80
0.72	0.84	0.80	0.96
0.64	0.88	0.84	0.96
0.92	0.80	0.88	0.88
0.76	0.96	0.96	0.92
0.84	0.92	0.72	0.96
0.68	1.00	0.80	1.00
0.92	0.84	0.96	0.88
0.80	0.96	0.80	0.96
0.92	0.88	0.88	0.92
0.92	0.84	0.92	0.96
0.96	0.92	0.92	0.88
0.76	1.00	1.00	0.96
0.88	0.92	0.96	0.96
0.92	0.92	0.96	1.00
0.96	0.88	0.92	1.00
0.88	0.80	0.96	0.96
0.84	0.96	0.92	1.00
0.72	0.92	0.84	0.84
0.76	0.96	0.88	1.00
0.88	0.92	0.92	1.00
0.84	0.88	0.80	0.92
0.92	0.84	1.00	0.92
0.92	0.92	0.92	1.00
0.92	0.92	0.96	1.00
0.84	0.92	1.00	0.92
0.88	0.96	0.92	1.00
0.92	0.96	1.00	1.00
0.92	1.00	1.00	1.00
0.88	0.88	1.00	1.00
0.96	0.96	1.00	1.00

Experiment # 5
Proportion correct, S # 8

St1	St2	St3	St4
0.64	0.36	0.52	0.48
0.64	0.64	0.56	0.76
0.32	0.60	0.56	0.64
0.44	0.68	0.48	0.56
0.72	0.32	0.56	0.60
0.52	0.24	0.60	0.56
0.72	0.44	0.72	0.52
0.64	0.16	0.80	0.08
0.72	0.28	0.76	0.32
0.76	0.16	0.72	0.40
0.76	0.24	0.80	0.36
0.48	0.32	0.80	0.52
0.84	0.36	0.64	0.44
0.60	0.28	0.64	0.76
0.72	0.24	0.76	0.40
0.60	0.32	0.68	0.56
0.60	0.52	0.56	0.60
0.76	0.20	0.64	0.44
0.48	0.40	0.68	0.72
0.76	0.36	0.60	0.52
0.68	0.48	0.68	0.76
0.36	0.52	0.56	0.80
0.60	0.60	0.36	0.76
0.84	0.32	0.60	0.40
0.68	0.40	0.52	0.56
0.60	0.20	0.80	0.72
0.72	0.32	0.72	0.40
0.92	0.20	0.92	0.28
0.56	0.52	0.64	0.76
0.84	0.28	0.72	0.72
0.60	0.12	0.92	0.44
0.88	0.28	0.88	0.60
0.80	0.16	0.76	0.56
0.92	0.08	0.84	0.24
0.44	0.32	0.80	0.44
0.84	0.24	0.88	0.28
0.72	0.28	0.76	0.40
0.76	0.12	0.80	0.52
0.88	0.24	0.76	0.52
0.80	0.24	0.64	0.44
0.64	0.28	0.60	0.44
0.64	0.56	0.68	0.72
0.68	0.24	0.92	0.64
0.76	0.44	0.80	0.52
0.72	0.32	0.80	0.48
0.44	0.52	0.52	0.76
0.44	0.36	0.56	0.68
0.40	0.60	0.52	0.72
0.68	0.48	0.64	0.76
0.64	0.44	0.60	0.76

Experiment # 5
Proportion correct, S # 9

St1	St2	St3	St4
0.92	0.68	0.88	0.56
0.88	0.36	0.92	0.76
0.92	0.40	0.92	0.68
0.96	0.28	0.96	0.44
0.64	0.44	0.68	0.80
0.80	0.68	0.80	0.64
0.68	0.60	0.96	0.84
0.80	0.56	0.96	0.88
0.84	0.72	1.00	0.80
0.84	0.72	0.92	0.88
0.60	0.76	0.84	0.88
0.56	0.68	0.80	0.80
0.92	0.48	1.00	0.60
0.64	0.72	0.68	0.96
0.76	0.64	0.92	0.88
0.80	0.60	0.92	0.92
0.76	0.92	0.76	0.84
0.72	0.76	0.76	0.92
0.76	0.60	0.96	0.88
0.56	0.72	0.84	0.96
0.44	0.64	0.80	0.96
0.60	0.88	0.84	0.96
0.48	0.72	0.76	0.92
0.56	0.76	0.72	0.92
0.68	0.84	0.76	0.96
0.72	0.64	0.76	0.84
0.68	0.88	0.92	0.96
0.72	0.84	0.96	0.88
0.68	0.76	1.00	0.92
0.60	0.80	0.84	1.00
0.64	0.72	0.96	0.92
0.68	0.84	0.96	1.00
0.56	0.72	1.00	0.96
0.68	0.76	0.88	1.00
0.84	0.84	0.92	0.92
0.60	0.76	0.96	0.96
0.44	0.88	0.88	1.00
0.44	0.76	0.92	1.00
0.60	0.92	0.88	0.96
0.56	0.88	0.88	0.92
0.60	0.92	0.88	0.96
0.64	0.64	0.80	0.96
0.68	0.68	0.92	0.92
0.44	0.76	0.80	0.96
0.56	0.88	0.92	1.00
0.40	0.84	0.80	1.00
0.60	0.92	0.84	1.00
0.68	0.92	0.96	0.96
0.56	0.92	0.92	1.00
0.84	0.92	0.92	0.96

Experiment # 5
Proportion correct, S # 5

St1	St2	St3	St4
0.72	0.48	0.68	0.32
0.60	0.44	0.56	0.32
0.72	0.40	0.60	0.36
0.84	0.40	0.80	0.24
0.92	0.32	0.88	0.32
0.80	0.52	0.88	0.32
0.92	0.20	0.92	0.28
1.00	0.20	0.96	0.16
1.00	0.16	0.96	0.28
0.88	0.16	1.00	0.24
0.96	0.12	0.76	0.32
0.72	0.24	0.84	0.40
0.72	0.60	0.60	0.40
0.76	0.56	0.76	0.72
0.56	0.60	0.68	0.72
0.40	0.60	0.76	0.56
0.80	0.52	0.56	0.64
0.44	0.48	0.60	0.60
0.60	0.52	0.64	0.44
0.64	0.72	0.60	0.60
0.72	0.60	0.84	0.80
0.76	0.72	0.72	0.84
0.80	0.64	0.64	0.56
0.64	0.60	0.64	0.68
0.68	0.76	0.44	0.72
0.64	0.84	0.76	0.76
0.92	0.76	0.76	0.68
0.76	0.64	0.76	0.76
0.72	0.68	0.68	0.64
0.84	0.68	0.60	0.80
0.80	0.88	0.84	0.76
0.84	0.92	0.72	0.68
0.88	0.92	0.76	0.84
0.68	0.84	0.88	0.76
0.88	0.84	0.76	0.84
0.84	0.84	0.76	0.60
0.76	0.96	0.80	0.84
0.64	0.92	0.76	0.80
0.80	0.96	0.88	0.64
0.96	0.76	0.88	0.76
0.68	0.96	0.80	0.92
0.72	0.76	0.84	0.84
0.84	0.88	0.84	0.76
1.00	0.88	0.80	0.72
0.96	0.76	1.00	0.76
0.84	0.80	0.88	0.68
0.84	0.84	0.84	0.52
0.84	0.92	0.76	0.68
0.76	0.88	0.84	0.72
0.80	0.88	0.84	0.72

Experiment # 5
Proportion correct, S # 6

St1	St2	St3	St4
0.44	0.84	0.48	1.00
0.24	0.80	0.40	1.00
0.32	0.80	0.76	0.96
0.92	0.60	0.88	0.92
0.64	0.84	0.80	1.00
0.76	0.68	0.76	1.00
0.92	0.76	1.00	0.96
0.80	0.72	1.00	1.00
0.80	0.68	0.96	1.00
0.84	0.84	1.00	1.00
0.92	0.64	0.96	1.00
0.88	0.68	1.00	0.92
0.72	0.72	0.96	0.92
0.72	0.84	1.00	1.00
0.80	0.88	0.96	0.92
0.80	0.84	1.00	0.96
0.96	0.56	1.00	0.96
0.96	0.56	0.96	1.00
0.88	0.80	0.96	1.00
0.92	0.64	0.96	0.96
0.88	0.60	1.00	0.84
0.84	0.88	0.96	0.96
0.60	0.88	1.00	0.96
0.72	0.80	1.00	1.00
0.64	0.92	0.96	1.00
0.80	0.92	0.88	0.96
0.84	0.76	0.92	0.92
0.92	0.96	0.96	1.00
0.96	0.80	1.00	0.96
0.92	0.92	1.00	0.96
1.00	0.80	1.00	0.88
0.88	0.96	0.96	0.96
0.88	0.92	0.96	0.92
1.00	0.88	1.00	1.00
0.92	0.84	0.96	0.96
1.00	0.68	0.92	0.88
1.00	0.88	1.00	0.92
0.84	0.88	0.88	0.88
0.52	0.88	1.00	1.00
0.56	0.96	1.00	1.00
0.84	0.96	1.00	0.96
1.00	0.88	1.00	0.92
0.96	0.92	1.00	1.00
0.96	0.84	1.00	0.96
0.96	0.84	1.00	0.92
0.92	0.92	0.92	0.96
0.84	0.92	0.88	1.00
0.76	0.88	0.88	0.92
1.00	0.84	1.00	0.96
0.96	0.80	1.00	0.96

Experiment # 6a
Proportion correct for subject # 14

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.5	0.4	0.9	0.4	0.8	0.3	1.0	0.5	0.9	0.2
0.7	0.3	0.8	0.2	1.0	0.4	0.9	0.3	1.0	0.1
0.7	0.3	0.7	0.4	0.8	0.3	0.9	0.2	0.9	0.2
0.9	0.3	0.9	0.1	1.0	0.1	0.8	0.3	1.0	0.1
1.0	0.1	0.8	0.1	0.9	0.1	1.0	0.1	0.9	0.1
0.8	0.2	0.9	0.2	1.0	0.1	0.9	0.0	0.8	0.1
0.9	0.1	0.9	0.2	0.8	0.2	1.0	0.2	0.9	0.1
0.9	0.1	0.9	0.2	1.0	0.2	0.8	0.2	1.0	0.1
1.0	0.2	1.0	0.0	1.0	0.2	0.8	0.3	0.9	0.3
0.9	0.2	0.9	0.2	0.5	0.4	0.9	0.5	1.0	0.5
1.0	0.1	0.9	0.1	0.9	0.3	0.8	0.2	1.0	0.1
0.9	0.0	0.7	0.4	0.9	0.1	0.9	0.2	1.0	0.1
1.0	0.1	0.7	0.3	0.9	0.3	0.9	0.3	0.8	0.1
0.9	0.3	1.0	0.3	1.0	0.0	1.0	0.5	0.9	0.2
0.9	0.2	0.9	0.4	0.7	0.1	0.9	0.1	1.0	0.1
1.0	0.4	1.0	0.4	0.6	0.2	0.9	0.2	1.0	0.2
0.9	0.4	0.9	0.2	0.7	0.3	1.0	0.2	0.8	0.2
0.9	0.3	0.9	0.5	0.9	0.6	1.0	0.2	1.0	0.1
0.8	0.2	0.7	0.2	0.8	0.1	1.0	0.4	0.9	0.3
0.7	0.3	0.9	0.4	0.6	0.2	0.8	0.3	0.9	0.4
1.0	0.3	0.6	0.2	0.8	0.3	0.9	0.3	0.9	0.0
1.0	0.0	0.7	0.1	0.8	0.5	0.8	0.4	1.0	0.1
0.9	0.5	0.7	0.3	0.7	0.4	0.7	0.4	0.6	0.3
0.9	0.3	0.8	0.4	0.7	0.3	0.8	0.3	0.6	0.6
0.8	0.3	0.7	0.4	0.6	0.4	0.7	0.6	0.7	0.3
0.7	0.4	0.8	0.4	0.7	0.5	0.8	0.4	0.8	0.5
0.6	0.5	0.8	0.4	0.7	0.1	0.9	0.3	1.0	0.2
0.9	0.6	1.0	0.4	0.7	0.5	0.7	0.2	0.8	0.3
0.7	0.4	0.7	0.4	0.5	0.5	0.7	0.7	1.0	0.6
0.7	1.0	0.9	0.7	0.8	0.5	0.7	0.7	0.8	0.5
0.8	0.5	0.6	0.6	0.5	0.1	0.9	0.4	1.0	0.6
0.9	0.6	0.8	0.4	0.8	0.4	0.8	0.6	0.7	0.9
0.8	0.6	0.9	0.3	0.8	0.2	0.7	0.4	0.8	0.8
0.9	0.6	1.0	0.3	0.8	0.6	0.8	0.8	0.9	0.7
0.7	0.7	0.8	0.3	0.9	0.6	0.7	1.0	1.0	0.8
0.7	0.9	0.8	0.4	0.9	0.5	0.8	0.8	0.7	1.0
1.0	0.8	0.9	0.4	0.7	0.9	0.8	0.7	0.9	0.9
1.0	0.7	0.8	0.8	0.9	0.6	0.8	0.9	0.8	1.0
0.9	0.8	0.7	0.4	0.9	0.8	0.7	0.9	0.8	0.9
1.0	0.8	0.8	0.4	0.8	0.7	0.8	0.8	0.8	0.9
0.6	0.8	0.7	0.4	0.9	0.5	0.9	0.8	1.0	0.9
1.0	1.0	0.7	0.7	0.9	0.6	1.0	0.7	0.6	1.0
1.0	0.9	0.7	0.5	0.9	0.5	1.0	0.8	1.0	0.9
0.9	1.0	0.9	0.7	0.6	0.8	0.9	0.8	0.8	0.8
0.8	1.0	1.0	0.7	0.8	0.7	1.0	0.9	0.9	0.9
0.8	0.9	0.9	0.5	0.9	0.6	1.0	0.7	1.0	0.8
1.0	1.0	1.0	0.7	0.8	0.9	1.0	0.8	0.9	0.9
1.0	0.8	0.9	0.6	1.0	0.6	0.9	0.7	1.0	0.9
0.8	1.0	1.0	0.4	0.9	0.6	1.0	0.9	0.9	0.9
0.9	1.0	0.9	0.5	1.0	0.6	1.0	0.8	1.0	0.9

Experiment # 6a

Proportion correct for subject # 15

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.6	0.5	0.8	0.5	0.8	0.3	0.5	0.4	0.8	0.2
0.6	0.6	0.8	0.5	0.7	0.2	0.4	0.6	0.4	0.8
0.1	0.4	0.5	0.3	0.5	0.5	0.2	0.8	0.6	0.4
0.3	0.9	0.6	0.7	0.7	0.6	0.3	0.7	0.2	0.4
0.3	0.9	0.4	0.9	0.7	0.4	0.5	0.7	0.4	0.5
0.6	0.7	0.5	0.9	0.4	0.6	0.3	0.6	0.3	0.7
0.4	0.7	0.4	0.9	0.7	0.5	0.4	0.6	0.4	0.6
0.3	0.8	0.3	0.9	0.6	0.6	0.5	0.7	0.4	0.6
0.7	0.6	0.2	0.8	0.4	0.9	0.6	0.9	0.8	0.5
0.7	0.4	0.6	0.8	0.7	0.8	0.8	0.6	0.5	0.6
1.0	0.2	0.6	0.5	0.6	0.8	0.7	0.6	0.6	0.7
0.8	0.4	0.6	0.4	0.5	0.4	0.7	0.7	0.5	0.8
1.0	1.0	0.4	0.6	0.4	0.7	0.7	0.8	0.9	0.8
0.8	0.8	0.5	0.9	0.6	0.6	1.0	0.7	0.9	0.9
0.9	0.9	0.5	0.9	0.6	0.7	1.0	0.9	0.9	0.8
0.9	0.8	0.4	0.8	0.6	0.7	0.9	0.7	0.9	0.8
0.8	1.0	0.7	0.7	0.6	0.9	0.8	1.0	0.8	0.9
0.8	1.0	0.8	0.6	0.2	0.7	0.8	0.9	0.7	1.0
1.0	1.0	0.5	0.9	0.5	0.8	0.8	0.9	1.0	1.0
0.9	0.9	0.5	0.9	0.7	1.0	0.8	0.9	1.0	0.7
0.9	0.8	0.4	0.6	0.8	0.8	1.0	1.0	0.9	0.8
0.9	0.8	0.8	0.7	0.9	0.8	0.7	0.7	1.0	0.7
0.5	0.9	0.9	0.5	0.8	0.4	0.8	1.0	0.7	1.0
0.5	0.8	0.7	0.7	0.6	0.9	0.7	0.9	0.7	1.0
0.8	0.9	0.7	0.6	0.9	0.9	0.5	1.0	0.2	1.0
1.0	1.0	0.5	0.6	0.8	0.9	0.6	0.9	0.7	0.8
0.9	0.9	0.7	1.0	0.6	0.9	0.5	1.0	0.6	1.0
0.6	0.9	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.9
0.9	1.0	0.7	0.9	0.7	1.0	0.7	0.9	1.0	0.8
1.0	1.0	0.8	0.7	0.8	1.0	0.8	0.9	0.8	0.8
0.9	1.0	0.6	0.9	0.9	0.8	0.9	0.9	0.8	1.0
0.8	0.8	1.0	0.7	0.6	0.9	0.8	0.9	0.9	1.0
1.0	1.0	0.8	0.9	0.7	1.0	1.0	1.0	1.0	0.7
0.8	0.9	0.8	1.0	0.7	0.9	1.0	0.8	0.9	1.0
0.7	1.0	0.8	0.9	0.7	1.0	1.0	0.9	0.8	0.9
0.8	1.0	0.9	1.0	0.4	0.9	0.9	1.0	0.8	1.0
1.0	1.0	0.8	1.0	0.9	0.7	1.0	0.9	0.8	1.0
0.9	1.0	0.8	0.9	1.0	0.8	1.0	0.9	0.9	0.9
0.9	0.9	0.8	1.0	0.9	0.8	0.8	0.9	1.0	0.7
1.0	0.8	0.8	0.9	0.9	0.9	1.0	0.6	0.8	0.8
1.0	0.9	1.0	1.0	0.8	0.8	1.0	0.9	1.0	0.8
0.9	0.8	0.9	1.0	0.9	1.0	0.9	1.0	1.0	0.9
1.0	0.9	0.8	0.9	0.9	0.7	1.0	1.0	1.0	0.8
1.0	1.0	1.0	0.9	0.9	1.0	1.0	0.8	0.9	0.8
0.9	1.0	1.0	0.9	1.0	0.9	0.9	1.0	0.9	0.8
0.9	1.0	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.8
1.0	0.9	0.9	0.8	0.9	0.8	1.0	0.7	0.9	0.9
0.9	1.0	0.5	0.9	0.9	0.8	0.9	1.0	0.9	1.0
0.9	1.0	0.9	0.9	0.8	1.0	1.0	0.9	1.0	0.9
1.0	1.0	0.6	1.0	0.7	0.9	0.9	0.9	1.0	1.0

Experiment # 6a

Proportion correct for subject # 16

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.8	0.5	1.0	0.0	1.0	0.1	0.8	0.0	0.8	0.0
0.7	0.1	0.8	0.1	0.8	0.1	0.8	0.2	1.0	0.2
0.7	0.4	0.6	0.3	0.7	0.1	0.8	0.3	0.9	0.3
0.8	0.2	0.6	0.2	1.0	0.0	0.9	0.3	0.9	0.1
0.9	0.2	0.7	0.2	0.8	0.3	0.9	0.2	0.9	0.1
0.8	0.1	0.8	0.1	0.8	0.3	0.9	0.0	1.0	0.1
1.0	0.0	1.0	0.1	0.9	0.2	0.9	0.1	0.9	0.2
0.7	0.0	0.9	0.3	0.9	0.3	0.9	0.0	0.9	0.0
1.0	0.0	0.8	0.1	1.0	0.2	0.8	0.2	1.0	0.1
0.8	0.1	0.9	0.0	1.0	0.0	0.9	0.0	1.0	0.1
1.0	0.1	0.9	0.0	0.9	0.1	1.0	0.2	0.9	0.3
1.0	0.0	0.8	0.1	1.0	0.0	1.0	0.0	1.0	0.2
0.9	0.0	0.8	0.0	0.9	0.1	1.0	0.1	1.0	0.1
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.1	0.9	0.0	1.0	0.1	1.0	0.1	1.0	0.0
1.0	0.0	1.0	0.1	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.1
1.0	0.0	1.0	0.1	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.1	1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.1	1.0	0.0	1.0	0.1	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	0.9	0.0	1.0	0.0
0.9	0.2	0.9	0.1	0.8	0.2	1.0	0.3	0.8	0.0
1.0	0.0	0.9	0.2	0.9	0.2	1.0	0.1	1.0	0.0
1.0	0.3	0.9	0.1	0.9	0.0	0.9	0.1	1.0	0.1
1.0	0.3	0.9	0.1	1.0	0.1	0.8	0.1	0.8	0.2
0.8	0.3	0.8	0.1	0.8	0.1	0.9	0.0	1.0	0.1
0.8	0.1	0.7	0.1	1.0	0.2	0.9	0.0	0.7	0.1
0.6	0.3	0.7	0.3	0.5	0.4	0.6	0.1	0.8	0.1
0.9	0.0	0.7	0.1	0.8	0.0	1.0	0.1	1.0	0.0
1.0	0.0	0.9	0.0	0.8	0.1	1.0	0.0	0.9	0.2
0.9	0.2	1.0	0.1	0.7	0.3	1.0	0.1	0.9	0.2
0.9	0.2	0.9	0.0	0.9	0.2	0.8	0.1	0.8	0.1
0.9	0.5	0.9	0.2	0.7	0.2	0.9	0.3	0.7	0.4
0.4	0.2	0.7	0.1	0.6	0.5	0.5	0.3	0.7	0.5
0.5	0.4	0.6	0.1	0.7	0.3	0.8	0.2	0.9	0.5
0.9	0.2	0.7	0.1	0.9	0.1	0.9	0.2	0.9	0.3
0.8	0.3	0.9	0.3	0.8	0.4	0.8	0.2	0.5	0.3
0.8	0.0	0.9	0.4	0.5	0.4	1.0	0.1	0.7	0.3
0.6	0.2	0.9	0.3	0.7	0.2	1.0	0.2	0.8	0.3
0.8	0.3	0.9	0.1	0.8	0.4	0.6	0.2	0.7	0.2
0.7	0.1	0.9	0.1	0.9	0.0	1.0	0.0	0.9	0.0
0.8	0.2	0.9	0.1	0.8	0.2	0.9	0.1	0.8	0.1
0.9	0.0	1.0	0.0	0.9	0.0	1.0	0.1	0.9	0.4
0.9	0.2	0.9	0.1	0.8	0.1	0.6	0.2	0.8	0.2
0.8	0.1	0.8	0.3	1.0	0.1	0.8	0.1	0.9	0.4
0.5	0.3	0.9	0.2	0.8	0.5	0.6	0.2	0.7	0.5
0.8	0.2	0.9	0.1	0.8	0.1	0.9	0.2	0.8	0.5
0.9	0.3	0.8	0.3	0.9	0.2	0.9	0.1	0.8	0.3
0.9	0.2	0.8	0.2	0.8	0.3	0.8	0.1	0.6	0.5

Experiment # 6a

Proportion correct for subject # 18

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.7	0.3	1.0	0.4	0.8	0.2	0.6	0.3	0.8	0.3
0.7	0.5	0.7	0.4	0.8	0.2	0.5	0.4	0.6	0.6
1.0	0.5	0.3	0.2	0.4	0.2	0.8	0.4	0.8	0.3
0.5	0.4	0.9	0.3	0.6	0.3	0.1	0.7	0.7	0.4
0.8	0.6	0.8	0.1	0.7	0.1	0.8	0.4	0.6	0.4
0.7	0.1	0.9	0.0	1.0	0.0	0.5	0.4	0.8	0.1
0.9	0.4	0.7	0.0	0.9	0.5	0.6	0.2	0.8	0.2
0.9	0.3	0.9	0.2	0.9	0.2	0.8	0.3	0.9	0.0
0.8	0.7	0.9	0.2	0.7	0.3	0.5	0.6	0.6	0.4
0.8	0.4	0.7	0.3	0.9	0.4	0.6	0.3	0.9	0.4
0.7	0.3	0.9	0.0	0.7	0.1	0.8	0.4	0.8	0.7
0.6	0.2	0.7	0.1	1.0	0.3	0.6	0.3	0.9	0.4
0.9	0.5	0.8	0.2	0.5	0.4	0.9	0.4	0.7	0.8
0.8	0.6	0.8	0.2	0.5	0.2	0.8	0.9	0.9	0.8
0.8	0.5	0.6	0.2	0.7	0.3	0.7	0.6	0.7	0.9
0.8	0.8	0.7	0.1	0.7	0.2	0.6	0.8	0.4	0.7
0.7	0.7	1.0	0.2	0.8	0.4	0.7	0.6	0.9	0.8
0.6	0.6	0.9	0.0	0.7	0.4	1.0	0.8	0.6	0.6
0.9	0.3	0.5	0.2	0.7	0.1	1.0	0.4	1.0	0.4
0.9	0.8	0.8	0.2	0.9	0.1	0.7	0.6	0.7	0.7
0.6	0.5	0.7	0.2	0.9	0.3	0.8	0.3	0.8	0.6
0.7	0.7	0.5	0.4	0.8	0.5	0.9	0.7	0.7	0.8
0.9	0.5	0.6	0.3	0.9	0.1	0.9	0.2	0.8	0.4
1.0	0.8	0.9	0.3	0.8	0.1	1.0	0.5	1.0	0.4
1.0	0.4	0.9	0.0	1.0	0.0	1.0	0.2	0.8	0.6
0.8	0.5	0.8	0.1	1.0	0.3	1.0	0.3	0.9	0.6
0.6	0.4	0.6	0.0	0.9	0.3	0.9	0.6	0.8	1.0
0.7	0.9	0.8	0.2	0.9	0.1	1.0	0.8	1.0	0.7
0.9	0.7	0.9	0.0	1.0	0.2	1.0	0.4	0.8	0.8
0.6	0.7	0.9	0.1	1.0	0.4	0.9	0.6	0.7	0.8
0.7	0.8	1.0	0.2	1.0	0.2	0.8	0.7	0.8	0.6
1.0	0.8	0.8	0.0	0.9	0.1	0.9	0.6	1.0	0.8
0.7	0.8	1.0	0.0	0.9	0.0	0.9	0.9	0.9	0.9
0.9	0.8	1.0	0.1	0.7	0.5	1.0	0.9	0.9	0.9
1.0	0.9	0.6	0.1	0.7	0.5	1.0	0.9	0.9	0.9
0.9	0.7	1.0	0.5	0.9	0.2	0.9	0.7	1.0	0.7
1.0	1.0	0.7	0.2	0.9	0.2	1.0	0.9	1.0	0.8
1.0	0.9	0.9	0.3	0.6	0.3	0.9	0.6	1.0	0.5
1.0	0.7	0.8	0.0	0.8	0.2	1.0	0.9	1.0	0.7
0.9	0.7	1.0	0.1	1.0	0.1	1.0	0.9	0.9	0.8
0.9	0.6	1.0	0.1	1.0	0.3	1.0	0.6	0.6	0.8
1.0	0.8	0.8	0.1	1.0	0.4	1.0	0.8	1.0	1.0
0.8	0.7	0.8	0.0	0.8	0.2	0.7	0.7	0.8	0.7
1.0	0.4	1.0	0.1	0.8	0.2	0.8	0.8	0.9	0.6
0.9	0.6	0.9	0.0	0.8	0.3	0.9	0.8	1.0	0.8
1.0	0.5	0.9	0.1	0.7	0.4	0.9	0.7	0.9	0.5
0.8	0.7	0.7	0.0	1.0	0.4	1.0	0.9	1.0	0.9
0.9	0.5	0.5	0.2	0.7	0.6	0.8	1.0	1.0	0.8
0.8	0.8	0.9	0.2	0.7	0.4	0.9	0.9	0.8	0.9
1.0	0.9	1.0	0.1	0.8	0.4	1.0	0.8	0.9	1.0

Experiment # 6b

Proportion correct for subject # 14

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.9	0.7	0.2	0.7	0.1	0.7	0.9	0.5	0.9	0.7
1.0	1.0	0.6	0.6	0.1	0.6	1.0	0.7	1.0	0.8
1.0	0.9	0.6	0.4	0.5	0.6	0.9	0.9	1.0	1.0
1.0	0.9	0.7	0.3	0.6	0.6	1.0	0.4	1.0	0.7
1.0	0.9	1.0	0.5	0.9	0.4	1.0	0.7	1.0	0.8
0.9	0.9	1.0	0.2	0.3	0.8	1.0	0.9	0.9	1.0
1.0	0.9	0.9	0.1	0.8	0.4	0.9	0.6	0.9	0.8
0.9	0.9	1.0	0.3	0.9	0.3	1.0	0.7	0.8	0.8
1.0	0.8	1.0	0.0	0.8	0.2	0.8	0.9	0.7	1.0
1.0	0.9	0.9	0.1	0.9	0.2	0.9	0.6	0.9	0.8
1.0	0.9	1.0	0.0	0.8	0.3	1.0	0.8	0.9	0.9
0.9	0.8	0.8	0.2	0.8	0.6	0.9	0.7	1.0	0.8
1.0	0.9	0.7	0.1	0.8	0.4	1.0	0.7	1.0	1.0
1.0	0.9	1.0	0.0	0.5	0.5	0.9	0.9	0.7	0.8
1.0	0.9	0.8	0.1	0.8	0.6	1.0	0.7	0.8	0.9
0.9	0.9	1.0	0.1	0.9	0.6	1.0	1.0	0.9	0.9
1.0	1.0	0.8	0.2	1.0	0.1	1.0	0.9	1.0	0.9
1.0	0.7	0.7	0.2	0.8	0.7	0.8	1.0	1.0	1.0
1.0	1.0	1.0	0.1	0.7	0.3	1.0	0.9	1.0	0.9
1.0	0.8	0.9	0.0	1.0	0.5	1.0	1.0	1.0	0.9
0.9	1.0	0.8	0.3	0.8	0.4	1.0	0.8	0.9	0.9
1.0	1.0	0.8	0.5	0.7	0.3	1.0	0.8	0.8	0.9
0.9	0.7	1.0	0.1	0.8	0.3	1.0	0.8	0.9	0.9
1.0	1.0	0.8	0.1	0.9	0.4	1.0	0.7	0.9	1.0
1.0	0.9	0.6	0.7	1.0	0.2	1.0	0.8	0.8	0.9
0.7	0.7	0.8	0.5	0.9	0.3	1.0	0.8	0.8	0.9
0.9	0.9	0.5	0.7	1.0	0.1	1.0	0.9	0.9	1.0
1.0	0.9	1.0	0.2	1.0	0.5	1.0	0.9	0.9	1.0
1.0	0.9	0.9	0.1	1.0	0.0	1.0	0.8	1.0	1.0
0.8	0.9	1.0	0.5	1.0	0.5	1.0	1.0	1.0	1.0

Experiment # 6b

Proportion correct for subject # 15

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
1.0	1.0	0.7	0.7	0.8	0.8	1.0	0.8	0.8	0.9
1.0	1.0	0.9	0.7	1.0	0.7	0.8	0.9	0.9	0.8
1.0	0.9	0.6	0.9	0.9	0.8	0.8	0.9	1.0	0.9
0.9	1.0	0.7	0.8	0.8	1.0	0.8	0.9	0.9	1.0
0.9	0.7	0.6	0.9	0.8	0.9	0.8	0.9	0.9	0.9
0.8	1.0	0.5	0.8	0.7	0.9	0.9	0.8	0.8	1.0
1.0	0.9	1.0	0.8	0.9	0.8	1.0	0.8	1.0	0.9
1.0	0.9	1.0	0.8	1.0	0.8	1.0	1.0	1.0	0.8
0.9	1.0	0.8	0.8	0.9	0.7	1.0	0.9	1.0	1.0
1.0	0.9	0.8	0.6	0.9	0.9	0.9	0.9	1.0	1.0
0.9	1.0	1.0	0.9	1.0	0.8	1.0	0.8	0.8	1.0
1.0	1.0	1.0	0.9	1.0	0.9	0.8	0.8	0.8	1.0
0.9	1.0	1.0	0.8	1.0	0.8	1.0	0.9	0.9	1.0
1.0	0.9	0.8	0.6	0.9	0.8	0.8	0.9	0.8	1.0
1.0	0.9	0.9	0.9	1.0	0.7	0.9	1.0	0.8	1.0
1.0	1.0	0.8	1.0	0.7	0.8	0.9	0.9	0.8	1.0
1.0	0.9	0.8	1.0	1.0	0.9	0.8	0.9	0.9	0.9
1.0	1.0	1.0	0.8	1.0	0.8	1.0	1.0	0.9	1.0
1.0	1.0	0.8	1.0	0.9	1.0	1.0	0.9	1.0	0.8
1.0	1.0	1.0	0.8	0.5	0.8	1.0	0.9	0.9	1.0
0.9	1.0	0.7	0.9	0.9	0.9	1.0	1.0	0.9	1.0
0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7
0.9	0.9	0.9	0.9	1.0	0.9	1.0	0.9	1.0	0.9
1.0	1.0	1.0	0.8	1.0	1.0	1.0	0.9	1.0	1.0
1.0	1.0	1.0	0.7	0.9	0.9	1.0	1.0	1.0	1.0
1.0	1.0	1.0	0.7	1.0	0.9	0.9	0.9	0.8	0.9
1.0	1.0	0.9	0.8	1.0	0.9	1.0	0.9	1.0	1.0
0.8	1.0	0.8	0.6	0.8	1.0	0.8	1.0	1.0	1.0
1.0	1.0	1.0	0.4	0.9	1.0	0.9	1.0	1.0	0.9
0.8	1.0	0.9	0.6	0.8	0.8	0.9	1.0	1.0	1.0

Experiment # 6b

Proportion correct for subject # 18

St1	St2	St3	St4	St5	St6	St7	St8	St9	St10
0.9	0.8	0.7	0.4	0.8	0.0	1.0	0.5	0.9	0.5
1.0	0.6	0.9	0.1	1.0	0.1	0.8	0.9	1.0	0.4
1.0	0.4	0.6	0.2	0.7	0.3	1.0	0.7	0.9	0.7
1.0	0.8	0.9	0.1	0.6	0.1	0.8	0.9	0.9	0.8
1.0	0.7	1.0	0.2	0.8	0.1	0.9	0.8	1.0	0.8
1.0	0.6	0.9	0.1	0.9	0.1	1.0	0.7	1.0	0.9
0.8	0.9	0.9	0.1	0.8	0.4	1.0	0.8	1.0	0.8
0.8	0.7	0.8	0.0	0.7	0.2	0.6	0.9	0.8	0.8
0.9	0.5	0.7	0.0	0.8	0.2	1.0	0.6	1.0	0.8
0.8	0.7	0.7	0.1	0.6	0.7	1.0	0.9	1.0	0.9
0.9	0.6	1.0	0.1	0.8	0.6	0.9	0.9	0.9	1.0
1.0	0.8	0.9	0.1	0.8	0.1	0.7	0.9	0.9	0.7
0.9	0.7	0.8	0.1	0.7	0.2	0.6	0.9	0.9	0.8
0.8	0.9	0.8	0.1	0.4	0.2	0.9	0.7	0.9	1.0
1.0	0.7	0.8	0.1	0.9	0.3	1.0	0.9	0.9	0.9
1.0	0.5	0.9	0.0	0.9	0.4	0.9	0.7	0.9	0.7
1.0	0.6	0.9	0.0	0.6	0.2	0.9	0.8	0.9	0.8
0.9	0.8	0.8	0.1	1.0	0.2	1.0	0.8	0.9	1.0
0.9	0.9	1.0	0.0	0.9	0.0	1.0	0.8	1.0	0.8
1.0	1.0	1.0	0.0	0.9	0.1	0.7	1.0	0.9	1.0
0.6	1.0	1.0	0.1	0.6	0.4	0.5	1.0	0.9	0.9
0.9	1.0	0.9	0.1	0.8	0.4	0.8	0.8	0.7	0.8
1.0	0.4	0.8	0.1	0.8	0.1	0.9	1.0	1.0	1.0
0.9	1.0	0.9	0.1	0.8	0.0	0.8	0.7	0.8	0.9
0.9	0.9	0.9	0.3	0.9	0.1	1.0	0.8	0.7	0.8
1.0	0.8	0.9	0.0	0.9	0.1	0.9	0.5	1.0	0.7
0.9	0.6	0.7	0.3	0.8	0.1	0.9	0.4	1.0	0.5
0.9	0.6	0.8	0.2	0.8	0.2	0.9	0.9	1.0	0.8
0.9	0.7	0.9	0.1	0.9	0.1	1.0	0.6	1.0	0.4
0.8	0.6	0.7	0.3	0.8	0.2	1.0	0.5	1.0	0.6

Experiment # 7
Proportion correct for Subject # 12

St1	St2	St3	St4	St5	St6	St7	St8
0.9	0.2	0.8	0.1	0.7	0.6	0.4	0.3
0.5	0.6	0.6	0.3	0.6	0.1	0.7	0.2
0.8	0.2	0.6	0.6	0.9	0.2	0.9	0.0
0.9	0.1	0.9	0.1	0.8	0.1	0.9	0.0
0.7	0.1	0.8	0.5	0.9	0.1	0.9	0.0
0.8	0.1	0.8	0.4	0.6	0.4	0.9	0.1
0.8	0.2	0.7	0.5	0.8	0.2	0.9	0.2
0.8	0.3	0.8	0.4	0.9	0.1	0.8	0.1
0.7	0.3	0.6	0.3	0.7	0.2	0.7	0.2
0.7	0.3	0.6	0.2	0.8	0.3	0.7	0.2
0.7	0.5	0.8	0.4	0.6	0.1	0.9	0.5
0.6	0.3	0.7	0.2	0.7	0.2	0.8	0.1
0.5	0.3	0.9	0.5	0.9	0.4	0.6	0.1
0.8	0.4	0.5	0.7	0.7	0.4	0.8	0.2
0.4	0.3	0.7	0.2	1.0	0.4	0.6	0.2
0.8	0.2	0.8	0.4	0.7	0.1	0.6	0.3
0.9	0.5	0.8	0.4	0.6	0.2	0.8	0.2
1.0	0.2	0.8	0.4	0.6	0.1	1.0	0.3
0.9	0.2	0.9	0.4	0.9	0.1	0.9	0.2
0.8	0.1	0.9	0.1	0.8	0.2	1.0	0.1
0.9	0.1	0.9	0.3	0.9	0.1	0.9	0.2
0.9	0.2	0.9	0.2	0.9	0.0	0.8	0.0
0.9	0.2	0.7	0.9	1.0	0.0	1.0	0.1
1.0	0.1	0.7	0.4	0.9	0.0	0.8	0.1
0.8	0.1	1.0	0.3	0.9	0.0	1.0	0.0
1.0	0.1	0.7	0.8	1.0	0.1	0.9	0.0
0.6	0.2	0.9	0.5	1.0	0.3	0.8	0.1
0.6	0.4	0.7	0.8	0.7	0.3	0.6	0.2
0.8	0.7	0.8	0.6	0.9	0.4	0.9	0.2
0.8	0.2	1.0	0.7	0.7	0.3	0.5	0.1
0.8	0.3	0.9	0.6	0.8	0.3	0.8	0.1
0.8	0.2	1.0	0.6	0.9	0.3	0.9	0.1
0.7	0.4	0.9	0.6	0.7	0.3	0.9	0.4
0.6	0.1	0.7	0.4	0.9	0.1	1.0	0.0
0.8	0.3	1.0	0.7	0.9	0.1	0.8	0.0
0.9	0.2	1.0	0.4	1.0	0.0	0.9	0.0
0.9	0.4	0.9	0.5	0.8	0.0	1.0	0.0
0.6	0.3	0.8	0.3	1.0	0.1	0.9	0.0
0.6	0.4	0.8	0.7	1.0	0.1	0.9	0.2
0.4	0.2	0.9	0.7	0.9	0.2	0.9	0.5
0.8	0.0	0.9	0.4	0.8	0.0	1.0	0.1
0.9	0.3	0.9	0.5	1.0	0.1	0.9	0.1
0.9	0.1	0.9	0.8	1.0	0.3	0.9	0.1
0.7	0.5	0.9	0.4	1.0	0.2	0.8	0.2
0.8	0.2	1.0	0.7	0.9	0.8	0.9	0.5
0.9	0.2	0.8	0.8	0.6	0.6	1.0	0.4
0.8	0.3	1.0	0.6	0.7	0.7	0.7	0.4
1.0	0.3	1.0	0.8	1.0	0.5	1.0	0.9
0.8	0.2	0.9	0.9	0.9	0.6	0.8	0.6
0.9	0.0	0.8	0.7	1.0	0.4	0.9	0.7

0.9	0.3	1.0	1.0	0.9	0.8	1.0	0.9
0.9	0.3	0.7	1.0	0.9	0.5	0.8	0.7
0.6	0.3	0.9	0.9	1.0	0.2	0.9	0.3
0.7	0.3	0.9	0.6	0.9	0.6	0.8	0.3
0.4	0.0	0.9	0.9	0.7	0.4	0.7	0.5
0.7	0.1	1.0	0.7	1.0	0.5	0.8	0.2
1.0	0.3	0.8	0.7	0.8	0.6	1.0	0.8
0.8	0.2	0.9	0.7	0.8	0.5	0.8	0.4
1.0	0.0	1.0	0.6	0.9	0.6	0.8	0.6
1.0	0.0	0.9	0.6	1.0	0.5	0.8	0.3

Experiment # 7
Proportion correct for Subject # 13

St1	St2	St3	St4	St5	St6	St7	St8
0.8	0.6	0.5	0.2	0.8	0.5	0.7	0.5
0.4	0.9	0.4	0.5	0.8	0.4	0.9	0.4
0.4	0.6	0.6	0.4	0.7	0.5	0.6	0.5
0.4	0.7	0.6	0.7	0.6	0.6	0.7	0.4
0.7	0.4	0.7	0.3	0.9	0.3	0.7	0.2
0.6	0.6	0.7	0.5	0.6	0.4	0.8	0.3
0.5	0.5	0.6	0.4	0.8	0.2	0.9	0.2
0.6	0.4	0.6	0.4	0.7	0.5	0.8	0.1
0.7	0.4	0.8	0.2	0.9	0.6	0.8	0.3
1.0	0.2	0.9	0.2	0.9	0.2	0.9	0.1
0.9	0.3	0.9	0.0	1.0	0.0	0.9	0.0
0.7	0.2	0.8	0.3	1.0	0.1	0.8	0.3
0.8	0.0	0.8	0.3	0.9	0.1	0.8	0.1
0.9	0.0	0.8	0.1	0.9	0.0	0.9	0.0
1.0	0.0	0.9	0.2	1.0	0.0	1.0	0.0
0.9	0.0	0.9	0.1	1.0	0.0	1.0	0.0
1.0	0.1	1.0	0.1	0.9	0.0	1.0	0.0
0.9	0.3	0.9	0.1	1.0	0.1	1.0	0.2
1.0	0.1	1.0	0.0	1.0	0.0	0.9	0.0
0.9	0.0	1.0	0.0	1.0	0.0	1.0	0.0
0.9	0.0	0.9	0.0	1.0	0.0	0.8	0.0
0.9	0.0	0.9	0.1	1.0	0.2	1.0	0.1
0.9	0.1	0.9	0.0	1.0	0.2	1.0	0.0
0.9	0.1	0.9	0.1	1.0	0.0	1.0	0.0
0.9	0.1	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	0.9	0.1	1.0	0.2	0.9	0.2
1.0	0.1	0.9	0.1	1.0	0.1	0.9	0.0
0.9	0.0	1.0	0.0	1.0	0.0	1.0	0.0
0.6	0.4	0.5	0.4	1.0	0.0	1.0	0.4
0.8	0.3	0.9	0.2	1.0	0.1	1.0	0.1
0.8	0.2	0.9	0.3	1.0	0.0	1.0	0.1
1.0	0.0	0.9	0.1	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
0.7	0.5	0.8	0.1	1.0	0.1	1.0	0.0
1.0	0.0	1.0	0.1	1.0	0.0	1.0	0.0

1.0	0.1	1.0	0.0	1.0	0.0	0.8	0.0
1.0	0.0	1.0	0.0	1.0	0.0	1.0	0.0
0.8	0.0	0.9	0.1	1.0	0.0	0.9	0.0
0.9	0.0	1.0	0.1	1.0	0.0	1.0	0.0
0.9	0.1	1.0	0.3	1.0	0.0	1.0	0.1
1.0	0.0	0.9	0.0	1.0	0.0	1.0	0.0
1.0	0.0	0.9	0.1	1.0	0.1	1.0	0.0
1.0	0.1	1.0	0.1	1.0	0.0	1.0	0.0
0.9	0.2	0.9	0.1	0.9	0.0	1.0	0.1
1.0	0.1	0.9	0.2	1.0	0.0	0.9	0.1
1.0	0.1	1.0	0.1	1.0	0.1	1.0	0.1
1.0	0.0	1.0	0.2	1.0	0.0	1.0	0.0
0.7	0.4	1.0	0.4	0.7	0.1	0.8	0.3
0.8	0.2	1.0	0.2	0.9	0.1	0.9	0.1
0.8	0.5	0.9	0.1	0.9	0.0	0.9	0.1
0.8	0.3	0.9	0.4	0.8	0.1	0.8	0.1
0.7	0.1	0.8	0.4	1.0	0.1	0.8	0.1
0.9	0.2	0.8	0.2	1.0	0.2	0.9	0.0
0.8	0.3	0.8	0.1	1.0	0.2	1.0	0.0
0.9	0.1	1.0	0.1	0.9	0.0	0.9	0.0
1.0	0.1	0.8	0.2	1.0	0.1	0.7	0.1

Experiment # 7
Proportion correct for Subject # 17

St1	St2	St3	St4	St5	St6	St7	St8
1.0	0.0	0.8	0.0	0.9	0.1	1.0	0.0
0.9	0.0	0.8	0.1	0.8	0.1	1.0	0.0
0.6	0.2	0.8	0.1	0.8	0.0	0.9	0.2
0.8	0.3	0.6	0.5	0.4	0.6	0.3	0.4
0.8	0.2	0.9	0.4	0.8	0.1	0.9	0.2
1.0	0.3	0.8	0.3	1.0	0.3	0.9	0.2
0.9	0.3	0.9	0.1	0.8	0.1	0.8	0.3
0.9	0.0	0.9	0.2	0.8	0.0	0.9	0.0
0.9	0.0	1.0	0.2	0.9	0.3	1.0	0.4
0.8	0.2	0.9	0.0	0.9	0.0	0.8	0.1
0.9	0.0	1.0	0.2	0.9	0.1	1.0	0.1
0.9	0.1	1.0	0.0	1.0	0.0	1.0	0.0
1.0	0.0	1.0	0.0	0.8	0.0	1.0	0.0
1.0	0.1	1.0	0.0	0.8	0.1	0.8	0.0
1.0	0.1	1.0	0.0	1.0	0.0	0.9	0.0
1.0	0.1	1.0	0.0	0.9	0.0	1.0	0.0
0.8	0.0	1.0	0.1	1.0	0.0	1.0	0.2
0.9	0.1	1.0	0.1	1.0	0.0	1.0	0.1
1.0	0.1	0.9	0.1	1.0	0.0	0.9	0.1
0.8	0.1	0.9	0.1	1.0	0.1	1.0	0.0
0.9	0.1	1.0	0.1	0.9	0.0	1.0	0.1
1.0	0.0	1.0	0.0	0.8	0.1	0.9	0.0
0.9	0.0	1.0	0.1	0.9	0.0	0.9	0.0
1.0	0.0	1.0	0.2	0.9	0.1	0.9	0.2
1.0	0.0	1.0	0.2	1.0	0.1	0.9	0.1
1.0	0.0	0.9	0.0	1.0	0.0	1.0	0.0
0.8	0.2	1.0	0.3	0.9	0.2	0.9	0.2
0.8	0.2	0.8	0.2	0.6	0.1	0.7	0.2

1.0	0.0	1.0	0.1	0.9	0.1	0.9	0.2
0.9	0.0	0.9	0.2	1.0	0.0	0.8	0.2
0.9	0.4	0.9	0.4	0.9	0.0	0.9	0.4
0.8	0.0	0.7	0.4	1.0	0.2	0.6	0.3
0.9	0.0	1.0	0.1	1.0	0.2	0.9	0.1
1.0	0.0	0.8	0.3	0.9	0.2	0.6	0.4
1.0	0.1	1.0	0.1	0.8	0.1	0.8	0.2
0.8	0.3	1.0	0.3	0.9	0.2	0.6	0.3
1.0	0.1	0.8	0.4	0.9	0.3	0.6	0.4
1.0	0.2	0.8	0.5	0.8	0.2	0.8	0.3
0.8	0.0	0.9	0.3	0.8	0.3	0.8	0.2
0.9	0.1	0.8	0.3	0.8	0.3	0.6	0.4
0.7	0.3	0.8	0.4	0.9	0.2	0.9	0.0
0.8	0.3	0.9	0.6	0.8	0.2	1.0	0.3
0.9	0.2	0.8	0.4	0.9	0.2	1.0	0.2
0.8	0.3	0.8	0.4	1.0	0.1	0.8	0.2
0.9	0.1	0.8	0.2	0.9	0.2	0.7	0.2
0.6	0.5	0.9	0.3	0.9	0.2	0.8	0.3
0.7	0.3	0.8	0.4	1.0	0.2	1.0	0.1
0.7	0.1	0.8	0.3	0.7	0.4	1.0	0.1
0.5	0.4	0.9	0.3	0.9	0.3	0.7	0.3
0.8	0.2	0.8	0.4	0.9	0.2	0.8	0.2
0.7	0.2	0.7	0.4	0.7	0.4	1.0	0.1
0.7	0.1	0.8	0.5	0.7	0.4	1.0	0.1
0.6	0.2	0.9	0.3	1.0	0.2	0.9	0.2
0.7	0.2	0.8	0.4	0.9	0.2	0.9	0.1
0.6	0.4	0.8	0.5	1.0	0.2	1.0	0.1
0.7	0.3	0.8	0.5	0.9	0.3	0.9	0.2
0.7	0.3	0.8	0.6	0.6	0.5	0.6	0.5
1.0	0.2	0.7	0.5	0.9	0.3	0.9	0.2
0.9	0.1	0.8	0.5	0.9	0.3	0.8	0.3
0.5	0.4	0.8	0.4	1.0	0.2	0.9	0.2

REFERENCES

Blough, D.S. (1982). Pigeon recognition of letters of the alphabet. *Science, 218*, 397-398.

Blough, D.S. (1984). Form recognition in pigeons. In H. L. Roitblat, T. G. Bever, and H. S. Terrace (Eds.), *Animal Cognition*, (pp. 277-288). Hillsdale, NJ: Erlbaum.

Blough, D. S. (1985). Discrimination of letters and random dot patterns by pigeons and humans. *Journal of Experimental Psychology: Animal Behavior Processes, 11*, 261-280.

Bower, G. H., and Winzenz, D. (1969). Group structure, coding, and memory for digit series. *Journal of Experimental Psychology Monograph, 80*, 1-17.

Bower, G. H., and Springston, F. (1970). Pauses as recoding points in letter series. *Journal of Experimental Psychology, 83*, 421-430.

Bower, G. H. (1972). A selective review of organizational factors in memory. In E. Tulving, and W. Donaldson (Eds.). *Organization of Memory* (pp. 93-137). New York: Academic Press.

Brown, P. L., and Jenkins, H. M. (1968). Auto-shaping of the pigeon's pecking response. *Journal of the Experimental Analysis of Behavior, 11*, 1-8.

Cerella, J. (1990). Shape constancy in the pigeon: The perspective transformations decomposed. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.), *Quantitative Analysis of Behavior: Behavioral Approaches to Pattern Recognition and Concept Formation* (Vol. VIII), Cambridge, Mass: Ballinger.

Chen, I. (1982). Topological structure in visual perception. *Science, 218*, 699-700.

Enns, J. T., and Prinzmetal, W. (1984). The role of redundancy in the object-line effect. *Perception and Psychophysics, 35*, 22-32.

Eriksen, B. A., and Eriksen, C. W. (1974). Effects of noise letters upon the identification of a target letter in a nonsearch task. *Perception and Psychophysics, 15*, 143-149.

Estes, W. K. (1972). Interaction of signal and background variables in visual processing. *Perception and Psychophysics, 12 (3)*, 278-286.

Estes, W. K. (1974). Redundancy of noise elements and signals in the visual detection of letters. *Perception and Psychophysics, 16*, 53-60.

Goodale, M. A., and Graves, J. A. (1982). Retinal locus as a factor in interocular transfer in the pigeon: in Ingle, Goodale, Mansfield, *Analysis of visual behavior*, pp. 269-299, Cambridge: MIT Press.

Goodale, M. A. (1983). Visually guided pecking in the pigeon (Columba Livia). *Brain Behavior and Evolution, 22*, 22-41.

Heinemann, E. G. (1984a). A memory model for decision processes in pigeons. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.), *Quantitative Analyses of Behavior: Discrimination Processes* (Vol. IV, pp. 3-19). Cambridge, Mass: Ballinger.

Heinemann, E. G. (1984b). The presolution period and the detection of statistical associations. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.), *Quantitative Analyses of Behavior: Discrimination Processes* (Vol. IV, pp. 21-35). Cambridge, Mass: Ballinger.

Heinemann, E. G., and Chase, S. (1990). A quantitative model for pattern recognition. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.). *Quantitative Analyses* *of Behavior: Computational and Clinical Approaches to Pattern Recognition and Concept Formation* (Vol. IX). Cambridge, Mass: Ballinger.

Heinemann, E. G., and Kadison, K. (1976). Control of pigeon's choice behavior choice behavior by the position and luminance of a spot of light. *Bulletin of the Psychonomic Society*, *7*, 522-524.

Herrnstein, R. J. (1984). Objects, categories, and discriminative stimuli. In H. L. Roitblat, T. G. Bever, and H. S. Terrace (Eds.), *Animal Cognition: Proceedings of the Harry Frank Guggenheim Conference*, june 2-4. (pp. 233-257). Hillsdale, NJ: Erlbaum.

Kerlinger, F. N.; Pedhazur, E. J. (1973). *Multiple regression in behavioral research.* New York: Holt, Rinehart and Winston, Inc.

Lea, S. G., and Ryan, C. M. E. (1984). Feature analyses of pigeons' acquisition of concept discrimination. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.). *Quantitative Analyses of Behavior: Discrimination Processes* (Vol. IV, pp. 239-253). Cambridge, Mass: Ballinger.

McFadden, S. A. (1989). Eye design for depth and distance perception in the pigeon: An observer oriented perspective. *International Journal of Comparative Psychology*, *3*, 101-130.

Neisser, U. (1967). *Cognitive Psychology.* New York: Appleton-Century-Crofts.

Norušis, . J. (1988). *SPSS/PC+™ V2.0 Base Manual for the IBM PC/XT/AT and PS/2.* Chicago: SPSS Inc.

Paivio, A. (1971). *Imagery and Verbal Processes.* New York: Holt, Rinehart, and Winston.

Paivio, A. (1977). Images, propositions, and knowledge. In J. M. Nichols (Ed.), Images, *Perception, and Knowledge*. Boston: D. Reidel Publishing.

Paivio, A. (1978). A dual coding approach to perception and cognition. In H. L. Pick, Jr., and E. Saltzman (Eds.), *Models of Perceiving and Processing Information*. Hillsdale, NJ: Erlbaum.

Pomerantz, J. R., and Schwaitzberg, S. D. (1975). Grouping by proximity: Selective attention measures. *Perception and Psychophysics*, *18*, 355-361.

Pomerantz, J. R., Sager, L. C., and Stoever, R. J. (1977). Perception of wholes and their component parts: Some configural superiority effects. *Journal of Experimental Psychology: Human Perception and Performance*, *3*, 422-435.

Pomerantz, J. R. (1981). Perceptual organization in information processing. In M. Kubovy, and J. R. Pomerantz (Eds.), *Perceptual Organization.* Hillsdale, NJ: Erlbaum.

Pomerantz, J. R. (1986). Visual form perception: An overview. In E. C. Schwab and H. C. Nusbaum (Eds.), *Pattern Recognition by Humans and Machines: Visual Perception* (Vol. 2, pp. 1-30). London: Academy Press.

Steele, R. (1990). Configural processes in pigeon perception. In M. L. Commons, R. J. Herrnstein, and A. R. Wagner (Eds.), *Quantitative Analysis of Behavior: Behavioral Approaches to Pattern Recognition and Concept Formation* (Vol. VIII), Cambridge, Mass: Ballinger.

Treisman, A., and Paterson, R. (1984). Emergent features, attention, and object perception. *Journal of Experimental Psychology: Human Perception and Performance*, *10*, 12-31.

Weisstein, N., and Harris, C. (1974). Visual detection of line segments: An object superiority effect. *Science*, *186*, 752-755.