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THE EFFECTS OF INTRADIMENSIONAL SHIFTS ON THE LENGTH OF
THE PRESOLUTION PERIOD FOR DISCRIMINATION LEARNING

City University of New York

PH.D.

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THE EFFECTS OF INTRADIMENSIONAL SHIFTS ON THE
LENGTH OF THE PRESOLUTION PERIOD FOR DISCRIMINATION LEARNING

by

MARY KNOPP

A dissertation submitted to the Graduate
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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

THE EFFECTS OF INTRADIMENSIONAL SHIFTS ON THE LENGTH OF THE PRESOLUTION PERIOD FOR DISCRIMINATION LEARNING

by

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Initial acquisition on a discrimination learning task is often characterized by a period during which the subject responds at random to the experimentally manipulated stimuli. This initial stage of acquisition has been referred to as the presolution period. While the presolution period has generated some theoretical interest, investigations of the variables influencing the length of the presolution period are limited. The purpose of this study was to extend the findings on the presolution period and to evaluate theoretical accounts of the processes underlying the presolution period.

Specifically, the study investigated the effects of simple easy-to-hard and easy-to-hard reversal training, given while the subjects were still in the presolution period, on the length of the presolution period. Fifty-six pigeons were trained on a two-choice, successive discrimination task. The discrimination stimuli were levels of white noise

intensity that differed by either 30 dB for the easy task and 5 dB for the difficult task. Three groups were given 40, 80, or 160 trials on the easy task before a shift to the difficult discrimination. Two groups were trained on the easy task prior to a reversal shift to the difficult task. Two additional groups were trained on either the easy task or the difficult task alone.

Results showed that subjects shifted from the easy to the difficult discrimination during the presolution period had shorter mean presolution periods than subjects trained on the difficult task alone. Subjects given easy training prior to a reversal shift to the difficult problem had longer mean presolution periods than controls. The results are in general agreement with the quantitative predictions of a theory developed by Heinemann (in press). This theory regards the subject as a detector of the contingencies arranged in the experiment and is based on the sequential analysis techniques developed by Wald (1947).

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Psychologists have long been interested in providing a formal description of the learning of associations between stimuli and responses. Most attempts to study acquisition processes have centered on the variables which determine the familiar, negatively accelerated learning curve. However, for some tasks, the learning curve is preceded by a period during which there is no measurable change in the dependent variable and responding remains at chance levels. Krechevsky (1932) suggested the term "presolution period" to describe this initial stage of acquisition. While presolution periods have been found in a number of procedures and suggested in others, the investigation of variables which affect the length of the presolution period has been limited. The purpose of this study is to extend the findings on the presolution period and to discuss the theoretical implications of these results.

Conditions Producing Presolution Periods

Presolution periods have been noted often in studies of discrimination learning. Lashley (1929) and Krechevsky (1932) found presolution periods for simultaneous discrimination tasks. Similar results have been obtained for successive and go/no-go procedures (Mackintosh, 1969;

Heinemann and Knopp, 1976). Presolution periods have also been found in discrimination tasks employing a classical conditioning paradigm. Pavlov (1927) reported that early acquisition on some differentiation tasks was characterized by a period during which no differentiation was present.

No direct attempt has been made to determine if presolution periods occur in tasks which do not employ explicit discrimination training procedures, i.e., simple learning tasks. However, several studies suggest that presolution periods may be present in simple learning. For example, Schneiderman, Fuentes, and Gormezano (1962) found that the probability of a conditioned eyelid response was 0.00 after 81 stimulus presentations and less than 0.10 after 162 stimulus presentations. Cumulative records of subject's acquisition on a continuous reinforcement schedule are often characterized by long periods with little or no responding early in training, followed by a rapid increase in response rate (Skinner, 1938). Presolution periods are also suggested in autoshaping studies which use the number of stimulus-reinforcer pairings that occur before the first key peck as a primary dependent variable.

After reviewing a large number of acquisition curves for simple learning tasks, Spence (1956) concluded

that the learning curves for many procedures are best described as S shaped rather than simply negatively accelerated. Mackintosh (1974) made similar observations. The initial flat segment of these learning curves would be expected if the subject had a presolution period for the learning task. The finding of presolution periods in simple learning tasks indicate that similar processes may underlie both discrimination and simple learning. This possibility is not surprising in light of studies by Jenkins and Harrison (1960) and Heinemann and Rudolph (1963), which found evidence of implicit discrimination training in simple learning tasks.

Investigations of the Presolution Period

While the presolution period has been demonstrated in a variety of procedures, there has been little direct investigation of the variables which influence the length of the presolution period. Autoshaping studies have suggested that variables such as the length of the inter-trial interval (Terrace, Gibbon, Farrell, and Baldock, 1975), the correlation between the CS and the US (Gamzu and Williams, 1971), and prior magazine training (Engberg, Hansen, Walker, and Thomas, 1972) may affect the length of the presolution period for simple learning situations

(see review by Hearst and Jenkins, 1974).

However, there is less information about the variables which are important in determining the length of the presolution period in tasks employing explicit discrimination training. Most of the available information comes from studies which investigated the effects of early cue reversal on the length of the presolution period (e.g., McCullough and Pratt, 1934; Krechevsky, 1938). In these studies, an experimental group received training on a two-choice, simultaneous discrimination task. Before the subjects showed evidence of solving this problem, the stimulus cues were reversed so that the cue which previously had signalled the presence of reinforcement, now signalled its absence; and the cue which previously signalled the absence of reinforcement, now signalled its presence. Subjects in the control group did not receive training on the original problem. Instead, they received a period of training in which the stimulus cues were uncorrelated with reinforcement, followed by training on the second task (Ehrenfreund, 1948), or they simply received training on the second task alone (McCullough and Pratt, 1934). The experimental and control groups were compared on the number of errors made during training or the number of trials to a performance criterion.

The results of the presolution reversal studies were inconsistent. For example, McCullough and Pratt (1934) and Spence (1945) found that reversal training increased the number of errors made in learning the discrimination, while Krechevsky (1938) found that the reversal training had no effect on the number of errors or the number of trials to criterion. Ehrenfreund (1948) concluded that discrepancies between the results of these studies reflected procedural differences. Ehrenfreund found that learning of a discrimination in a Lashley jumping stand was retarded by presolution reversal when conditions were arranged so that the subjects jumped directly at discriminative stimuli. There was no evidence of this retardation when subjects were required to jump below the discriminative stimuli. Ehrenfreund argued that when the subject's receptors were adequately stimulated by the discriminative stimuli, presolution period reversal negatively affected performance. This conclusion was supported by a number of reviewers (e.g., Sutherland and Mackintosh, 1971; Goodrich, Ross and Wagner, 1963).

Several studies have emphasized the role of discrimination difficulty in determining the length of the presolution period. For example, Heinemann and Knopp (1976) trained three groups of pigeons to discriminate between two

levels of white noise that differed by five decibels, three decibels, or one decibel. The results indicated that the length of the presolution period was inversely related to the discriminability of the stimuli.

Pavlov (1927) noted that prior training on a series of easier brightness tasks decreased the number of trials required to learn a difficult brightness discrimination. In an extension of Pavlov's work, Lawrence (1952) determined that experience with a single easy discrimination problem was as effective as a series of gradual shifts in producing more efficient acquisition of a difficult discrimination. The facilitative effect due to prior easy training has come to be known as the "easy-to-hard" effect or "transfer along a continuum." This facilitation is present even when the shift from easy-to-hard training is accomplished by a reversal in response shift (Sweller, 1972; Mackintosh and Little, 1970). It is of interest to note that in studies of transfer along a continuum, no presolution period is seen for the difficult discrimination task, following the shift from the easy problem. The lack of a presolution period on the difficult discrimination may be largely responsible for the faster acquisition exhibited in these studies. Marsh (1969)

showed that transfer along a continuum is found only in procedures employing intradimensional shifts and is not simply due to experience with discrimination tasks.

Theoretical Treatments of the Presolution Period

It is clear that any complete description of acquisition must provide an account of the processes underlying the presolution period. Traditionally, two differing explanations have been offered. The noncontinuity theorists, represented by Lashley (1929) and Krechevsky (1932, 1938), argued that during the presolution period, the subject systematically tests and discards a number of hypotheses about the relationship of reward to different aspects of the stimulus situation. While the subject attends to one dimension of the stimulus complex, it learns nothing about other aspects of the stimulus. The presolution period ends abruptly when the subject "solves" the problem by responding on the basis of the experimentally manipulated stimuli.

Spence (1936) offered an alternative formulation known as continuity theory. Continuity theory is based on the assumption that learning is a gradual and continuous process. According to Spence, the subject responds on the basis of a stimulus complex consisting of all the stimuli

impinging on its receptors. The subject obtains the sum of the excitatory strengths associated with each of these stimulus components and approaches the stimulus complex with the greatest accumulated excitatory strength. Reinforcement increases this excitatory strength, while nonreinforcement decreases it. Therefore, on each trial, the subject learns something about all the stimulus components associated with the presence and absence of reward. It is assumed that the chance performance seen in early acquisition reflects the overriding contribution of irrelevant cues to the cumulated excitatory strength of the stimulus complex. The presolution period ends when the difference in the excitatory strengths of the relevant stimulus components is greater than the difference between the summed excitatory strengths of all the other components in the stimulus complexes.

The presolution period reversal studies discussed earlier were developed to provide a critical test of the continuity and noncontinuity positions. In response to the findings of these studies, a number of theorists have developed modified noncontinuity models (e.g., Zeaman and House, 1963; Lovejoy, 1968; Sutherland and Mackintosh, 1971). According to these theories, discrimination learning is

a two-stage process consisting of learning to attend to the relevant stimulus dimension and learning to make the appropriate response attachments. Unlike classical non-continuity theory, these theories assume that during the presolution period, the subject learns something about the relevant stimulus dimension. The presolution period represents an initial stage of acquisition during which the probability of attention to the relevant stimulus dimension is relatively low, and the correct responses are only weakly attached.

More recently, Heinemann and Knopp (1977) have proposed a description of the processes underlying the presolution period for a two-choice, successive discrimination task. Unlike modified noncontinuity theories, the subject is assumed to learn only which dimension is relevant during the presolution period, and not what response to make. This theory regards the subject as a detector of statistical associations among the stimulus presented, the response made, and the consequences of that response. As in continuity theory, the subject analyzes information coming in from all dimensions of the stimulus situation. The subject must determine which stimulus dimension is relevant, in the sense that it is profitable

to base responding on values of that dimension.

As in signal-detection theory, it is assumed that repeated presentations of the discriminative stimuli, S_1 and S_2 , produce sensory effects which are normally distributed with different means, μ_1 and μ_2 , and a common standard deviation, σ_s . For each stimulus dimension, the subject stores the sensory effects present when a particular response, R_1 , is followed by reward, and when the alternative response, R_2 , is followed by reward. The subject's task then is to decide whether the mean sensory effects which preceded rewarded R_1 and R_2 responses, M_1 and M_2 , differ significantly. If a difference exists, the dimension is relevant, and the subject will base its responses on that stimulus dimension. If there is no difference, the dimension is irrelevant.

The model for the decision process is based on Wald's (1947) sequential likelihood method for testing statistical hypotheses. This is a family of sequential methods that for a number of situations, Wald has shown to be optimal in that no other test of the same strength leads to acceptance or rejection of a hypothesis in fewer observations. The strength of the test is defined by α and β , the probability of errors of the first and

second kind.

In this application of Wald's model, it is assumed that the subject tests two competing hypotheses. The first hypothesis, H_1 , states that the difference between the mean sensory effects present when R_1 and R_2 are followed by reward is equal to zero. The alternative hypothesis, H_2 , states that the absolute value of this difference is greater than or equal to some positive value δ . The presolution period ends with the rejection of H_1 . It is assumed that the subject never rejects H_2 .

It is assumed that the subject makes a test of these hypotheses every N trials. For example, if the subject were to test every 10 trials, it would compute a difference between the mean sensory effects present when R_1 and R_2 were rewarded on those 10 trials. Ten trials later, the subject would compute another difference between the means. Each difference between the means, ΔM , is referred to as an observation. ΔM is a normally distributed random variable with a mean, $\Delta\mu = \mu_2 - \mu_1$, and a standard deviation, $\sigma_{\Delta M}$.

With every test, the subject adds a new observation to the observations made on previous tests. Each time it tests, the subject computes a likelihood ratio, namely,

the probability of the obtained sample of observations given that H_1 is true, divided by the probability of the obtained sample given that H_2 is true.

Wald (p. 135) shows that a convenient way to carry out likelihood ratio tests is to work with a decision variable, Z_m . For the case considered here,

$$Z_m = \ln \cosh \left[\frac{\delta}{\sigma} \sum_{\alpha=1}^m (\mathcal{X}_\alpha) \right] \quad (1)$$

where \mathcal{X}_α is a random variable with a standard deviation, σ , and m is the number of observations. For the case presented, \mathcal{X}_α may be expressed as ΔM and σ is equal to $\sigma_{\Delta M}$ ($\sigma_{\Delta M} = 2\sigma_s/N$).

The equation may be rewritten in terms of these variables

$$Z_m = \ln \cosh \left[\frac{\delta}{\sigma_{\Delta M}} \sum_{\alpha=1}^m \Delta M_\alpha \right] \quad (2)$$

Wald's theory provides a decision rule based on comparing Z_m to two criterion values, A and B. The decision rule calls for one of three decisions:

1. If

$$Z_m \geq \ln A + (\delta^2/2)m, \quad (3)$$

then terminate testing with the rejection of H_1 .

2. If

$$Z_m \leq \ln B + (\delta^2/2)m, \quad (4)$$

then terminate testing with the rejection of H_2 .

3. If

$$\ln B + (\delta^2/2)m < Z_m < \ln A + (\delta^2/2)m \quad (5)$$

then continue to test (by taking another observation).

The values A and B are determined by α and β where $A = (1 - \beta/\alpha)$ and $B = \beta/(1 - \alpha)$. The procedure described by Wald is illustrated in Figure 1. The presolution period ends when Z_m attains a criterion value.

The predictions to be made from this model are based on expected values. The expected value of Z_m is given by

$$E(Z_m) = \ln \cosh \left[\frac{\sigma_m \Delta \mu}{\sigma_{\Delta M}} \right] \quad (6)$$

Further, it can be shown that

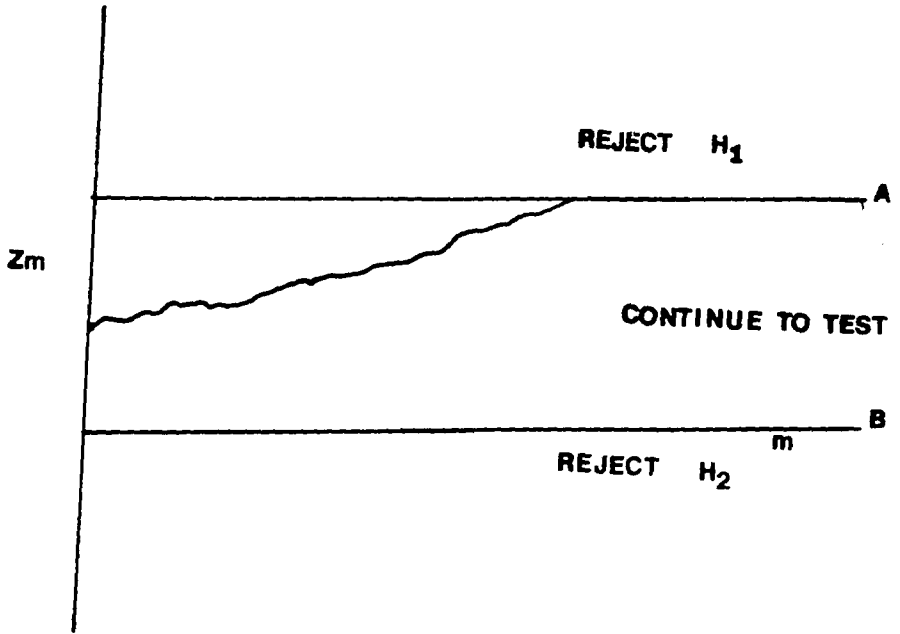
$$\frac{\Delta \mu}{\sigma_{\Delta M}} = \frac{d' \sqrt{N}}{2} \quad (7)$$

where $d' = \frac{\Delta \mu}{\sigma_s}$ and N is the number of trials on which each observation is based, it is possible to substitute for in Eq. 6, leading to

$$E(Z_m) = \ln \cosh \left[\frac{\sigma \sqrt{N}}{2} m d' \right] \quad (8)$$

As can be seen from Eq. 5, the value Z_m must attain to end the test varies linearly with m, the number of observations, the slope of the decision line being $\frac{\sigma^2}{2}$. It is possible to estimate the upper bound of σ from a knowledge of the smallest value of d' which subjects are able to discriminate and an assumed value of N. Previous research has shown that pigeons can learn to discriminate between intensity levels of white noise for which $d' = 0.1$ (Heinemann and Knopp, 1976). N is not known, but it seems reasonable to assume that subjects make at least one test in each experi-

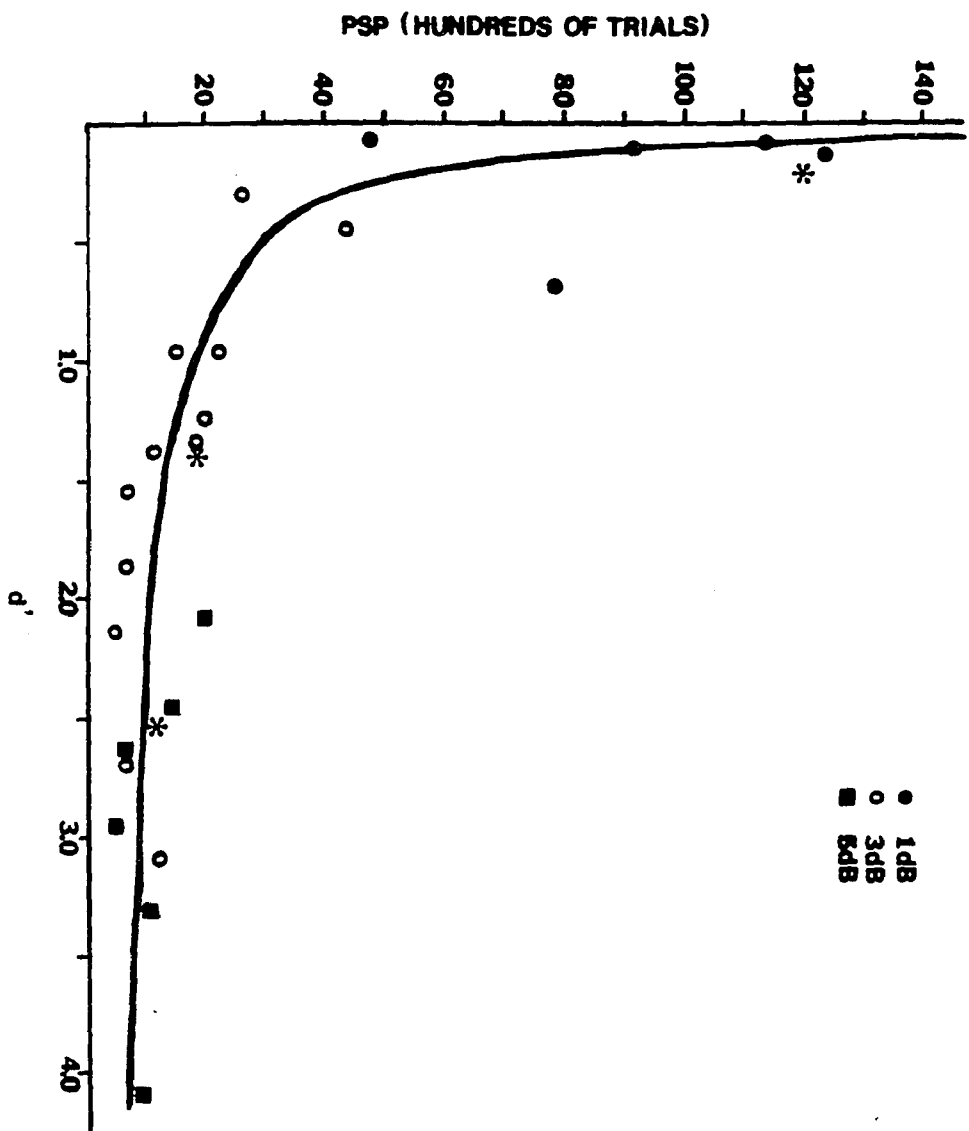
Figure 1. Schematic representation of the Waldian decision rule. The case presented here represents the course of the decision variable, Z_m , over m trials, if the true difference between the mean sensory effects preceding rewarded R_1 and R_2 responses is not equal to zero.



mental session. In the study cited above, 80 trials were presented in each session; therefore, it may be assumed that N is no larger than 80. Numerical calculations show that for $d' = 0.1$ and $N = 80$, the slope of the decision line would have to be less than 0.4. For smaller values of δ , the slope of the decision line will be even closer to zero.

The development that follows assumes that for all practical purposes, the slope of the decision lines may be treated as equal to zero. Numerical calculations show that for $\frac{\delta^2}{2} = 0.4$, theoretical predictions for $\frac{\delta^2}{2} = 0$ and $\frac{\delta^2}{2} = 0.4$ are virtually indistinguishable. It can be seen from Eq. 8 that Z_m varies only with the product of d' and m . Therefore, the expected value of the number of observations that must be made to end the presolution period is inversely proportional to d' . This relation is the average sample number function or ASN function of the sequential test. Figure 2 shows the results obtained in a study in which three groups of subjects were trained to discriminate intensities of white noise which differed by five, three, or one dB (Heinemann and Knopp, 1976). The function relating d' and the length of the presolution period for these subjects has the form predicted by the theory, i.e., the ASN function defined above.

Figure 2. An illustration of the inverse relationship between d' and the length of the presolution period. Each circle represents the results of a single subject. The empirical points conform well to a curve having the form of the ASN function predicted by Wald (from Heinemann and Knopp, 1976).



The results of Heinemann and Knopp's study are compatible with this theory of the presolution period. It is possible to make more demanding tests of this theory since it yields precise predictions for the effects of a number of manipulations within the presolution period. Specifically, consider an easy-to-hard shift within the presolution period. Subjects would be given a fixed amount of training on an easy discrimination followed by a shift to a more difficult one. The shift would occur while the subject is still in the presolution period on the original problem. The theory's predictions may be derived in the following way:

Let

d'_e = the discriminability of the stimuli in the easy discrimination problem,

d'_h = the discriminability of the stimuli in the difficult discrimination problem,

M_e = the expected value of the number of trials in the presolution period for subjects trained with the easy task alone,

M_H = the expected value of the number of trials in the presolution period for subjects trained with the difficult task alone,

m_e = the number of training trials presented on the easy task, prior to a shift to the hard task,

m_h = the number of training trials on the difficult task to the end of the presolution period following a shift from an easier discrimination.

Since the slope of the decision lines is assumed to be zero, the decision variable must attain a fixed criterion value in order to terminate testing. Since the value attained by Z_m varies only with the quantity $d(m)$, it follows that

$$d'_e m_e + d'_h m_h = d'_e M_E = d'_h M_H \quad (9)$$

From Eq. 9

$$d'_e m_e = d'_e M_E - d'_h m_h \quad (10)$$

and

$$d'_h m_h = d'_h M_H - d'_e m_e \quad (11)$$

From Eq. 11

$$m_h = M_H - d'_e/d'_h m_e \quad (12)$$

Substituting

$$m_h = M_H - M_H/M_E m_e \quad (13)$$

The total presolution period for an easy-to-hard shift is given by

$$m_e + m_h = M_H - M_H/M_E m_e + m_e \quad (14)$$

$$M_{EH} = (1 - M_H/M_E) m_e + M_H$$

where M_{EH} is the expected value of number of trials in the presolution period for subjects given easy-to-hard training.

A similar development shows that the model predicts the effects of easy-to-hard reversal training as

$$M_{ER} = (1 + M_H/M_E) m_e + M_H \quad (15)$$

where M_{ER} represents the expected value of the total number of trials in the presolution period for subjects given easy-to-hard reversal training. These predictions are based on the assumption that the slopes of the decision lines are equal to zero. An alternative derivation which does not require this assumption is discussed in Appendix D.

The statistical decision theory proposed by Heinemann and Knopp suggests a direction for further study of the presolution period by investigating the effects of experimental manipulations within the presolution period. In the present study, subjects are given easy-to-hard and easy-to-hard reversal training. In contrast to the procedure used in earlier studies of transfer along a continuum, the shift from one task to the next occurs while the subject is still in the presolution period on the original problem. The study is designed to provide a critical test of the statistical decision model of the presolution period and to evaluate qualitatively, the adequacy of continuity and noncontinuity models.

METHOD

Subjects

Fifty-six experimentally naive White Carneaux pigeons served as subjects. They were acquired from Palmetto Pigeon Plant, Sumter, South Carolina, and were 4 to 6 years old at the beginning of the study. The birds were singly housed in stainless steel cages where grit and water were available at all times. During the study, the subjects were maintained at 75% to 80% of their ad libitum weights. They were randomly assigned to one of seven experimental conditions with the restriction that each group contain four males and four females.

Apparatus

Four Lehigh Valley pigeon chambers with automatic control and recording equipment were used in the study. Each chamber was fitted with a three-key response panel. The response keys were evenly spaced on the panel, 48mm apart and 24cm above the floor. They were 26mm in diameter and were illuminated from behind with yellow light. During the experimental sessions, the chamber received illumination from the houselight, situated 44mm above the center response key.

Sound stimuli were presented through a Quam speaker, 76mm in diameter, located in the lower left corner of the response panel. The speaker was connected to a Grayson-Stadler white noise generator, Model 901B, which was used in conjunction with a potentiometer, to produce white noise intensities over a range from 60 to 90 dB (re .0002 dyne/cm²). Sound intensities were measured with a General Electric sound level meter, Type 1565-A (C-network), which was placed in front of the response panel in the approximate position of the pigeon's head.

Procedure

Preliminary Training - The subjects were randomly assigned to one of the four experimental chambers, with the restriction that equal numbers of subjects were assigned to each chamber. Following magazine training, they were taught to peck the center response key by the method of successive approximation. Pecks to the lighted center key caused it to darken and allowed the subject to eat from the food magazine for two seconds. A ten-second intertrial interval followed the presentation of food. During the intertrial interval, the response keys remained darkened, and pecks to the response keys were not followed by the presentation of food.

After the subject completed 20 center-key responses, there were a series of trials on which a peck to the center key caused it to darken and caused one of the two side keys to illuminate. A response to the lighted key was followed by the presentation of grain and the intertrial interval. This training was continued until the subject had made 20 responses to each side key.

Discrimination Training - Following preliminary training, all subjects received discrimination training. The onset of each trial was signalled by the illumination of the center response key. A peck to the center key caused the key to darken and resulted in the illumination of the two side keys and the simultaneous presentation of white noise at one of the two predetermined intensity levels. A response to either side key ended the trial, causing the keys to darken and the white noise to terminate. If the response was correct for the value of the stimulus presented, the trial was followed by reward, i.e., two seconds access to the food magazine and a ten-second intertrial interval. If the response was incorrect, a correction was employed. The response was followed by the intertrial interval, and the stimulus was repeated on the next trial.

R_1 designates the response considered correct in the presence of the lower intensity stimulus (S_1), and R_2 the response considered correct in the presence of the higher intensity stimulus (S_2). The particular response key designated as correct for each stimulus was counter-balanced among subjects.

Discrimination training sessions were conducted five days a week. During these sessions, the stimuli were scheduled in randomized blocks of ten trials. Within each block each stimulus value appeared equally often. The session was ended after the subject responded correctly on 80 trials. Performance was measured for each session by determining the proportion of R_1 and R_2 responses made in the presence of each value of the stimulus. Discrimination training was continued until the performance of all subjects in a particular condition was judged to have attained asymptotic levels.

Three groups of subjects received varying amounts of training on an easy task before a shift to a more difficult discrimination task. The easy task required the subjects to discriminate between white noise intensities of 60dB and 90dB. Intensities of 73dB and 78dB were the discriminative stimuli for the difficult task. The shift from the easy task to the difficult task occurred after 40

trials for Group ED40, after 80 trials for Group ED80, and after 160 trials for Group ED160. The amounts of easy training were chosen on the basis of pilot data which showed that the shortest presolution period found for subjects trained on the easy task was 200 trials.

Two additional groups of subjects received 160 easy training trials before a reversal shift to the difficult discrimination problem. The easy and difficult tasks were as defined earlier. The response alternatives designated as correct for the two stimuli in the difficult task (e.g., a peck to the left response key was considered correct in the presence of the softer sound) were reversed with respect to the correct alternatives on the easy task. The subjects in Group ER received training on the easy task prior to a reversal shift to the difficult task. For subjects in Group EIR, reversal training on the easy task was interpolated within training on the reversed difficult task. These subjects were shifted to the 160 easy reversal trials after 400 on the difficult task and were shifted back to the original task after the easy reversal training. Discrimination training was terminated for both groups after 145 sessions.

Finally, there were two control groups, one of which

was trained on only the difficult task (Group DC) and the other on only the easy task (Group EC). For all subjects trained with the difficult task, discrimination training was terminated after 145 sessions. Subjects trained on the easy task alone (Group EC) received 36 sessions of discrimination training.

Bird 465 in Group DC died after completing only 72 training sessions. In spite of the shorter training period, this subject's performance appeared asymptotic and is included in the analysis.

RESULTS

Presolution Period Performance

Since a correction procedure was employed during discrimination training, on trials following an incorrect response, subjects could conceivably base their responses on information other than stimulus intensity. To exclude choice behavior that might be influenced by such non-stimulus information, only noncorrection trials (i.e., trials following a correct response) were included in the data analysis. There were 80 noncorrection trials in every training session, and each stimulus was presented on 40 of these trials. The data are expressed in terms of the number of R_2 responses made in the presence of each of the training stimuli. These conditional events are denoted as R_2S_2 and R_2S_1 . The results of each training session are summarized by listing only these two quantities, since the number of R_1S_1 and R_2S_1 responses are readily obtained by subtraction. Appendix A contains a summary of the performance of all subjects in this study.

Figures 3 through 5 show the acquisition curves for typical subjects from each experimental condition. The proportion of R_2S_2 and R_2S_1 responses are plotted against session number. In all cases, subjects did not

Figure 3. Sample learning curves for subjects in
Groups EC and DC.

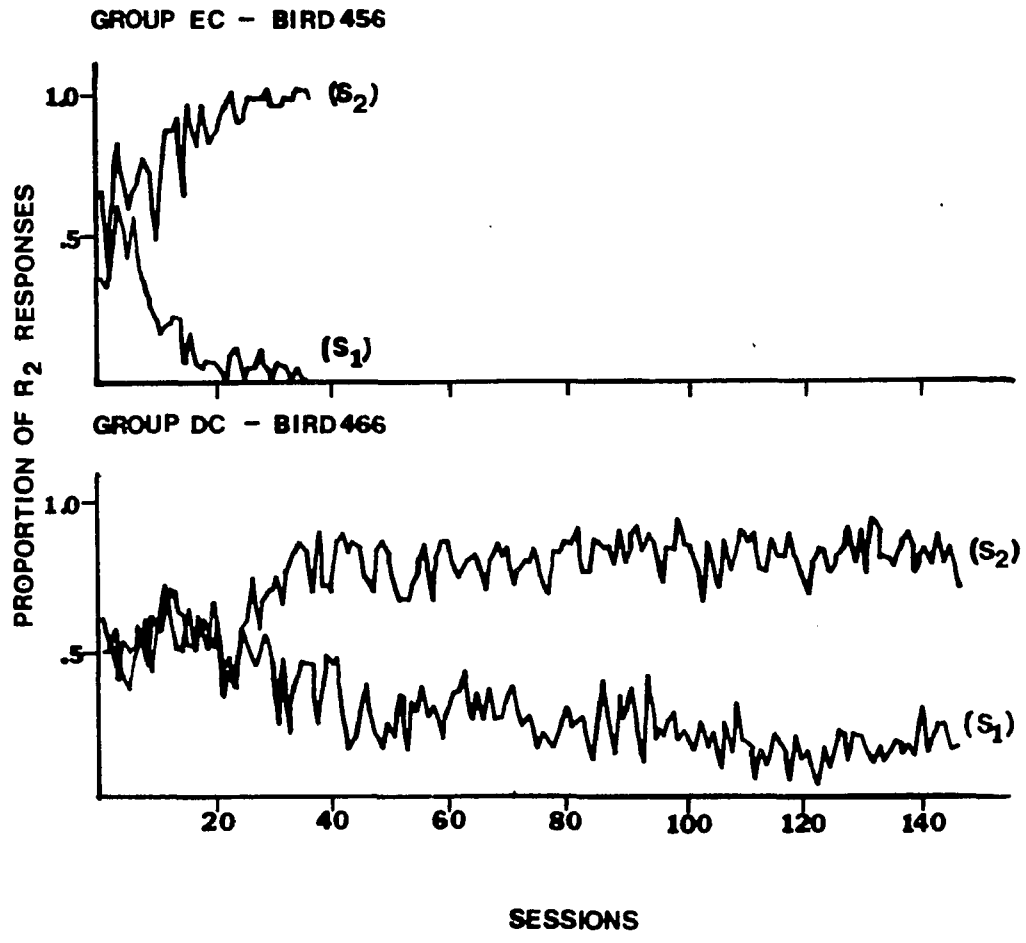
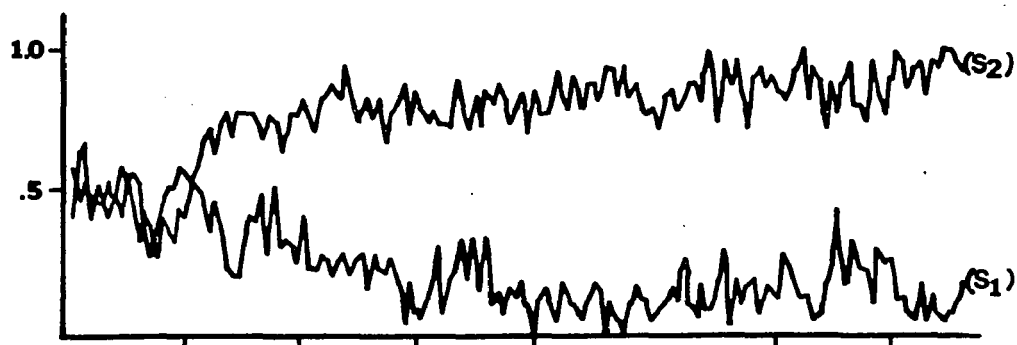
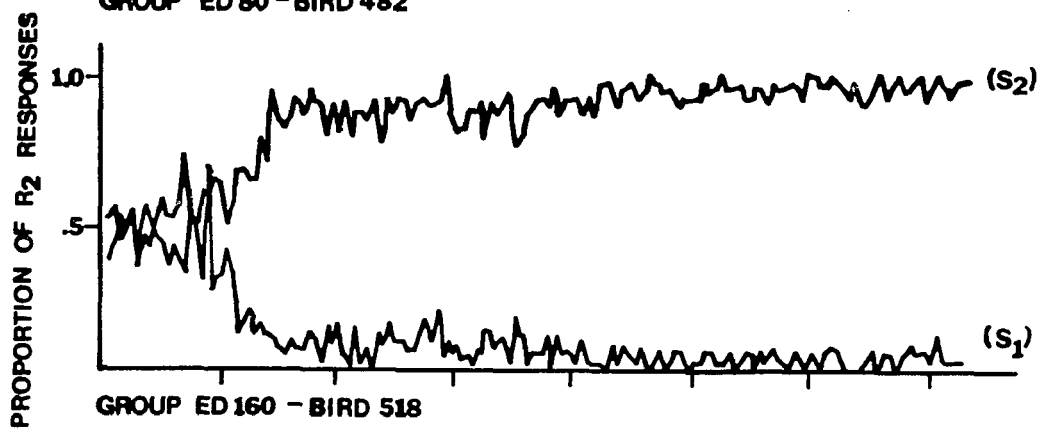


Figure 4. Sample learning curves for subjects in Groups ED40, ED80, and ED160.

GROUP ED 40 - BIRD 510



GROUP ED 80 - BIRD 482



GROUP ED 160 - BIRD 518

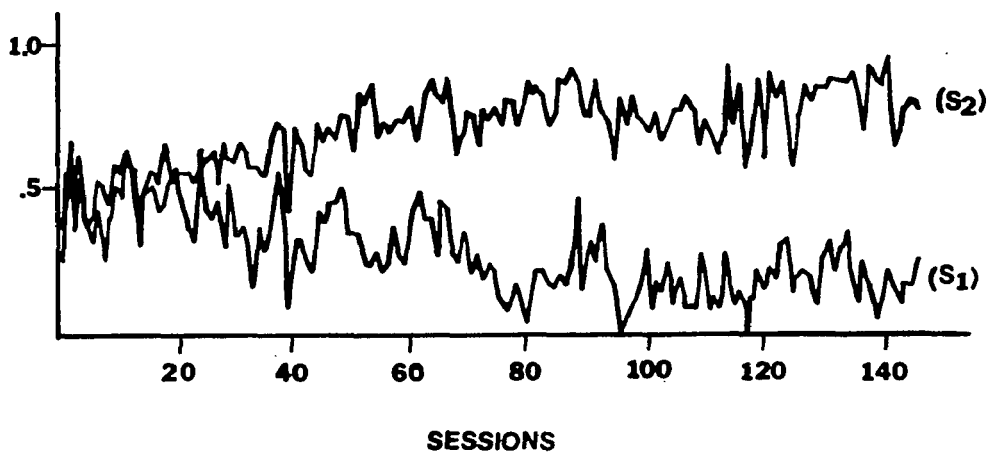
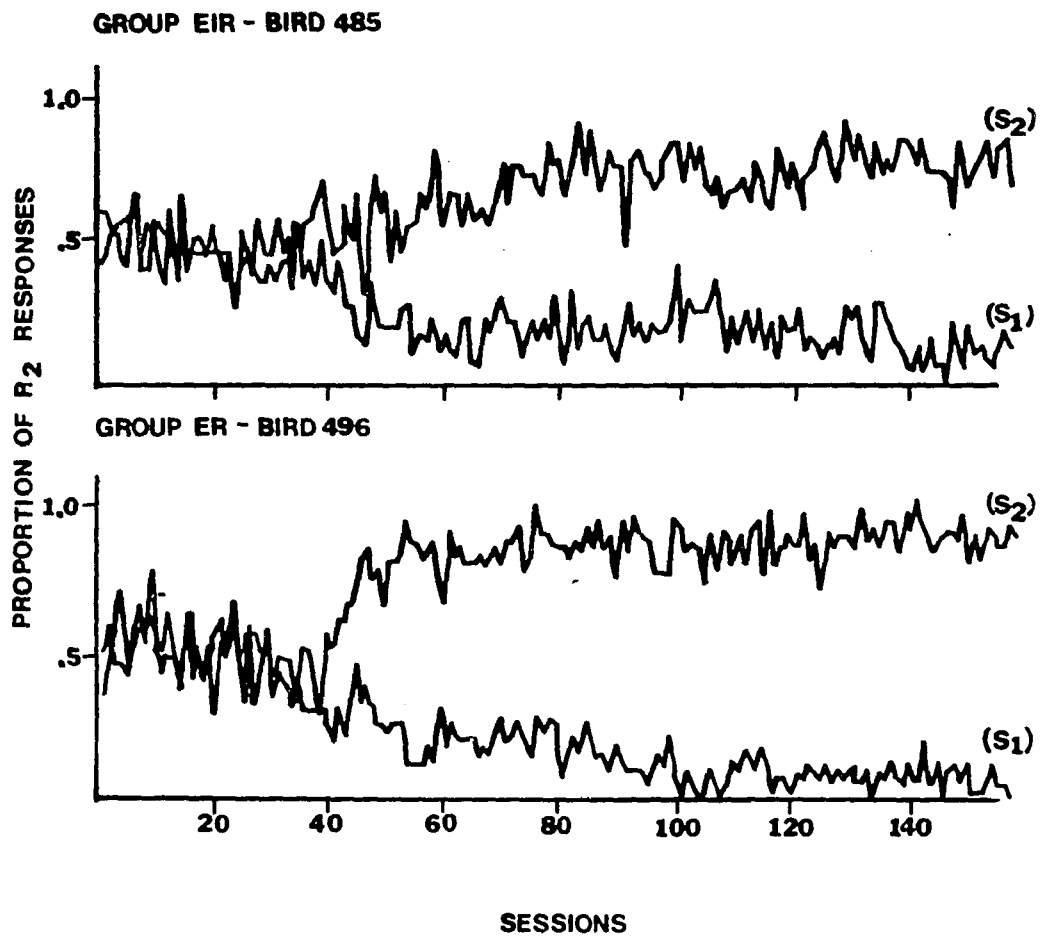


Figure 5. Sample learning curves for subjects in
Groups ER and EIR.



respond differently to the discriminative stimuli early in training. During this presolution period, both of the conditional response proportions remained near chance levels. The wide variation in the length of the presolution periods shown here reflects the variation seen in the study as a whole. Estimates of the lengths of the presolution periods for all subjects are shown in Table 1.

To obtain these estimates, the results were converted to the proportion of errors made in each session and were then fitted by the method of least squares with a learning curve consisting of a horizontal line ($p=0.5$) for the first few sessions and a negatively accelerated learning curve taken from Estes and Straughen (1954)¹. The parameters varied during the fitting procedure were the length of the horizontal line, the learning rate parameter, θ , and the first-day value of the error proportion, $P(1)$. Appendix B contains a more detailed discussion of presolution period measurement and includes a listing of the program used to fit the learning curves.

The mean values listed in Table 1 were based on the reciprocals of the presolution period estimates

¹ $P(n) = \pi - [\pi - P(1)][1 - \theta]^n$ Where $P(n)$ is the percent of errors after n trials, π is the asymptotic error rate, and $P(1)$ and θ are as described above.

TABLE 1

Estimated Number of Trials in the Presolution Period for All Subjects

Presolution			Presolution		
Group	Bird	Period	Group	Bird	Period
EC	452	240	ED160	516	1040
	453	560		517	2080
	454	400		518	1280
	455	240		519	1680
	456	320		520	1120
	457	400		521	5440
	458	480		522	400
	459	480		523	7600
	Mdn	400		Mdn	1480
	Mean	357		Mean	1226
DC	460	800	EIR	484	3040
	461	3040		485	2640
	462	--		486	2160
	463	3040		487	6080
	464	1440		488	2240
	465	1440		489	2960
	466	2000		490	2800
	467	960		491	1760
	Mdn	1720		Mdn	2880
	Mean	1653		Mean	2627
ED40	508	1280	ER	492	2880
	509	2000		493	3600
	510	1280		494	2880
	511	960		495	6240
	512	1520		496	3040
	513	1120		497	3120
	514	1600		498	5760
	515	1360		499	1200
	Mdn	1320		Mdn	3080
	Mean	1330		Mean	2868
ED80	476	720			
	477	2400			
	478	1040			
	479	3040			
	480	2080			
	481	1440			
	482	1440			
	483	1200			
	Mdn	1440			
	Mean	1380			

(specifically, $M = n / \sum_{i=1}^n \frac{1}{x_i}$). The reciprocal transform is often applied when the extreme scores of some subjects may serve to increase the variance of a treatment group (see Edwards, 1972). A theoretical reason for the use of this transform in analyzing presolution period data is discussed in Appendix C. Bird 465 showed no evidence of solving the discrimination task by the 145th session, when training was discontinued. As a result, the subject's presolution period was undetermined, and a value of zero was assigned as the reciprocal of the presolution period.

The estimates presented in Table 1 indicate that the intensity difference between the discriminative stimuli affects the length of the presolution period. The six groups of subjects trained with the difficult discrimination task showed longer presolution periods than the easy control group. The difference in mean presolution periods for Groups EC and DC is more than 1,200 trials or 15 training sessions.

Inspection of Table 1 also reveals that the stimulus manipulations performed during the presolution period affected the length of the presolution period. The mean presolution periods for the three groups shifted from easy to difficult are intermediate between those obtained for the two control groups. Subjects in the

two reversal groups had longer mean presolution periods than those in the nonreversal shift groups.

An analysis of variance comparing the reciprocal presolution periods for all conditions revealed significant differences among groups ($F(6,49)=22.57; p<.001$). To assess the effectiveness of specific experimental manipulations, five planned comparisons were made.¹ A comparison between the two control groups, EC and DC, supports the observation that the length of the presolution period is related to discrimination difficulty ($F(1,49)=75.39; p<.001$). The mean reciprocal presolution periods were compared to determine if the placement of the easy training trials had a significant effect on the length of the presolution period. The means did not differ significantly ($F(1,49)=0.02, p>.05$). Therefore, the data from the two reversal groups were combined in subsequent analyses. The remaining comparisons showed that the mean reciprocal presolution period of the combined reversal groups differed significantly.

¹ Not all of these comparisons were orthogonal. Authors of statistical texts disagree on the necessity of planning only orthogonal comparisons. For example, Hays (1963) states that orthogonality is required for planned comparisons. On the other hand, Winer (1971) and Keppel (1973) argue that it is legitimate to make nonorthogonal planned comparisons of experimental interest.

from that of Group ED160, the group given the same amount of training on the easy task ($F(1,49)=4.24, p < .05$). Neither the reversal groups nor Group ED160 differed significantly from the difficult control group ($F(1,49)=0.70; p > .05$; and ($F(1,49)=1.20; p > .05$).

Asymptotic Performance

As the curves in Figures 3 through 5 show, the end of the presolution period is followed by a gradual improvement in the accuracy of responding to the discriminative stimuli. With continued training, the proportion of R_2S_2 responses increases while the proportion of R_2S_1 responses decreases. The improvement becomes more gradual as training progresses, and the performance of all subjects appears to have attained asymptotic levels well before the end of training. The asymptotic performance of each subject was used to obtain a value of d' , the signal detection theory index of discriminability. For subjects trained with the difficult discrimination, the d' estimates were based on the average proportions of R_2S_2 and R_2S_1 responses for the last 20 training sessions. For subjects in Group EC, these estimates were based on the response proportions for the last 10 days of training.

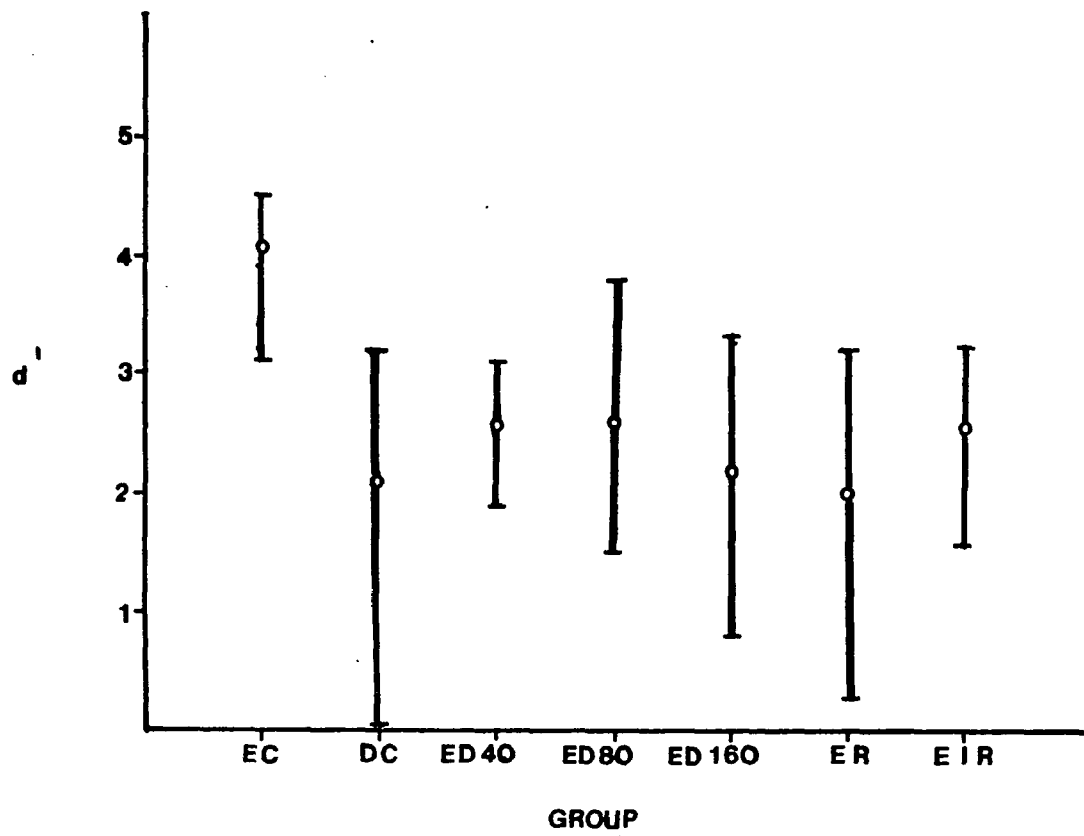
The asymptotic response proportions and d' values for all subjects are shown in Table 2. The mean d' values for each condition are presented in Figure 6. It is clear

TABLE 2

Asymptotic Response Proportions and d' Values for All Subjects

Group	Bird	R ₂ S ₂	R ₂ S ₁	d'	Group	Bird	R ₂ S ₂	R ₂ S ₁	d'
DC	460	.9550	.0675	3.1900	ED160	516	.9187	.0875	2.7504
	461	.8688	.1387	2.2000		517	.8887	.1912	2.0890
	462	.3850	.3787	0.0164		518	.8275	.2050	1.7633
	463	.8425	.2575	1.6509		519	.9175	.1450	2.4434
	464	.9237	.0962	2.7316		520	.9525	.1050	2.9214
	465	.9012	.1062	2.5320		521	.6237	.3362	0.7331
	466	.8462	.1825	1.9216		522	.9737	.0775	3.3597
	467	.9000	.1075	2.5185		523	.7725	.2125	1.5396
EC	452	.9800	.0075	4.4883	ER	492	.9112	.1050	2.5990
	453	.9275	.0500	3.1010		493	.9500	.0625	3.1779
	454	.9875	.0175	4.3517		494	.7275	.1500	1.6368
	455	.9875	.0150	4.4136		495	.5237	.3950	0.3230
	456	.9750	.0125	4.2030		496	.9150	.0875	2.7262
	457	.9775	.0425	3.7275		497	.7600	.2975	1.2324
	458	.9925	.0300	4.3150		498	.7675	.1775	1.6505
	459	.9750	.0175	4.0696		499	.9075	.1050	2.5763
ED40	508	.9262	.1000	2.7273	EIR	484	.8700	.0600	2.6786
	509	.9300	.0737	2.9224		485	.7737	.1462	1.7992
	510	.8412	.1800	1.9102		486	.9575	.0625	3.2557
	511	.9500	.0612	3.1884		487	.8425	.2637	1.6318
	512	.9275	.0762	2.8863		488	.9175	.0625	2.9208
	513	.9412	.1662	2.5312		489	.8487	.1662	1.9958
	514	.8862	.2150	1.9915		490	.9475	.0625	3.1541
	515	.9425	.1250	2.7241		491	.9475	.0637	3.1440
ED80	476	.9725	.0300	3.8003					
	477	.9462	.1400	2.6869					
	478	.8375	.1762	1.9096					
	479	.8675	.3537	1.4754					
	480	.8812	.0575	2.7548					
	481	.6800	.1025	1.7310					
	482	.9550	.0300	3.5763					
	483	.9437	.0687	3.0704					

Figure 6. Mean d' values for each group.



from this figure that d' is related to the size of the intensity difference between the discriminative stimuli. The mean d' for the easy control condition was 4.084, while subjects in the difficult control condition had a mean d' of 2.096. Figure 6 indicates that there was no systematic variation in the mean d' values of groups trained in the difficult task. Statistical analyses support these observations. An analysis of variance comparing the d' values for all conditions was significant ($F(6,49)=6.54$; $p .05$). A Newman-Keuls multiple comparison found that the mean for Group ED differed from all other conditions, but there were no significant differences in mean d' among groups trained in the difficult task. These results indicate that asymptotic performance was affected by the intensity difference between the discriminative stimuli, but there is no evidence that shifts from easy-to-hard discrimination problems affected final performance.

Theoretical Analysis

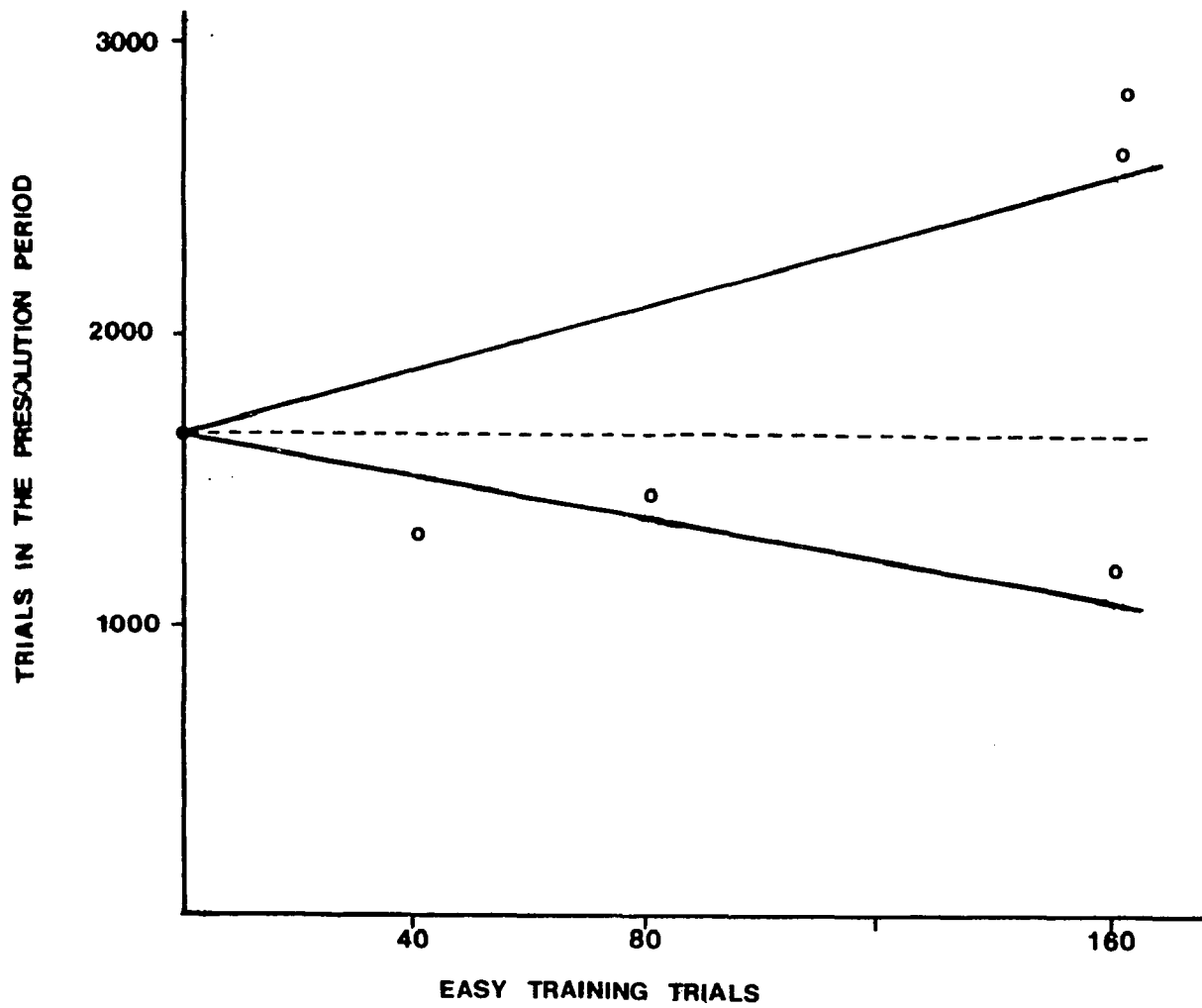
The theory proposed by Heinemann and Knopp describes the processes which determine the length of the presolution period for choice discrimination tasks. The theory makes exact predictions about the effects of simple easy-to-hard shifts and easy-to-hard reversal shifts during the presolution period. The predicted effects of these manipu-

lations were given in equations 14 and 15.

The predictions are based on the expected values of M_E and M_H . Since there is no way to empirically determine these expected values, they must be estimated from the mean presolution periods of subjects given the appropriate training. For this study, predicted values of the lengths of the presolution periods for subjects given simple easy-to-hard and easy-to-hard reversal training were based on values of M_E and M_H , which were estimated from the mean presolution periods of Groups EC and DC.

Predicted values of the mean lengths of the presolution periods for subjects given 40, 80, and 160 training trials on the easy discrimination before a shift to the hard task are shown in Figure 7. The theory predicts a linear relationship between these values and the number of easy training trials, with a slope equal to $1 - M_H/M_E$ (see equation 14), or in this case, -3.630. The mean presolution periods for Groups ED40, ED80, and ED160 are also shown (circles). The data are in general agreement with the model. Clearly, the means do not lie along the dotted line in Figure 7, as would have been predicted if there had been no effect of easy-to-hard training. As the model predicts, the mean presolution periods for groups given

Figure 7. Comparison of the predicted and empirical lengths of the presolution period for easy-to-hard and easy-to-hard reversal training. Predictions are shown in the two solid lines for simple easy-to-hard training (lower line) and easy-to-hard reversal training (upper line). The circles represent the results of the experiment.



easy-to-hard training are shorter than the mean of the difficult control group. Although the means are not ordered as this theory predicts, they do lie reasonably close to the predicted values and provide support for this model.

The predicted value of the mean length of the presolution period for subjects given 160 training trials on the easy task before the reversal shift to the difficult task is 2555.29 trials. This value falls on a line with a slope equal to $1 + M_H/M_E$ (see Equation 15), which is plotted in Figure 7 along with the mean presolution periods for Groups ER and EIR (circles). The theory predicts that easy-to-hard reversal training results in larger changes in length of the presolution period than simple easy-to-hard training. The results of this study support this prediction. The theory also predicts that easy reversal training may be introduced at any time during the presolution period and produce the same effect. Therefore, the same value is predicted for both groups. The mean presolution periods for the reversal groups are larger than the mean for the difficult control group, and they lie reasonably close to the predicted value. In addition, the analysis presented earlier shows no significant difference

in the presolution periods of the two reversal groups.
Again, the predictions of the theory are confirmed
reasonably well.

DISCUSSION

Clearly, there was some effect of the stimulus manipulations performed in the present study, as indicated by the significant difference in the mean presolution periods of the combined reversal groups and Group ED160. However, since neither the reversal groups nor Group ED160 differed significantly from the difficult control, it is possible that only one of these manipulations was effective. While this possibility cannot be eliminated, the overall pattern of results suggest that both simple easy-to-hard training and easy-to-hard reversal training were effective in producing changes in the presolution period. Subjects shifted from an easy discrimination to a more difficult one while still in the presolution period on the original problem had shorter presolution periods than subjects trained for the difficult task alone. Subjects shifted from an easy discrimination to a more difficult reversed discrimination while still in the presolution period on the original problem had longer mean presolution periods than a group of subjects trained on the difficult task alone.

The results of simple easy-to-hard training found in the present study are in general agreement with prior investigations of transfer along a continuum. For example, Pavlov (1927) reported a study by Gubergritz in which a subject was required to learn a difficult brightness task. After more than 75 stimulus presentations, the subject

showed no evidence of a discrimination. However, the same difficult discrimination was established in a total of 20 trials when the subject was presented with a graded series of easier discrimination tasks, gradually approaching the difficult task. North (1959) also found that subjects required fewer trials to learn a complex shape discrimination if this task was preceded by pretraining on an easier discrimination.

However, some effects of easy-to-hard training found in previous studies do not appear in the present one. A number of investigators report that subjects given easy-to-hard training make significantly fewer errors on the difficult task than subjects trained on the difficult task from the outset (Lawrence, 1952; Logan, 1966; Sutherland, Mackintosh and Mackintosh, 1963). In these studies, this superior performance is evident on trials immediately following the shift from the easier task. In the present study, there is no evidence of superior performance for easy-to-hard groups immediately following the shift to the difficult task; nor is there evidence that superior accuracy develops for these subjects. No significant difference was found in the d' values of groups trained with difficult task.

The differences between these results and those of the other investigators cited may be explained if procedural differences are taken into account. In the

present study, because the transition from the easy task to the hard task occurred while the animal was still in the presolution period for the easy task, initial performance on the difficult discrimination was at chance levels. The subjects showed evidence of being in a presolution period for the difficult task. However, in previous studies, subjects were not shifted to the difficult discrimination task until a reliable discrimination had been established on the easy task. For these subjects, initial performance on the difficult problem was better than chance, and there was no evidence of a presolution period for the difficult problem. As Pavlov (1927) noted:

In building up a differentiation by stages, beginning with a remoter stimulus, the development of the first crude differentiation takes place comparatively slowly, especially if it is desired to obtain an absolute differentiation giving a permanent zero. When, however, an absolute or almost absolute differentiation has been obtained, the succeeding stages of progress toward the finer differentiation are passed through with increasing rapidity... (p. 122)

All or most findings concerning the easy-to-hard effect suggest that easy-to-hard training is a procedure which facilitates discrimination learning primarily by affecting the length of the presolution period for the difficult task. If the shift from an easy-to-hard discrimination occurs while the subjects are still in the presolution period for the original task, there will be a decrease in the number of trials in the presolution period.

If the shift from an easy-to-hard discrimination occurs after a reliable discrimination has been established, the presolution period for the difficult task will be eliminated.

A similar explanation may be offered for the discrepancies between the results of the present study and prior studies with respect to the effects of easy-to-hard reversal training. Mackintosh and Little (1970) and Sweller (1972) found evidence of positive transfer from an easy task to a difficult reversed discrimination. In both studies, subjects given easy-to-hard reversal training showed poorer performance immediately following the shift to the difficult task than a control group trained on the difficult task from the outset. However, with continued training, easy-to-hard reversal subjects showed rapid improvement in performance and were superior to control subjects by the end of training. Mackintosh and Little found that the easy-to-hard reversal group made fewer errors on the difficult task by the end of training, and Sweller found that easy-to-hard reversal subjects took fewer trials to reach a performance criterion on the difficult task.

In contrast, the results of the present study showed poorer performance for subjects given easy-to-hard reversal

training. These subjects had longer presolution periods than control subjects trained on the difficult task alone. There was no evidence of superior performance for the easy-to-hard reversal groups by the end of training since the mean d' values for all groups trained with the difficult discrimination task showed no consistent differences.

In the earlier studies, subjects were shifted from the easy task to the difficult task after they were performing accurately on the easy discrimination. The poor performance these subjects displayed immediately following the shift to the difficult discrimination seems to reflect the effects of the reversal procedure. For example, Sweller's subjects averaged only 1.67 correct trials out of 10 total trials on the first day of training on the difficult task, indicating that the subjects were still responding to the stimulus-response contingencies established during training on the easy discrimination. In these studies, subjects given easy-to-hard reversal training showed no evidence of a presolution period for the difficult problem. The rapid improvement in discrimination accuracy observed in Mackintosh and Little's study is suggestive of the performance of subjects trained on a simple reversal of an established discrimination.

When the performance of subjects in the easy-to-hard reversal group was compared with controls immediately following the shift to the difficult discrimination, subjects in the reversal conditions showed relatively poor performance since they were responding below chance levels on the difficult discrimination. The control subjects were still in the presolution period and responded randomly to the discriminative stimuli. With further training, the control group showed very gradual improvement in comparison with the easy-to-hard reversal group. The advantage in performance demonstrated by the easy-to-hard reversal subjects reflected the absence of a presolution period for the difficult task.

In the present study, the easy-to-hard reversal subjects were shifted to the difficult task while still in the presolution period for the easy task. Both the easy-to-hard reversal subjects and the control subjects showed a presolution period for the difficult task. Since the subjects given easy-to-hard reversal training had longer mean presolution periods than controls, it seems that the easy-to-hard reversal training given during the presolution period retarded learning.

Theoretical Implications of Results

In order to account for the results of the present

study, a theory must be able to predict the direction and size of the effects of simple easy-to-hard training and easy-to-hard reversal training that were found. A number of theories have been developed to explain the processes underlying the presolution period. In order to evaluate these theories, it is necessary to determine how well each theory is able to predict the present results.

Classical noncontinuity theory (Krechevsky, 1932) assumes that the subject attends to only a single stimulus dimension on each trial. While responding on the basis of a particular stimulus dimension, the subject learns nothing about other aspects of the stimulus complex. During the presolution period, the subject responds randomly with respect to the relevant stimulus dimension. Therefore, the subject must be attending to irrelevant cues. Any changes in the relevant stimulus dimension during the presolution period should not be detected by the subject and should not affect performance of the discrimination task. Given this assumption, the theory is unable to account for the results of the present study.

The inability of classical noncontinuity theory to

account for the results of presolution period reversal studies was noted by earlier investigators (e.g., McCullough and Pratt, 1934; Ehrenfreund, 1948). In response to these findings, several theorists have proposed modified non-continuity theories (e.g., Zeaman and House, 1963; Sutherland and Mackintosh, 1971). While these theories differ in detail, they share a number of assumptions about the nature of discrimination learning. In contrast to classical noncontinuity theory, these theories allow the subject to learn something about the relevant stimulus dimension during the presolution period. Therefore, changes affecting the relevant stimuli during the presolution period will have some effect on the subject's performance.

Modified noncontinuity theories divide discrimination learning into two processes: learning to attend to the relevant stimulus dimension and learning to make the correct response in the presence of a particular value of the relevant dimension. During the presolution period, both processes are occurring. Therefore, such theories predict that any procedure which affects the probability of attention to the relevant dimension or the learning of the appropriate responses will affect the length of the presolution period. The theory should be able to predict

the effects of the stimulus manipulations performed in the present study. Easy-to-hard training should affect the probability of attention to the appropriate dimension by altering the discriminability of the relevant stimuli. Since the probability of attention depends upon how well the values of a given stimulus dimension predict the presence and absence of reward, the less confusable these stimuli are, the better their predictive value will be. Reversal training should affect the establishment of response connections, changing the relationship of rewarded responses to values of the relevant stimulus dimension.

It seems that modified noncontinuity theories can account, qualitatively, for the effects of simple easy-to-hard training found in the present study. The presolution period for subjects given easy-to-hard training should be shortened, since the subjects are able to establish a higher probability of attention to the relevant stimulus dimension than a group of subjects trained on the difficult task alone. The easy pretraining allows the subjects to build up a higher probability of attention, since highly discriminable values of the relevant dimension are presented. Therefore, when these subjects are shifted to the difficult task, they start out with a higher probability of attention to the relevant dimension than control

subjects.

However, it is not clear that these theories predict the effects of easy-to-hard reversal training found in the present study. If easy pretraining increased the probability of attention to the relevant dimension on a simple easy-to-hard shift, it follows that subjects given easy pretraining prior to a difficult reversal shift should also establish a higher probability of attention to the relevant stimulus dimension. Reversal training should disrupt any response attachments that might have been formed during the easy pretraining; but given that the shift takes place during the presolution period, response attachments should be only weakly established. While there should be some decrement in performance related to the reversal procedure, it would seem that such a decrement could be offset by the attentional advantage of the easy training. The precise effects of the easy training would be determined by the strength of the response attachments and the probability of attention established. It is only possible to determine the values of these parameters by computer simulation of the theories

An alternative formulation continuity theory was developed by Spence (1936, 1937) to describe learning in two-choice, simultaneous discrimination tasks. In this theory, it is assumed that the subject responds

to a stimulus complex that includes all the stimuli impinging upon the receptors of the organism rather than a single stimulus dimension as in noncontinuity theory. The relevant stimulus is simply one component of a particular stimulus complex. On rewarded trials, excitation is increased for all components of the stimulus complex to which the subject responded. On nonrewarded trials, excitation is decreased for all components of the stimulus complex to which the subject responded. This decrease in excitation may also be expressed as the growth of inhibition to stimuli associated with nonreward. On each trial, the subject responds to the stimulus complex with the greatest total excitatory strength.

The presolution period exists because early in training irrelevant cues have greater excitatory strengths than the relevant ones, and therefore determine responding. The length of the presolution period is determined, in part, by the a priori excitatory strengths of these irrelevant cues and, in part, by the differential build up of excitation and inhibition to the relevant stimuli. Changes in these factors will result in changes in the length of the presolution period.

For relevant stimuli varying within the same stimulus dimension, the discriminability of the stimuli

will play a role in determining how quickly excitation and inhibition will be built up to the stimuli. According to Spence, excitation built up to a particular stimulus value spreads to other stimuli varying on the same physical dimension. The effect of inhibition spreads in a similar manner. For stimuli varying along the same dimension, overlapping gradients of excitation and inhibition will develop. The subject's response to a value of this stimulus dimension will depend on the algebraic sum of the excitatory and inhibitory strengths for that stimulus. If the relevant stimuli are highly discriminable, the degree of overlap between excitatory and inhibitory gradients will be relatively small, and differential responding to the stimuli will be established more quickly than if the stimulus values are closer together on the dimension. Stimuli which are low in discriminability should require a greater number of training trials to establish the differential build up of excitation and inhibition.

Therefore, it would seem that the theory should predict effects of easy-to-hard training qualitatively similar to those found in the present study for simultaneous discrimination tasks. A number of investigators

have pointed out that Spence's theory can predict the effects of transfer along a continuum if assumptions are made about the shape of the gradients of excitation and inhibition (Lawrence, 1955; Logan, 1966; Bitterman, 1966). With these assumptions, it is possible to show that during easy pretraining, a larger difference in excitatory strengths is established for the relevant stimuli in the difficult task than is established by the same amount of training on the difficult task alone. Therefore, the control group will show chance performance for a larger number of trials.

It follows from this explanation that for simultaneous discrimination situations this theory will also predict effects of easy-to-hard reversal training similar to those found in the present study. Since the easy training establishes a greater difference in the excitatory strengths of the relevant stimuli for the difficult task, a reversal procedure should have a noticeable effect on the performance of the subjects. In order to learn the reversal task, the subject must establish a difference in the excitatory strengths of the relevant stimuli in the opposite direction of the original training.

While this theory makes qualitative predictions about

the stimulus manipulations similar to those employed in the present study, it is not possible to make more quantitative predictions on the basis of this theory without making a large number of assumptions. Spence left many of the details of this theory open. A more quantitative theory is possible only if these details are better defined.

In addition, it is not clear that Spence's theory may be easily extended to describe discrimination learning in a task such as the one employed in the present study. The theory was developed to account for learning in simultaneous visual discrimination tasks, and Spence (1952) illustrates that the theory might account for learning in successive or conditional visual discrimination tasks. Typically in these procedures, the subject must approach one of the discriminative stimuli when responding. Spence describes the response in discrimination learning as the tendency to approach a particular stimulus complex. In the present study, the relevant stimuli are levels of sound intensity. The required response cannot reasonably be described as the tendency to approach one of the relevant stimuli. While the subject may learn to approach a particular response key in the presence of a given sound intensity, the stimulus is not localized on the response key. It would seem that Spence's theory cannot account for

the results of the present study without modification.

The statistical decision theory described earlier, appears to be the only existing theory that offers a quantitative account of the effects of easy-to-hard and easy-to-hard reversal training during the presolution period. The theory makes exact predictions for the effects of these stimulus manipulations, and there is reasonable agreement between the theoretical predictions and the empirical findings. The present study constitutes a demanding test of the theory. The agreement between the results and the theory is very satisfactory, particularly in view of the fact that the parameters needed to make the theoretical predictions were taken from the control groups and not from the experimental groups whose results were predicted.

The selection of this theory is not based on arbitrary factors such as the tractability of the mathematics involved. This theory has biological and ecological significance in that it describes the best possible way, in some reasonable sense, in which associations between responses and environmental events may be made. An optimal theory is a reasonable approach for this kind of theory since it seems that millions of years of evolutionary

development would lead to very nearly optimal processes.

APPENDIX A

SUMMARY OF DATA FROM EACH SESSION - GROUP EC

<u>Session</u>	Bird 452		Bird 453		Bird 454		Bird 455	
	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>
1	19	18	22	28	28	22	22	27
2	20	24	21	17	26	18	23	23
3	25	19	30	21	30	21	26	23
4	20	11	23	20	31	25	24	15
5	27	11	24	25	21	28	24	15
6	27	10	15	16	36	7	28	8
7	28	8	15	11	22	11	29	8
8	32	7	32	13	32	15	36	3
9	25	0	29	5	36	10	22	9
10	32	4	38	12	40	3	30	3
11	36	7	30	5	39	3	30	5
12	38	2	29	2	40	3	34	2
13	40	5	32	4	40	2	36	5
14	40	4	35	2	40	1	36	1
15	39	2	35	4	39	0	39	0
16	37	2	34	5	39	2	39	2
17	40	1	37	7	38	4	38	3
18	40	0	32	4	39	1	40	1
19	38	1	33	5	39	0	39	1
20	40	2	35	0	40	1	38	1
21	40	0	31	5	40	3	38	0
22	40	0	39	3	39	2	37	0
23	39	0	40	4	37	0	39	5
24	40	1	39	2	40	1	40	0
25	38	0	37	1	37	1	39	1
26	39	0	36	1	39	1	35	2
27	38	0	33	3	37	0	40	1
28	38	0	37	2	39	3	40	2
29	39	0	36	1	39	0	39	2
30	39	0	38	1	40	0	39	0
31	39	1	36	4	40	1	40	0
32	40	0	40	1	40	0	39	0
33	40	0	39	3	40	0	39	0
34	39	2	38	1	40	1	39	1
35	40	0	36	1	40	1	40	0
36	40	0	38	3	40	1	40	0

SUMMARY OF DATA FROM EACH SESSION - GROUP EC

<u>Session</u>	Bird 456		Bird 457		Bird 458		Bird 459	
	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>	<u>R2S2</u>	<u>R2S1</u>
1	17	18	14	26	17	12	31	25
2	17	15	13	20	21	20	24	23
3	21	17	28	24	21	19	22	21
4	20	20	33	21	26	20	23	27
5	30	19	24	17	38	16	25	22
6	35	11	26	23	25	19	20	19
7	34	3	28	17	32	11	24	16
8	35	2	31	14	28	13	33	3
9	38	4	29	12	35	7	40	8
10	37	5	20	9	35	4	36	8
11	33	4	31	7	35	0	30	4
12	39	3	35	8	36	0	39	1
13	37	1	35	9	40	0	39	3
14	39	1	36	9	36	0	40	2
15	38	2	26	3	40	2	39	3
16	39	0	38	7	38	2	37	3
17	38	2	32	3	39	0	36	1
18	37	2	38	2	40	2	40	1
19	37	2	33	3	40	1	40	0
20	39	0	34	3	40	0	40	2
21	39	1	36	2	40	0	40	4
22	39	1	38	1	40	4	40	0
23	38	5	40	4	39	1	39	1
24	38	2	36	5	40	0	39	0
25	40	2	36	0	40	2	40	1
26	36	2	39	2	39	1	38	0
27	39	2	39	2	40	1	40	1
28	39	1	39	4	40	0	36	0
29	38	1	40	2	40	0	38	0
30	39	0	38	1	40	1	38	1
31	39	1	38	3	39	2	39	0
32	40	0	39	2	40	4	40	0
33	38	0	39	0	39	0	39	1
34	40	0	40	2	39	2	40	3
35	39	0	40	1	40	1	40	1
36	39	0	39	0	40	1	40	0

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 460

<u>Session</u>	<u>R2S2</u>	<u>R2S1</u>	<u>Session</u>	<u>R2S2</u>	<u>R2S1</u>
1	27	24	41	36	4
2	30	27	42	37	2
3	18	18	43	36	4
4	19	15	44	39	3
5	18	24	45	36	5
6	23	23	46	35	8
7	19	17	47	37	3
8	17	22	48	39	4
9	26	19	49	36	3
10	17	15	50	38	1
11	28	11	51	38	5
12	26	11	52	37	2
13	32	12	53	39	0
14	31	12	54	38	5
15	32	11	55	38	6
16	28	9	56	36	10
17	30	13	57	39	8
18	35	10	58	37	3
19	31	9	59	40	3
20	37	2	60	38	3
21	31	9	61	38	10
22	33	4	62	35	4
23	31	13	63	34	2
24	33	5	64	37	6
25	33	4	65	38	1
26	27	9	66	37	3
27	31	7	67	37	5
28	36	7	68	35	2
29	34	4	69	37	7
30	32	2	70	39	0
31	35	3	71	37	5
32	40	4	72	37	2
33	37	4	73	39	1
34	33	8	74	36	2
35	37	6	75	37	2
36	35	11	76	38	3
37	37	12	77	36	5
38	31	6	78	39	5
39	38	3	79	39	5
40	36	2	80	39	1

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 460

<u>Session</u>	<u>R2S2</u>	<u>R2S1</u>	<u>Session</u>	<u>R2S2</u>	<u>R2S1</u>
81	37	2	114	39	3
82	38	0	115	40	1
83	38	2	116	40	8
84	39	1	117	37	1
85	35	2	118	37	2
86	38	2	119	38	1
87	38	5	120	39	3
88	38	6	121	37	6
89	36	1	122	37	8
90	39	1	123	34	1
91	40	3	124	39	0
92	39	4	125	38	2
93	37	0	126	36	2
94	38	3	127	38	7
95	40	2	128	38	1
96	38	2	129	37	3
97	37	1	130	39	0
98	36	7	131	35	1
99	35	5	132	38	5
100	38	4	133	38	2
101	39	4	134	40	2
102	34	5	135	39	0
103	36	6	136	38	0
104	38	4	137	38	3
105	39	3	138	40	6
106	39	2	139	39	1
107	39	2	140	38	5
108	38	3	141	37	2
109	38	1	142	39	1
110	39	4	143	40	3
111	38	3	144	39	5
112	40	2	145	38	5
113	38	2			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 461

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	18	18	41	29	18
2	16	16	42	23	14
3	23	19	43	26	18
4	21	20	44	25	15
5	21	22	45	30	17
6	18	18	46	26	18
7	12	15	47	29	16
8	14	14	48	25	13
9	21	23	49	25	15
10	16	22	50	24	16
11	21	30	51	27	9
12	21	19	52	31	9
13	13	13	53	29	15
14	14	13	54	30	11
15	14	4	55	28	16
16	13	19	56	31	17
17	10	10	57	25	17
18	11	13	58	31	17
19	18	21	59	27	11
20	10	13	60	27	13
21	13	9	61	34	13
22	13	18	62	32	7
23	19	13	63	33	11
24	11	10	64	31	12
25	19	12	65	30	9
26	17	8	66	35	9
27	9	10	67	26	9
28	14	14	68	29	11
29	16	19	69	31	10
30	17	17	70	29	6
31	19	18	71	36	10
32	26	15	72	36	7
33	32	18	73	36	14
34	26	22	74	31	9
35	25	20	75	32	4
36	24	23	76	31	9
37	25	28	77	35	11
38	22	22	78	31	15
39	26	16	79	36	6
40	20	21	80	29	10

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 461

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	35	7	114	35	7
82	34	7	115	37	4
83	35	4	116	31	4
84	29	5	117	36	9
85	32	10	118	34	10
86	33	5	119	36	8
87	34	7	120	31	8
88	28	2	121	34	8
89	32	4	122	32	10
90	29	11	123	34	6
91	27	12	124	30	2
92	35	7	125	38	2
93	33	6	126	35	5
94	32	6	127	35	9
95	31	5	128	39	7
96	35	8	129	36	7
97	36	5	130	35	6
98	34	7	131	35	10
99	39	3	132	33	3
100	34	4	133	37	3
101	34	8	134	33	5
102	31	11	135	30	4
103	32	7	136	37	8
104	34	8	137	36	6
105	32	8	138	34	6
106	36	6	139	34	6
107	34	13	140	34	3
108	33	9	141	33	5
109	34	7	142	37	7
110	36	9	143	33	6
111	35	12	144	37	2
112	36	9	145	32	3
113	32	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 462

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	22	26	41	12	14
2	19	14	42	16	13
3	21	19	43	12	13
4	20	15	44	12	16
5	19	19	45	13	15
6	16	14	46	15	17
7	18	15	47	16	16
8	22	25	48	10	14
9	16	15	49	12	14
10	18	18	50	19	17
11	14	24	51	19	16
12	29	20	52	15	18
13	14	22	53	12	13
14	16	18	54	11	19
15	15	19	55	16	16
16	14	19	56	16	19
17	16	14	57	21	18
18	18	16	58	18	18
19	26	23	59	22	16
20	21	24	60	12	19
21	15	16	61	21	15
22	22	21	62	23	22
23	15	15	63	16	23
24	21	16	64	20	22
25	23	16	65	17	15
26	14	17	66	19	14
27	18	17	67	15	17
28	20	17	68	17	17
29	17	17	69	18	16
30	21	18	70	16	18
31	12	9	71	17	18
32	13	18	72	10	20
33	27	31	73	19	15
34	16	16	74	14	13
35	18	16	75	18	21
36	17	17	76	22	21
37	22	16	77	27	15
38	20	12	78	8	18
39	14	10	79	24	23
40	15	14	80	16	16

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 462

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	3	10	114	16	14
82	17	13	115	18	26
83	19	18	116	20	15
84	24	22	117	23	9
85	16	21	118	7	6
86	17	12	119	12	20
87	14	16	120	16	23
88	16	23	121	9	14
89	21	18	122	13	9
90	25	29	123	13	16
91	23	18	124	13	10
92	19	16	125	10	19
93	23	24	126	16	11
94	16	17	127	7	9
95	20	11	128	13	11
96	14	26	129	9	11
97	19	22	130	18	18
98	19	20	131	18	21
99	22	23	132	12	8
100	24	21	133	15	11
101	19	17	134	17	16
102	15	15	135	17	16
103	16	13	136	13	16
104	22	18	137	23	18
105	16	21	138	14	15
106	15	14	139	12	11
107	14	15	140	11	16
108	14	16	141	22	21
109	17	12	142	20	20
110	13	14	143	18	17
111	12	14	144	18	22
112	19	9	145	15	15
113	12	14			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 463

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	21	41	33	22
2	23	13	42	33	14
3	21	18	43	35	22
4	19	12	44	30	10
5	25	18	45	27	5
6	26	26	46	31	8
7	21	24	47	34	9
8	17	20	48	31	3
9	23	22	49	33	8
10	15	18	50	34	6
11	19	16	51	36	6
12	16	11	52	29	5
13	12	12	53	31	4
14	16	19	54	29	7
15	14	17	55	36	7
16	20	16	56	37	5
17	22	14	57	32	7
18	14	18	58	32	5
19	15	14	59	30	6
20	16	17	60	30	4
21	23	21	61	30	6
22	19	21	62	33	3
23	13	15	63	31	3
24	10	12	64	28	2
25	17	13	65	31	5
26	20	19	66	32	11
27	17	18	67	22	8
28	15	22	68	29	10
29	22	21	69	35	10
30	20	17	70	29	12
31	20	16	71	27	10
32	18	13	72	29	6
33	22	22	73	32	4
34	27	17	74	27	6
35	25	14	75	13	6
36	22	14	76	27	8
37	26	18	77	22	9
38	23	14	78	29	9
39	28	11	79	24	7
40	21	21	80	30	4

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 463

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	32	8	114	32	10
82	31	6	115	33	10
83	32	11	116	34	14
84	31	8	117	32	9
85	30	10	118	33	13
86	31	13	119	31	6
87	34	7	120	37	11
88	35	6	121	35	13
89	33	7	122	35	13
90	22	8	123	29	10
91	31	8	124	37	11
92	28	5	125	32	8
93	31	12	126	35	12
94	26	10	127	33	9
95	30	13	128	38	9
96	28	13	129	37	10
97	31	4	130	32	12
98	28	6	131	31	10
99	34	10	132	37	15
100	28	5	133	38	4
101	28	7	134	35	9
102	28	15	135	30	6
103	36	12	136	33	16
104	35	8	137	31	15
105	35	13	138	33	5
106	34	6	139	31	9
107	29	5	140	36	13
108	33	9	141	32	15
109	30	6	142	36	9
110	38	12	143	32	8
111	37	18	144	35	9
112	34	13	145	29	11
113	27	10			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 464

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	17	22	41	27	8
2	19	18	42	26	4
3	24	16	43	30	10
4	23	25	44	29	5
5	16	22	45	28	11
6	25	27	46	31	13
7	17	18	47	35	13
8	21	11	48	34	12
9	19	17	49	35	7
10	14	14	50	33	12
11	13	19	51	33	7
12	16	14	52	34	12
13	12	10	53	30	9
14	11	18	54	34	10
15	12	13	55	30	8
16	14	20	56	34	7
17	16	12	57	38	8
18	18	19	58	37	14
19	27	21	59	37	8
20	32	21	60	33	10
21	26	25	61	33	7
22	28	13	62	33	9
23	28	8	63	37	5
24	25	15	64	37	5
25	25	15	65	35	11
26	18	13	66	33	14
27	24	11	67	34	7
28	24	11	68	36	8
29	26	13	69	37	11
30	21	14	70	31	11
31	34	10	71	33	5
32	29	11	72	36	7
33	31	7	73	38	9
34	30	13	74	36	6
35	32	13	75	36	8
36	26	15	76	38	7
37	35	11	77	34	3
38	35	10	78	37	6
39	31	7	79	37	8
40	29	15	80	36	6

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 464

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	32	7	114	30	5
82	37	5	115	28	1
83	37	6	116	34	2
84	31	9	117	28	3
85	38	11	118	30	2
86	38	16	119	35	1
87	38	10	120	36	6
88	27	7	121	30	1
89	26	6	122	30	4
90	26	9	123	27	3
91	37	7	124	34	6
92	37	10	125	35	7
93	30	12	126	32	3
94	34	14	127	33	3
95	33	7	128	31	10
96	29	11	129	37	5
97	32	6	130	35	6
98	35	5	131	35	3
99	34	9	132	37	6
100	31	7	133	34	9
101	28	3	134	32	3
102	29	2	135	33	4
103	32	4	136	35	3
104	30	10	137	36	1
105	33	4	138	38	9
106	28	3	139	37	1
107	36	8	140	38	1
108	31	0	141	35	2
109	35	3	142	37	6
110	26	4	143	35	0
111	31	2	144	35	3
112	27	3	145	39	5
113	35	3			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 465

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	22	27	37	28	3
2	18	21	38	28	8
3	19	21	39	35	13
4	18	14	40	22	3
5	14	14	41	19	4
6	21	16	42	25	0
7	23	24	43	21	2
8	19	19	44	29	2
9	19	20	45	28	1
10	23	17	46	36	4
11	19	25	47	29	3
12	16	16	48	30	0
13	18	18	49	29	1
14	17	17	50	36	0
15	21	21	51	36	1
16	16	13	52	37	1
17	12	26	53	37	1
18	18	18	54	35	5
19	21	14	55	35	3
20	24	18	56	35	5
21	16	13	57	39	3
22	22	14	58	36	6
23	28	13	59	37	6
24	28	12	60	38	3
25	30	14	61	33	3
26	22	9	62	34	5
27	22	17	63	38	10
28	34	12	64	39	5
29	28	10	65	39	6
30	21	7	66	34	1
31	23	7	67	40	2
32	29	9	68	34	5
33	31	14	69	36	6
34	21	5	70	33	2
35	27	4	71	32	7
36	23	10			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 466

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	24	41	36	14
2	20	21	42	34	7
3	23	16	43	35	8
4	17	21	44	34	11
5	15	20	45	30	15
6	19	20	46	28	12
7	21	23	47	34	9
8	24	18	48	35	7
9	17	24	49	33	10
10	24	23	50	29	9
11	29	28	51	27	14
12	25	28	52	27	6
13	20	26	53	29	13
14	20	25	54	32	12
15	26	21	55	35	15
16	20	20	56	27	11
17	25	22	57	33	12
18	20	24	58	35	8
19	27	21	59	35	11
20	21	24	60	32	14
21	14	18	61	30	15
22	17	19	62	31	17
23	15	15	63	32	9
24	23	23	64	33	14
25	24	20	65	28	10
26	30	19	66	32	15
27	23	18	67	35	11
28	27	22	68	33	11
29	28	18	69	34	12
30	30	10	70	29	15
31	26	19	71	31	11
32	31	9	72	32	10
33	33	15	73	32	11
34	35	18	74	34	7
35	34	18	75	31	9
36	28	18	76	28	8
37	36	10	77	34	7
38	29	19	78	34	11
39	28	18	79	35	12
40	35	19	80	35	10

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 466

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	36	10	114	35	7
82	31	11	115	33	9
83	31	8	116	33	7
84	35	5	117	37	3
85	34	16	118	33	8
86	34	10	119	31	5
87	32	6	120	28	6
88	36	14	121	33	3
89	32	11	122	34	2
90	36	15	123	34	7
91	37	12	124	31	4
92	34	6	125	32	9
93	36	17	126	34	9
94	35	8	127	37	5
95	30	9	128	33	9
96	34	10	129	37	8
97	34	11	130	31	7
98	38	8	131	38	5
99	35	9	132	37	6
100	34	8	133	33	5
101	31	7	134	33	6
102	27	10	135	32	8
103	35	7	136	35	6
104	31	9	137	36	7
105	29	4	138	31	6
106	35	10	139	33	12
107	31	6	140	34	6
108	33	13	141	32	7
109	36	8	142	36	10
110	35	7	143	32	10
111	36	3	144	34	7
112	31	6	145	29	7
113	31	4			

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 467

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	26	21	41	36	8
2	20	15	42	33	6
3	22	21	43	32	6
4	25	27	44	37	5
5	25	25	45	37	8
6	28	26	46	34	5
7	19	19	47	37	6
8	7	23	48	33	7
9	26	31	49	37	6
10	21	23	50	32	6
11	20	21	51	38	3
12	18	25	52	32	1
13	23	12	53	36	1
14	17	14	54	35	7
15	26	16	55	30	2
16	29	7	56	33	3
17	22	9	57	35	3
18	29	8	58	37	4
19	28	18	59	37	4
20	36	9	60	39	4
21	27	12	61	40	6
22	31	13	62	40	7
23	33	7	63	37	7
24	30	11	64	35	9
25	31	15	65	35	9
26	30	14	66	38	10
27	30	10	67	36	3
28	30	10	68	34	5
29	31	16	69	39	6
30	32	10	70	39	3
31	27	11	71	36	6
32	30	14	72	36	1
33	32	7	73	38	7
34	36	12	74	35	7
35	32	14	75	39	10
36	38	9	76	39	1
37	36	12	77	39	4
38	35	5	78	37	1
39	36	6	79	38	4
40	37	5	80	38	2

SUMMARY OF DATA FROM EACH SESSION - GROUP DC

BIRD 467

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	40	3	114	39	3
82	38	3	115	39	1
83	39	7	116	37	1
84	36	5	117	37	2
85	39	7	118	37	6
86	39	9	119	37	3
87	38	5	120	38	3
88	36	10	121	37	4
89	38	11	122	37	7
90	38	3	123	38	1
91	39	7	124	40	4
92	38	5	125	40	5
93	40	5	126	37	5
94	38	3	127	34	4
95	40	2	128	38	3
96	40	3	129	40	5
97	38	1	130	40	5
98	38	2	131	39	8
99	40	5	132	37	1
100	38	2	133	36	5
101	38	3	134	37	3
102	37	6	135	39	2
103	37	2	136	39	5
104	35	10	137	35	7
105	36	3	138	39	3
106	40	6	139	35	3
107	36	7	140	38	2
108	32	12	141	36	5
109	29	6	142	39	4
110	40	6	143	39	6
111	40	5	144	39	4
112	38	1	145	39	6
113	39	4			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 508

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	8	10	41	28	10
2	20	15	42	35	17
3	21	25	43	29	9
4	23	21	44	24	11
5	26	25	45	26	10
6	28	32	46	25	14
7	22	22	47	23	14
8	19	21	48	27	14
9	17	24	49	25	12
10	21	22	50	26	6
11	21	20	51	32	3
12	22	23	52	25	15
13	19	19	53	20	12
14	14	17	54	22	15
15	15	16	55	31	16
16	18	25	56	22	15
17	17	15	57	23	16
18	13	7	58	27	14
19	16	13	59	28	12
20	16	14	60	34	7
21	23	12	61	30	17
22	27	17	62	24	11
23	24	17	63	29	10
24	26	13	64	30	12
25	27	14	65	32	14
26	28	19	66	27	17
27	32	11	67	30	13
28	31	14	68	30	15
29	27	19	69	27	17
30	24	25	70	34	12
31	25	15	71	24	13
32	20	10	72	31	11
33	28	15	73	33	9
34	26	8	74	30	10
35	23	17	75	32	10
36	23	11	76	26	7
37	18	9	77	34	12
38	23	12	78	31	8
39	20	7	79	28	5
40	29	15	80	34	9

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 508

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	32	11	114	32	11
82	20	4	115	35	7
83	27	15	116	30	5
84	35	12	117	33	6
85	30	10	118	36	5
86	38	11	119	33	8
87	35	3	120	37	3
88	33	4	121	35	4
89	25	7	122	31	9
90	28	5	123	36	4
91	23	3	124	37	7
92	27	8	125	35	7
93	30	10	126	37	5
94	33	6	127	32	8
95	28	5	128	38	4
96	26	6	129	38	6
97	29	6	130	35	4
98	27	8	131	35	4
99	31	5	132	36	4
100	29	7	133	36	4
101	34	5	134	37	4
102	33	8	135	36	2
103	31	7	136	39	2
104	33	7	137	39	2
105	33	4	138	38	6
106	27	8	139	39	4
107	28	5	140	39	7
108	30	5	141	38	3
109	30	5	142	38	2
110	22	2	143	38	3
111	23	8	144	35	6
112	34	9	145	36	0
113	31	10			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 509

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	10	13	41	36	6
2	18	18	42	34	4
3	23	21	43	35	10
4	26	20	44	34	10
5	22	17	45	38	8
6	25	19	46	32	4
7	23	18	47	35	5
8	15	19	48	31	10
9	20	16	49	20	8
10	20	18	50	30	6
11	16	22	51	35	6
12	22	23	52	32	9
13	26	23	53	28	7
14	23	23	54	33	11
15	20	25	55	33	5
16	27	25	56	31	5
17	23	24	57	31	6
18	16	14	58	31	10
19	21	18	59	36	12
20	22	20	60	33	6
21	33	31	61	26	7
22	31	29	62	28	5
23	22	19	63	35	4
24	20	18	64	37	2
25	7	9	65	34	1
26	12	4	66	34	6
27	22	8	67	32	5
28	21	11	68	36	7
29	19	6	69	33	5
30	27	6	70	39	5
31	25	12	71	38	7
32	25	11	72	35	4
33	20	18	73	23	4
34	34	12	74	36	4
35	32	10	75	37	6
36	34	11	76	35	5
37	32	6	77	38	2
38	31	14	78	32	2
39	35	14	79	39	2
40	36	9	80	34	6

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 509

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	38	5	114	38	1
82	33	2	115	36	5
83	38	4	116	36	1
84	37	5	117	37	1
85	37	6	118	39	3
86	38	4	119	35	2
87	33	1	120	38	4
88	37	2	121	38	4
89	31	1	122	31	6
90	40	5	123	32	2
91	36	5	124	37	5
92	39	3	125	35	3
93	38	1	126	36	3
94	35	3	127	38	2
95	39	1	128	38	2
96	38	4	129	37	3
97	37	5	130	39	4
98	30	3	131	38	2
99	32	2	132	39	0
100	33	6	133	38	5
101	38	4	134	37	3
102	37	6	135	37	2
103	38	1	136	34	4
104	38	0	137	38	7
105	38	6	138	37	1
106	39	2	139	34	7
107	36	2	140	37	3
108	40	5	141	37	4
109	37	3	142	37	3
110	35	3	143	38	1
111	36	3	144	39	2
112	37	3	145	36	1
113	39	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 510

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	6	12	41	32	16
2	16	23	42	30	9
3	25	18	43	28	9
4	26	21	44	32	11
5	16	19	45	33	10
6	20	18	46	34	8
7	19	18	47	32	10
8	16	21	48	36	11
9	18	19	49	32	8
10	23	16	50	29	10
11	21	22	51	30	11
12	22	17	52	32	6
13	21	13	53	30	10
14	15	17	54	32	9
15	11	15	55	26	8
16	15	11	56	30	10
17	19	16	57	32	8
18	20	14	58	34	2
19	20	13	59	29	7
20	23	17	60	33	3
21	22	16	61	31	3
22	21	21	62	29	5
23	23	20	63	30	7
24	26	19	64	29	12
25	28	14	65	29	3
26	25	22	66	28	8
27	29	13	67	35	9
28	30	9	68	31	12
29	27	8	69	28	8
30	30	8	70	32	13
31	30	14	71	29	6
32	30	16	72	33	13
33	29	16	73	32	4
34	27	19	74	34	5
35	30	11	75	32	3
36	29	20	76	29	6
37	25	12	77	30	5
38	27	13	78	33	7
39	30	12	79	28	4
40	30	10	80	33	0

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 510

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	30	5	114	37	7
82	30	6	115	33	4
83	32	4	116	28	6
84	36	2	117	35	7
85	32	7	118	36	3
86	31	5	119	34	5
87	35	4	120	35	6
88	31	6	121	33	5
89	34	4	122	32	11
90	34	7	123	33	9
91	32	6	124	36	7
92	36	0	125	39	5
93	36	4	126	32	5
94	33	2	127	36	2
95	36	0	128	35	3
96	32	4	129	28	7
97	34	6	130	34	10
98	32	5	131	30	17
99	30	4	132	34	7
100	31	2	133	37	7
101	28	3	134	31	12
102	32	4	135	31	9
103	33	6	136	29	8
104	31	5	137	37	4
105	31	10	138	32	1
106	34	4	139	30	10
107	34	2	140	35	10
108	32	6	141	38	5
109	38	3	142	37	5
110	35	3	143	34	3
111	29	7	144	36	2
112	37	11	145	37	7
113	34	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 511

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	9	9	41	34	7
2	16	23	42	32	4
3	22	24	43	28	11
4	18	27	44	33	10
5	24	26	45	29	7
6	26	19	46	31	9
7	20	25	47	23	12
8	15	18	48	30	5
9	19	15	49	29	13
10	26	22	50	31	11
11	21	18	51	32	18
12	17	15	52	34	12
13	24	12	53	30	7
14	17	15	54	37	8
15	22	12	55	34	8
16	29	17	56	31	8
17	28	18	57	35	4
18	33	14	58	34	9
19	34	14	59	37	8
20	33	12	60	30	8
21	33	15	61	33	6
22	34	14	62	33	11
23	31	9	63	34	7
24	33	7	64	33	10
25	35	6	65	32	9
26	30	11	66	36	10
27	29	10	67	33	12
28	32	10	68	30	8
29	33	3	69	26	7
30	31	5	70	36	8
31	31	14	71	29	7
32	26	10	72	34	5
33	34	5	73	35	8
34	30	10	74	29	7
35	27	6	75	30	6
36	27	8	76	32	4
37	28	9	77	34	1
38	30	9	78	33	3
39	35	2	79	35	1
40	34	4	80	31	8

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 511

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	33	6	114	34	5
82	38	8	115	35	3
83	38	6	116	36	1
84	36	4	117	36	3
85	34	6	118	37	4
86	33	5	119	38	2
87	32	8	120	37	5
88	35	5	121	39	1
89	30	3	122	39	4
90	34	5	123	38	4
91	31	6	124	40	6
92	31	4	125	37	1
93	34	4	126	37	3
94	31	5	127	37	2
95	36	5	128	38	1
96	33	2	129	40	0
97	32	0	130	36	1
98	33	4	131	39	2
99	31	2	132	40	4
100	35	7	133	40	7
101	32	8	134	38	10
102	36	4	135	34	5
103	36	5	136	36	3
104	33	4	137	38	0
105	32	2	138	38	1
106	32	3	139	38	1
107	32	7	140	38	3
108	32	6	141	38	0
109	37	4	142	38	3
110	35	5	143	40	1
111	38	4	144	39	1
112	37	2	145	38	1
113	36	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 512

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	8	12	41	38	5
2	17	23	42	39	5
3	19	20	43	34	8
4	18	23	44	37	5
5	16	19	45	31	6
6	26	15	46	29	10
7	27	23	47	33	5
8	26	29	48	35	4
9	17	20	49	27	10
10	27	25	50	27	8
11	7	12	51	28	3
12	13	15	52	31	5
13	10	11	53	29	8
14	22	14	54	38	10
15	17	15	55	35	5
16	25	16	56	27	3
17	24	7	57	35	6
18	23	10	58	34	3
19	30	10	59	37	2
20	34	9	60	37	1
21	27	11	61	33	6
22	30	6	62	33	3
23	35	7	63	35	3
24	36	4	64	37	3
25	34	6	65	38	4
26	34	11	66	29	6
27	39	3	67	29	5
28	32	6	68	30	4
29	36	5	69	35	8
30	35	2	70	36	4
31	32	3	71	35	8
32	37	4	72	36	3
33	40	2	73	36	1
34	38	5	74	37	1
35	36	2	75	36	2
36	36	6	76	36	7
37	31	2	77	38	2
38	38	2	78	39	2
39	39	2	79	36	7
40	35	3	80	40	6

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 512

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	36	6	114	33	5
82	38	2	115	36	4
83	36	2	116	37	2
84	37	4	117	37	3
85	36	7	118	32	4
86	38	13	119	39	4
87	37	3	120	38	2
88	39	4	121	34	2
89	36	3	122	37	1
90	36	1	123	39	1
91	37	21	124	37	2
92	40	4	125	38	2
93	40	6	126	31	3
94	39	4	127	34	1
95	40	4	128	35	4
96	40	3	129	38	1
97	40	9	130	39	3
98	39	5	131	38	1
99	37	4	132	39	2
100	39	5	133	40	4
101	40	6	134	38	4
102	39	5	135	35	6
103	39	6	136	39	4
104	38	2	137	37	1
105	38	6	138	37	5
106	33	5	139	36	3
107	39	2	140	39	4
108	39	5	141	37	4
109	38	4	142	39	3
110	36	5	143	38	4
111	35	4	144	38	0
112	39	6	145	35	2
113	37	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 513

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	13	12	41	35	7
2	30	30	42	37	10
3	21	25	43	35	8
4	23	22	44	39	8
5	25	16	45	39	8
6	33	26	46	29	7
7	23	27	47	40	12
8	28	30	48	39	7
9	25	18	49	33	12
10	22	16	50	32	9
11	20	14	51	38	11
12	19	17	52	34	14
13	23	18	53	38	10
14	19	18	54	38	6
15	26	10	55	38	2
16	26	13	56	37	10
17	35	11	57	39	12
18	33	16	58	38	11
19	32	10	59	40	14
20	34	10	60	39	6
21	36	15	61	39	6
22	26	4	62	38	7
23	38	5	63	35	6
24	37	6	64	39	5
25	35	6	65	40	9
26	37	4	66	38	9
27	37	5	67	39	7
28	40	4	68	38	3
29	34	3	69	39	5
30	34	5	70	37	3
31	36	7	71	39	8
32	40	7	72	39	9
33	40	5	73	40	2
34	38	3	74	39	1
35	38	8	75	39	10
36	37	6	76	40	7
37	34	7	77	38	10
38	34	7	78	40	6
39	36	5	79	39	4
40	30	8	80	40	4

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 513

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	39	7	114	40	10
82	40	3	115	36	9
83	36	3	116	37	8
84	35	6	117	34	5
85	39	6	118	33	5
86	33	2	119	37	4
87	38	6	120	40	9
88	35	0	121	39	8
89	40	4	122	39	4
90	35	4	123	40	6
91	40	12	124	38	6
92	39	7	125	37	7
93	38	2	126	38	2
94	36	5	127	38	55
95	36	4	128	37	10
96	35	5	129	39	11
97	37	2	130	35	5
98	36	2	131	35	11
99	31	7	132	38	14
100	36	6	133	38	6
101	39	9	134	40	5
102	36	3	135	37	7
103	39	5	136	38	4
104	37	7	137	37	4
105	34	9	138	40	7
106	35	5	139	36	6
107	40	11	140	35	10
108	35	13	141	37	6
109	26	6	142	38	2
110	37	11	143	39	4
111	38	6	144	40	10
112	40	8	145	40	4
113	39	8			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 514

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	8	6	41	22	7
2	18	26	42	24	9
3	15	21	43	29	9
4	20	17	44	23	8
5	18	16	45	26	9
6	21	19	46	17	5
7	21	23	47	31	9
8	23	19	48	22	7
9	19	16	49	29	8
10	16	17	50	30	6
11	10	15	51	27	2
12	16	16	52	28	5
13	10	12	53	33	9
14	8	16	54	32	5
15	13	14	55	35	5
16	17	18	56	30	11
17	24	18	57	29	7
18	24	17	58	29	6
19	22	18	59	27	11
20	19	17	60	35	5
21	25	11	61	25	1
22	22	15	62	28	4
23	35	7	63	31	4
24	29	14	64	33	4
25	32	7	65	36	7
26	24	12	66	26	2
27	31	15	67	27	7
28	27	9	68	28	5
29	30	10	69	27	2
30	27	14	70	30	10
31	23	8	71	34	4
32	30	16	72	35	3
33	25	10	73	29	7
34	34	14	74	32	1
35	22	12	75	36	5
36	21	7	76	31	0
37	23	7	77	32	6
38	29	5	78	35	1
39	23	10	79	34	4
40	27	7	80	36	2

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 514

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	34	5	114	28	1
82	36	2	115	37	3
83	35	3	116	36	7
84	32	7	117	34	6
85	31	12	118	30	9
86	35	5	119	35	9
87	36	4	120	36	10
88	36	6	121	35	11
89	35	4	122	39	8
90	31	1	123	39	9
91	38	3	124	36	8
92	31	4	125	33	7
93	36	4	126	37	7
94	30	1	127	34	6
95	35	4	128	35	3
96	27	4	129	35	5
97	28	4	130	38	12
98	27	6	131	37	6
99	32	4	132	36	6
100	30	6	133	35	6
101	35	6	134	35	7
102	33	2	135	34	4
103	33	6	136	36	4
104	34	6	137	33	7
105	34	3	138	38	2
106	31	8	139	37	5
107	34	6	140	33	8
108	33	3	141	37	2
109	35	4	142	35	5
110	38	7	143	34	6
111	29	8	144	37	4
112	37	3	145	33	7
113	33	6			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 515

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	9	9	41	36	23
2	21	16	42	38	14
3	21	25	43	38	16
4	27	26	44	36	11
5	19	23	45	38	19
6	26	28	46	38	16
7	17	24	47	39	7
8	29	18	48	35	15
9	22	18	49	36	12
10	27	14	50	37	10
11	19	15	51	33	17
12	24	17	52	36	13
13	24	9	53	39	13
14	24	16	54	37	6
15	23	16	55	36	6
16	15	11	56	33	12
17	16	17	57	38	2
18	25	21	58	38	11
19	28	12	59	38	10
20	23	23	60	38	6
21	29	18	61	37	14
22	26	20	62	38	7
23	27	20	63	37	14
24	26	19	64	37	6
25	24	18	65	39	11
26	25	19	66	37	13
27	28	13	67	39	5
28	27	12	68	36	9
29	30	13	69	34	8
30	30	11	70	37	9
31	33	15	71	38	13
32	36	9	72	35	11
33	32	7	73	37	12
34	30	13	74	39	5
35	38	8	75	38	5
36	35	15	76	37	3
37	35	18	77	34	9
38	32	11	78	33	8
39	36	14	79	38	14
40	32	16	80	36	4

SUMMARY OF DATA FROM EACH SESSION - GROUP ED40

BIRD 515

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	40	7	114	39	9
82	38	12	115	36	13
83	37	8	116	36	12
84	36	9	117	38	3
85	34	8	118	36	8
86	38	10	119	39	4
87	38	2	120	35	6
88	39	4	121	39	4
89	36	4	122	38	10
90	36	5	123	38	5
91	37	7	124	38	8
92	38	5	125	39	8
93	37	6	126	39	7
94	31	12	127	36	4
95	38	2	128	39	5
96	36	8	129	35	5
97	38	7	130	38	6
98	36	12	131	38	6
99	40	7	132	38	7
100	38	5	133	39	3
101	39	4	134	37	2
102	39	9	135	39	2
103	39	6	136	34	11
104	40	9	137	39	5
105	35	12	138	37	10
106	35	3	139	39	4
107	38	7	140	36	6
108	36	4	141	38	1
109	39	3	142	37	4
110	38	9	143	37	5
111	39	6	144	40	1
112	37	12	145	39	4
113	37	13			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 476

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	14	20	41	36	6
2	22	14	42	39	2
3	23	18	43	37	6
4	24	15	44	38	0
5	21	25	45	34	0
6	18	29	46	39	2
7	23	17	47	40	4
8	12	4	48	40	4
9	20	15	49	39	1
10	20	17	50	38	1
11	19	15	51	33	0
12	24	17	52	38	3
13	29	11	53	40	0
14	24	7	54	40	0
15	31	8	55	40	2
16	31	9	56	39	1
17	29	10	57	39	2
18	31	9	58	40	1
19	34	4	59	38	4
20	32	4	60	40	1
21	33	5	61	39	3
22	38	1	62	38	3
23	34	5	63	39	0
24	37	1	64	39	1
25	34	3	65	40	1
26	36	7	66	38	1
27	37	6	67	38	1
28	37	4	68	38	0
29	35	1	69	38	3
30	30	1	70	40	1
31	35	6	71	36	1
32	37	4	72	38	3
33	35	1	73	38	1
34	37	0	74	40	2
35	39	3	75	39	0
36	39	0	76	35	0
37	35	3	77	40	1
38	39	1	78	38	1
39	36	3	79	39	1
40	38	4	80	38	2

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 476

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	37	4	114	40	0
82	38	2	115	39	0
83	39	0	116	40	2
84	39	0	117	39	2
85	40	1	118	39	3
86	38	4	119	40	2
87	39	1	120	40	3
88	38	0	121	38	2
89	39	3	122	38	4
90	40	1	123	38	3
91	36	1	124	40	3
92	39	2	125	39	2
93	39	1	126	39	0
94	40	1	127	40	1
95	37	3	128	39	1
96	40	3	129	39	2
97	38	5	130	40	1
98	40	2	131	39	2
99	38	0	132	39	2
100	40	0	133	40	0
101	39	2	134	39	1
102	40	3	135	39	0
103	39	0	136	40	1
104	39	3	137	39	0
105	40	1	138	37	0
106	39	5	139	37	0
107	38	1	140	37	1
108	37	2	141	39	4
109	38	1	142	40	1
110	40	2	143	39	0
111	38	0	144	38	5
112	39	2	145	39	2
113	40	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 477

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	24	26	41	36	13
2	19	22	42	35	17
3	19	20	43	39	13
4	18	24	44	32	14
5	24	20	45	31	11
6	25	18	46	36	13
7	20	20	47	36	17
8	20	22	48	37	18
9	23	19	49	32	15
10	22	19	50	37	20
11	20	23	51	30	16
12	27	27	52	35	17
13	32	22	53	37	11
14	28	22	54	39	15
15	24	27	55	34	20
16	30	23	56	33	19
17	16	24	57	31	15
18	30	18	58	36	10
19	27	21	59	33	11
20	28	16	60	37	8
21	23	9	61	35	9
22	23	16	62	37	9
23	24	16	63	37	11
24	23	18	64	37	8
25	23	21	65	39	9
26	17	19	66	38	8
27	29	28	67	35	6
28	21	21	68	35	7
29	29	19	69	33	5
30	26	28	70	38	10
31	29	16	71	38	5
32	32	25	72	40	7
33	28	9	73	39	14
34	27	17	74	39	7
35	33	20	75	40	7
36	38	21	76	33	7
37	36	22	77	37	2
38	35	22	78	37	8
39	37	18	79	37	3
40	35	13	80	39	6

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 477

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	38	5	114	36	7
82	35	7	115	39	11
83	37	3	116	37	11
84	36	6	117	35	8
85	39	3	118	34	9
86	37	6	119	38	5
87	35	5	120	37	5
88	37	8	121	38	4
89	37	8	122	39	6
90	34	7	123	39	6
91	37	12	124	40	11
92	37	8	125	39	7
93	38	9	126	39	5
94	39	9	127	39	6
95	39	17	128	37	6
96	40	5	129	40	8
97	38	10	130	40	4
98	36	10	131	40	4
99	39	6	132	40	8
100	39	3	133	36	2
101	37	0	134	38	3
102	33	6	135	37	5
103	33	4	136	34	5
104	40	4	137	37	6
105	33	2	138	39	8
106	32	13	139	35	6
107	37	8	140	34	6
108	40	4	141	37	7
109	40	6	142	37	6
110	37	6	143	40	6
111	37	8	144	39	8
112	36	5	145	39	3
113	38	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 478

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	21	8	41	27	14
2	14	15	42	22	10
3	17	11	43	28	17
4	11	12	44	27	11
5	13	10	45	27	11
6	12	10	46	25	15
7	8	10	47	28	12
8	11	7	48	33	10
9	6	6	49	28	14
10	20	12	50	31	11
11	7	14	51	32	10
12	16	16	52	33	12
13	16	16	53	32	10
14	27	22	54	22	12
15	27	19	55	30	10
16	26	20	56	25	12
17	18	12	57	28	8
18	22	18	58	24	7
19	21	23	59	24	7
20	25	17	60	28	8
21	22	13	61	23	5
22	23	17	62	22	5
23	25	17	63	27	5
24	20	11	64	31	12
25	23	19	65	29	15
26	21	11	66	29	11
27	21	18	67	28	8
28	25	13	68	29	11
29	21	10	69	29	12
30	27	11	70	28	12
31	24	11	71	31	10
32	28	16	72	33	6
33	29	16	73	29	12
34	20	11	74	29	13
35	27	10	75	27	12
36	28	15	76	31	12
37	27	13	77	27	10
38	27	11	78	34	14
39	21	12	79	31	14
40	25	15	80	26	12

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 478

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	33	14	114	36	11
82	35	23	115	31	3
83	33	15	116	38	17
84	32	13	117	37	9
85	34	14	118	34	11
86	37	7	119	34	8
87	34	10	120	35	12
88	34	10	121	33	9
89	32	12	122	31	12
90	28	9	123	33	8
91	27	11	124	38	9
92	28	11	125	40	9
93	27	12	126	34	8
94	32	11	127	33	8
95	31	12	128	35	6
96	32	14	129	37	6
97	33	6	130	38	12
98	37	12	131	29	8
99	32	10	132	31	3
100	29	4	133	29	7
101	32	5	134	36	7
102	27	6	135	32	6
103	31	11	136	33	8
104	32	5	137	31	5
105	33	9	138	38	6
106	37	8	139	37	4
107	30	8	140	33	5
108	28	8	141	37	6
109	29	9	142	33	12
110	35	9	143	33	6
111	29	8	144	32	6
112	30	9	145	31	12
113	31	6			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 479

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	20	41	28	19
2	18	20	42	28	21
3	20	21	43	32	14
4	21	26	44	29	23
5	28	23	45	23	24
6	28	25	46	34	27
7	23	21	47	35	38
8	27	29	48	26	15
9	22	20	49	27	11
10	31	22	50	31	11
11	22	16	51	32	15
12	19	10	52	37	16
13	17	16	53	36	10
14	19	20	54	28	11
15	11	16	55	31	14
16	19	24	56	33	10
17	17	21	57	34	10
18	22	19	58	30	6
19	18	24	59	32	10
20	18	22	60	28	6
21	20	21	61	31	8
22	18	19	62	30	1
23	25	24	63	34	4
24	25	25	64	32	15
25	25	22	65	37	5
26	23	19	66	36	5
27	25	19	67	36	9
28	33	30	68	30	7
29	30	30	69	29	4
30	23	23	70	24	2
31	24	26	71	34	11
32	32	31	72	30	10
33	30	30	73	33	7
34	28	27	74	33	7
35	27	26	75	33	6
36	30	25	76	30	3
37	24	20	77	33	7
38	28	22	78	35	14
39	26	22	79	38	14
40	27	23	80	35	14

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 479

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	32	16	114	37	11
82	29	15	115	38	11
83	36	15	116	35	16
84	31	15	117	31	9
85	38	14	118	35	18
86	26	11	119	35	14
87	37	13	120	27	14
88	25	15	121	36	15
89	34	17	122	31	16
90	31	15	123	28	9
91	32	8	124	32	14
92	37	11	125	32	17
93	33	16	126	35	11
94	31	21	127	33	15
95	34	14	128	37	16
96	31	13	129	36	14
97	35	13	130	36	16
98	33	19	131	35	16
99	31	16	132	33	19
100	33	11	133	31	16
101	27	15	134	32	13
102	36	13	135	32	15
103	31	17	136	33	11
104	37	15	137	36	13
105	33	10	138	38	16
106	32	14	139	33	11
107	36	12	140	37	13
108	39	14	141	34	8
109	30	11	142	39	19
110	33	9	143	37	15
111	21	8	144	36	12
112	34	6	145	31	17
113	36	16			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 480

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	18	41	32	10
2	22	25	42	37	4
3	26	25	43	37	8
4	22	16	44	36	9
5	29	21	45	36	7
6	25	17	46	34	6
7	16	21	47	32	5
8	25	11	48	37	5
9	26	19	49	38	7
10	22	22	50	38	8
11	20	18	51	34	7
12	22	24	52	37	8
13	24	21	53	38	4
14	22	22	54	38	7
15	18	15	55	40	5
16	20	16	56	35	10
17	25	21	57	36	6
18	26	24	58	33	3
19	26	15	59	37	6
20	32	14	60	36	5
21	28	20	61	29	4
22	23	13	62	38	5
23	21	22	63	34	7
24	23	18	64	37	6
25	26	23	65	37	4
26	23	21	66	37	3
27	26	15	67	38	8
28	29	16	68	40	3
29	31	16	69	40	9
30	33	12	70	40	3
31	24	7	71	36	4
32	33	15	72	40	7
33	35	9	73	38	6
34	36	6	74	38	10
35	31	3	75	39	11
36	33	4	76	35	5
37	38	4	77	34	3
38	34	6	78	38	8
39	35	7	79	39	9
40	35	9	80	34	7

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80 .

BIRD 480

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	35	4	114	37	7
82	34	5	115	34	2
83	39	4	116	37	3
84	39	3	117	39	11
85	39	5	118	28	12
86	36	5	119	39	12
87	37	3	120	40	10
88	38	2	121	40	13
89	39	5	122	40	3
90	38	7	123	37	5
91	34	7	124	34	1
92	39	5	125	37	0
93	35	4	126	38	7
94	37	3	127	36	2
95	36	5	128	38	1
96	38	4	129	38	2
97	40	7	130	35	3
98	38	4	131	36	3
99	38	9	132	33	0
100	36	3	133	36	2
101	31	6	134	33	2
102	38	6	135	37	2
103	33	6	136	32	2
104	34	4	137	31	1
105	34	9	138	36	2
106	37	6	139	35	1
107	35	1	140	38	3
108	37	22	141	33	2
109	35	2	142	32	3
110	38	11	143	37	2
111	31	5	144	39	5
112	38	7	145	34	1
113	38	9			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 481

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	16	16	41	30	10
2	18	18	42	28	6
3	22	23	43	31	6
4	16	21	44	27	6
5	19	16	45	28	5
6	22	22	46	30	7
7	16	17	47	27	11
8	13	16	48	25	3
9	25	15	49	27	5
10	27	19	50	23	6
11	26	31	51	19	2
12	28	24	52	28	6
13	20	22	53	26	5
14	19	18	54	28	6
15	23	19	55	32	7
16	18	21	56	32	12
17	21	18	57	32	3
18	23	21	58	30	10
19	33	27	59	29	5
20	32	21	60	25	7
21	29	21	61	30	4
22	29	18	62	32	9
23	32	15	63	30	9
24	23	19	64	27	10
25	25	18	65	26	8
26	30	15	66	35	8
27	17	16	67	31	18
28	27	20	68	34	12
29	31	9	69	24	7
30	25	11	70	24	6
31	24	19	71	33	7
32	26	16	72	27	10
33	28	7	73	22	7
34	32	11	74	33	5
35	27	10	75	33	9
36	32	12	76	26	7
37	29	3	77	28	9
38	27	3	78	30	7
39	26	2	79	30	4
40	25	6	80	23	3

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 481

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	30	4	114	31	8
82	25	3	115	32	8
83	24	4	116	31	5
84	31	3	117	29	3
85	23	6	118	27	2
86	28	5	119	35	9
87	28	6	120	35	6
88	30	7	121	27	6
89	26	10	122	31	3
90	34	10	123	32	6
91	30	10	124	32	8
92	31	6	125	29	8
93	30	5	126	27	7
94	27	4	127	32	7
95	28	1	128	28	4
96	33	5	129	20	4
97	32	6	130	27	3
98	27	8	131	29	4
99	23	3	132	21	1
100	32	8	133	28	6
101	28	5	134	31	4
102	34	4	135	28	3
103	32	4	136	30	3
104	30	3	137	28	3
105	34	12	138	27	4
106	35	10	139	29	5
107	33	6	140	25	1
108	27	3	141	28	5
109	30	6	142	30	2
110	33	5	143	27	6
111	31	5	144	27	4
112	32	4	145	22	6
113	22	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 482

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	21	15	41	36	2
2	22	17	42	32	1
3	18	21	43	35	6
4	20	19	44	35	1
5	21	22	45	34	3
6	14	16	46	37	0
7	18	22	47	31	5
8	17	17	48	37	4
9	20	18	49	35	6
10	23	17	50	37	7
11	21	15	51	37	4
12	21	17	52	34	3
13	22	15	53	36	3
14	29	13	54	37	4
15	21	21	55	36	7
16	20	21	56	36	4
17	24	13	57	37	8
18	25	28	58	40	2
19	26	11	59	35	4
20	25	13	60	33	3
21	20	16	61	33	2
22	23	13	62	35	2
23	27	5	63	35	1
24	27	6	64	36	2
25	26	8	65	32	5
26	26	5	66	36	5
27	31	6	67	35	3
28	28	5	68	36	4
29	37	4	69	37	1
30	39	3	70	31	7
31	33	2	71	32	5
32	34	4	72	35	1
33	36	3	73	37	2
34	35	3	74	37	2
35	38	5	75	36	4
36	37	4	76	38	0
37	36	1	77	35	4
38	32	6	78	37	2
39	36	4	79	37	3
40	33	6	80	37	1

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 482

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	35	4	114	38	2
82	37	1	115	38	1
83	35	1	116	39	0
84	39	1	117	38	2
85	39	0	118	37	1
86	39	3	119	40	0
87	36	1	120	40	2
88	38	3	121	39	0
89	39	2	122	39	2
90	37	1	123	40	3
91	38	3	124	39	3
92	40	0	125	38	1
93	39	0	126	37	0
94	38	2	127	39	0
95	38	0	128	36	0
96	38	1	129	36	1
97	36	2	130	36	2
98	37	2	131	40	0
99	37	0	132	37	2
100	37	1	133	39	2
101	39	1	134	40	0
102	38	2	135	38	0
103	38	2	136	38	2
104	40	1	137	39	3
105	38	1	138	40	0
106	38	2	139	37	2
107	38	0	140	39	1
108	37	1	141	40	4
109	37	2	142	39	1
110	38	1	143	37	1
111	38	2	144	38	1
112	36	1	145	39	1
113	39	3			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 483

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	25	17	41	37	4
2	22	18	42	30	7
3	23	21	43	36	5
4	22	30	44	29	8
5	22	25	45	28	10
6	21	21	46	36	9
7	18	13	47	34	10
8	15	14	48	33	7
9	19	25	49	33	6
10	23	25	50	36	6
11	34	25	51	34	8
12	12	15	52	37	4
13	23	19	53	34	4
14	27	18	54	36	2
15	21	21	55	32	2
16	21	18	56	37	2
17	28	10	57	37	0
18	34	22	58	33	4
19	26	15	59	38	4
20	26	20	60	32	3
21	20	19	61	35	4
22	22	14	62	32	6
23	23	16	63	33	5
24	25	13	64	35	6
25	25	11	65	33	2
26	28	11	66	35	4
27	33	8	67	37	4
28	29	13	68	38	1
29	34	11	69	40	5
30	34	9	70	38	3
31	33	3	71	37	6
32	29	4	72	38	6
33	28	4	73	39	6
34	30	6	74	37	3
35	33	6	75	38	3
36	33	5	76	39	5
37	34	4	77	38	4
38	32	4	78	37	6
39	38	6	79	38	5
40	35	3	80	37	4

SUMMARY OF DATA FROM EACH SESSION - GROUP ED80

BIRD 483

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	39	4	114	36	2
82	36	6	115	36	3
83	37	3	116	35	4
84	38	9	117	37	7
85	37	2	118	34	5
86	39	5	119	37	5
87	39	5	120	34	9
88	38	7	121	36	3
89	40	2	122	37	4
90	39	5	123	35	3
91	37	8	124	35	1
92	39	7	125	39	2
93	34	7	126	38	7
94	38	1	127	38	3
95	37	3	128	34	3
96	36	4	129	38	1
97	38	0	130	38	5
98	40	1	131	39	0
99	36	1	132	37	3
100	36	0	133	36	3
101	38	10	134	36	2
102	35	4	135	37	3
103	35	0	136	39	3
104	37	2	137	38	1
105	34	4	138	39	4
106	36	4	139	38	2
107	37	3	140	39	5
108	38	4	141	38	2
109	37	3	142	38	1
110	37	6	143	38	3
111	34	7	144	38	0
112	38	6	145	39	4
113	38	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 516

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	13	16	41	30	8
2	25	17	42	36	10
3	21	26	43	31	7
4	14	21	44	31	8
5	19	12	45	32	10
6	18	16	46	31	10
7	16	19	47	34	13
8	15	17	48	35	8
9	21	19	49	28	13
10	18	18	50	29	8
11	21	21	51	36	5
12	15	16	52	32	12
13	10	19	53	38	9
14	36	21	54	31	9
15	18	18	55	30	4
16	17	10	56	34	7
17	16	11	57	34	8
18	20	19	58	29	9
19	18	8	59	36	5
20	24	4	60	32	10
21	19	12	61	32	9
22	22	11	62	37	4
23	24	11	63	32	12
24	28	9	64	38	6
25	30	15	65	36	3
26	31	6	66	38	7
27	32	13	67	34	7
28	33	13	68	32	12
29	31	12	69	38	2
30	35	13	70	39	8
31	36	7	71	39	7
32	31	12	72	39	2
33	35	10	73	35	8
34	34	12	74	36	3
35	35	11	75	33	11
36	38	8	76	33	9
37	37	14	77	40	9
38	36	10	78	38	7
39	29	16	79	40	7
40	27	11	80	34	4

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 516

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	36	7	114	36	5
82	38	5	115	35	2
83	36	7	116	37	3
84	36	8	117	36	4
85	37	5	118	37	3
86	38	6	119	32	0
87	36	6	120	34	5
88	36	2	121	35	9
89	38	6	122	33	10
90	36	4	123	33	5
91	35	8	124	31	5
92	37	7	125	36	6
93	34	5	126	36	4
94	37	3	127	34	2
95	33	7	128	38	5
96	37	5	129	37	1
97	39	0	130	38	3
98	36	2	131	38	1
99	34	4	132	37	3
100	37	3	133	38	5
101	34	4	134	36	4
102	37	7	135	37	5
103	35	2	136	38	1
104	38	3	137	39	3
105	33	3	138	38	4
106	34	5	139	34	4
107	34	5	140	40	4
108	36	2	141	35	2
109	33	2	142	33	7
110	36	2	143	35	4
111	37	5	144	36	4
112	36	2	145	38	4
113	38	4			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 517

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	16	18	41	31	11
2	23	21	42	24	10
3	20	19	43	26	10
4	22	22	44	33	15
5	20	19	45	33	15
6	19	15	46	32	11
7	22	23	47	22	15
8	26	21	48	31	10
9	19	23	49	34	8
10	29	20	50	29	9
11	21	21	51	31	5
12	22	25	52	29	11
13	20	17	53	32	7
14	16	16	54	30	12
15	22	25	55	20	13
16	15	20	56	23	9
17	29	20	57	28	12
18	24	22	58	29	12
19	17	11	59	30	9
20	15	18	60	31	11
21	19	12	61	27	15
22	26	14	62	30	11
23	25	15	63	34	9
24	24	23	64	36	14
25	22	22	65	31	9
26	23	19	66	37	11
27	24	14	67	33	12
28	24	15	68	35	13
29	22	12	69	31	16
30	30	12	70	31	14
31	27	11	71	38	15
32	32	14	72	35	27
33	29	14	73	34	8
34	28	14	74	34	7
35	28	12	75	29	11
36	32	9	76	31	9
37	30	12	77	30	10
38	26	16	78	32	10
39	32	13	79	28	8
40	31	11	80	31	9

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 517

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	37	8	114	39	3
82	37	8	115	37	4
83	30	5	116	33	8
84	31	4	117	36	3
85	34	4	118	34	7
86	30	7	119	35	8
87	36	6	120	37	8
88	34	7	121	37	9
89	34	7	122	34	5
90	37	10	123	37	9
91	38	5	124	34	8
92	33	7	125	35	17
93	36	7	126	35	11
94	38	7	127	34	5
95	37	7	128	35	8
96	32	6	129	35	7
97	26	9	130	35	7
98	34	5	131	38	8
99	35	9	132	36	9
100	32	11	133	32	7
101	33	7	134	37	9
102	37	8	135	38	10
103	33	8	136	35	6
104	33	5	137	36	6
105	32	14	138	33	9
106	36	8	139	37	7
107	33	12	140	35	10
108	35	3	141	36	9
109	31	6	142	38	5
110	36	11	143	33	5
111	35	6	144	34	7
112	37	4	145	39	10
113	35	3			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 518

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	15	10	41	26	13
2	27	22	42	23	11
3	15	19	43	22	9
4	22	25	44	29	17
5	15	16	45	27	16
6	16	13	46	28	18
7	21	17	47	27	18
8	20	10	48	30	20
9	18	16	49	30	14
10	23	20	50	25	14
11	22	19	51	33	14
12	25	24	52	32	10
13	22	23	53	34	10
14	16	12	54	27	11
15	20	19	55	29	9
16	22	20	56	28	10
17	21	17	57	29	15
18	26	18	58	29	11
19	21	21	59	30	10
20	22	23	60	31	17
21	22	19	61	27	20
22	22	15	62	33	16
23	21	13	63	35	16
24	23	25	64	33	11
25	24	17	65	32	18
26	25	16	66	35	17
27	21	18	67	25	11
28	26	12	68	27	10
29	24	20	69	30	14
30	24	14	70	30	9
31	26	15	71	26	11
32	25	13	72	31	8
33	23	7	73	30	10
34	23	15	74	31	8
35	22	12	75	29	5
36	27	14	76	32	4
37	29	22	77	32	5
38	28	19	77	29	7
39	17	4	79	34	2
40	28	13	80	33	5

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 518

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	34	9	114	29	4
82	33	9	115	34	6
83	29	8	116	23	1
84	30	7	117	29	5
85	35	4	118	35	9
86	35	7	119	24	7
87	36	9	120	36	9
88	32	19	121	32	8
89	30	6	122	35	12
90	30	13	123	28	13
91	34	10	124	23	6
92	31	15	125	30	8
93	29	9	126	34	9
94	24	7	127	33	8
95	32	1	128	34	4
96	29	3	129	34	11
97	33	5	130	34	13
98	30	6	131	35	9
99	29	12	132	35	12
100	28	4	133	35	14
101	30	7	134	36	9
102	27	6	135	32	5
103	29	10	136	28	10
104	31	5	137	37	7
105	31	8	138	35	3
106	32	4	139	34	5
107	31	4	140	38	9
108	25	4	141	26	7
109	29	10	142	28	5
110	28	4	143	31	7
111	25	5	144	32	7
112	27	4	145	31	10
113	37	11			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 519

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	17	22	41	26	13
2	23	23	42	28	7
3	24	23	43	30	11
4	19	15	44	27	20
5	11	19	45	29	10
6	15	15	46	35	11
7	12	24	47	32	14
8	18	20	48	30	9
9	23	19	49	26	15
10	12	14	50	27	10
11	17	15	51	27	15
12	19	22	52	34	20
13	21	23	53	25	13
14	17	19	54	31	14
15	14	18	55	33	11
16	21	16	56	33	4
17	22	21	57	27	7
18	20	24	58	37	5
19	19	22	59	29	3
20	24	19	60	37	7
21	21	24	61	33	6
22	24	20	62	31	11
23	22	19	63	32	7
24	21	21	64	31	9
25	21	16	65	33	7
26	26	21	66	34	10
27	20	17	67	30	7
28	21	19	68	33	9
29	24	17	69	32	13
30	24	18	70	31	11
31	28	14	71	33	10
32	20	13	72	29	7
33	25	13	73	30	10
34	26	13	74	25	14
35	18	6	75	26	13
36	16	9	76	31	9
37	17	11	77	31	11
38	22	8	78	36	8
39	20	10	79	33	11
40	25	8	80	33	11

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 519

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	38	9	114	33	12
82	30	10	115	36	10
83	31	5	116	36	8
84	34	9	117	38	9
85	35	11	118	33	7
86	33	12	119	32	10
87	37	6	120	38	11
88	38	8	121	39	8
89	28	13	122	39	7
90	37	7	123	35	8
91	40	10	124	34	7
92	39	13	125	34	12
93	38	8	126	40	6
94	31	11	127	38	9
95	34	12	128	39	3
96	38	8	129	38	4
97	34	10	130	37	5
98	33	8	131	37	6
99	29	14	132	39	2
100	31	9	133	34	3
101	38	7	134	37	9
102	36	16	135	37	8
103	38	4	136	39	4
104	34	16	137	37	5
105	37	6	138	33	8
106	31	6	139	36	9
107	36	11	140	36	6
108	36	8	141	33	7
109	37	9	142	35	6
110	37	11	143	37	3
111	36	9	144	36	7
112	40	4	145	36	6
113	37	0			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 520

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	24	18	41	37	1
2	12	17	42	37	4
3	8	12	43	36	7
4	17	16	44	31	7
5	24	17	45	34	3
6	18	20	46	37	6
7	23	22	47	36	6
8	21	20	48	39	5
9	23	22	49	30	7
10	24	24	50	33	11
11	23	21	51	35	7
12	23	22	52	35	4
13	20	24	53	36	5
14	29	24	54	32	8
15	25	24	55	38	7
16	27	20	56	35	5
17	26	22	57	29	4
18	25	23	58	34	3
19	23	12	59	34	7
20	29	10	60	32	8
21	28	11	61	37	8
22	33	13	62	32	8
23	35	13	63	36	9
24	35	8	64	35	8
25	32	11	65	29	6
26	28	14	66	29	9
27	38	9	67	30	6
28	35	5	68	35	1
29	29	11	69	35	6
30	30	8	70	38	4
31	32	5	71	37	6
32	36	3	72	33	9
33	38	2	73	38	3
34	32	8	74	36	6
35	38	9	75	35	11
36	39	6	76	32	6
37	36	9	77	37	8
38	38	6	78	39	7
39	30	4	79	33	6
40	34	7	80	36	4

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 520

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	35	7	114	37	0
82	37	4	115	37	8
83	33	9	116	35	3
84	31	5	117	37	4
85	36	7	118	40	4
86	37	8	119	35	4
87	38	6	120	39	2
88	39	4	121	39	4
89	35	6	122	36	7
90	38	3	123	36	10
91	35	3	124	37	10
92	34	5	125	38	5
93	36	2	126	37	7
94	35	5	127	37	2
95	34	6	128	38	4
96	36	6	129	38	5
97	36	4	130	37	4
98	34	5	131	38	6
99	33	8	132	39	7
100	37	5	133	40	2
101	36	7	134	37	6
102	35	5	135	40	6
103	35	6	136	38	4
104	35	6	137	39	5
105	35	5	138	39	3
106	38	4	139	39	3
107	37	8	140	40	4
108	36	5	141	38	2
109	37	2	142	33	6
110	37	11	143	39	5
111	36	4	144	38	6
112	33	3	145	38	3
113	39	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 521

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	30	24	41	18	22
2	17	24	42	23	24
3	20	23	43	20	24
4	24	21	44	23	21
5	18	20	45	14	18
6	23	21	46	16	19
7	25	23	47	22	27
8	18	29	48	21	18
9	18	28	49	21	19
10	23	25	50	20	17
11	23	18	51	17	14
12	23	20	52	19	17
13	19	16	53	11	16
14	16	19	54	18	16
15	21	19	55	28	26
16	17	20	56	17	21
17	13	14	57	18	23
18	19	15	58	20	21
19	15	18	59	25	17
20	22	24	60	20	19
21	16	18	61	16	16
22	26	24	62	23	18
23	23	20	63	24	25
24	25	21	64	18	19
25	24	23	65	12	15
26	17	21	66	14	14
27	23	23	67	19	15
28	24	26	68	21	19
29	23	27	69	20	23
30	19	24	70	21	15
31	19	17	71	17	16
32	20	16	72	25	17
33	20	18	73	22	18
34	16	17	74	21	27
35	18	16	75	19	19
36	20	17	76	21	14
37	16	24	77	31	26
38	19	28	78	25	24
39	22	19	79	28	20
40	15	15	80	22	21

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 521

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	26	22	114	32	10
82	25	19	115	28	14
83	24	24	116	26	14
84	29	25	117	25	17
85	21	25	118	23	14
86	29	19	119	15	24
87	21	20	120	23	22
88	18	17	121	23	21
89	22	17	122	29	21
90	26	23	123	28	21
91	21	22	124	30	26
92	22	14	125	20	21
93	19	10	126	27	24
94	28	21	127	27	21
95	24	13	128	25	17
96	27	18	129	22	15
97	27	24	130	26	14
98	28	20	131	23	15
99	23	20	132	29	11
100	24	20	133	28	13
101	27	19	134	23	14
102	25	22	135	27	14
103	25	21	136	34	15
104	29	15	137	30	15
105	19	19	138	17	9
106	27	12	139	24	14
107	25	19	140	19	13
108	28	19	141	24	11
109	27	17	142	24	14
110	26	19	143	26	10
111	26	18	144	30	0
112	27	15	145	24	10
113	21	15			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

PIRD 522

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	13	41	38	4
2	27	18	42	38	6
3	23	24	43	33	10
4	25	23	44	38	9
5	18	22	45	38	2
6	26	21	46	29	3
7	22	16	47	34	3
8	26	19	48	39	0
9	30	20	49	38	8
10	24	19	50	33	3
11	27	15	51	38	13
12	30	14	52	40	5
13	31	13	53	40	10
14	33	18	54	35	7
15	35	14	55	38	8
16	25	14	56	35	4
17	30	11	57	38	0
18	34	15	58	34	3
19	35	13	59	38	0
20	35	13	60	36	2
21	33	9	61	39	2
22	32	13	62	37	7
23	39	7	63	35	3
24	33	9	64	38	1
25	35	7	65	39	3
26	32	4	66	36	1
27	36	8	67	37	4
28	35	8	68	31	5
29	36	17	69	34	4
30	36	14	70	37	4
31	39	11	71	38	3
32	31	7	72	37	2
33	32	7	73	38	5
34	35	4	74	36	7
35	33	3	75	37	5
36	37	8	76	39	2
37	34	6	77	40	4
38	37	8	78	39	2
39	40	12	79	39	3
40	35	6	80	38	4

- SUMMARY OF DATA FROM EACH SESSION -- GROUP ED160

BIRD 522

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	39	2	114	36	3
82	37	6	115	40	1
83	40	1	116	39	2
84	37	4	117	39	5
85	40	2	118	38	2
86	39	5	119	37	1
87	39	4	120	40	0
88	38	2	121	40	4
89	38	4	122	38	2
90	38	1	123	40	3
91	38	3	124	36	2
92	39	1	125	40	1
93	40	1	126	38	1
94	39	1	127	39	2
95	40	1	128	39	3
96	40	1	129	40	3
97	39	2	130	38	4
98	39	2	131	39	2
99	39	2	132	40	1
100	37	1	133	40	0
101	39	3	134	40	6
102	40	4	135	37	3
103	38	2	136	39	3
104	40	0	137	39	8
105	38	3	138	39	3
106	38	4	139	38	5
107	39	1	140	38	2
108	35	1	141	40	4
109	38	1	142	40	2
110	38	1	143	39	3
111	39	1	144	38	6
112	38	0	145	39	7
113	39	4			

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 523

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	17	25	41	27	20
2	20	10	42	23	26
3	13	19	43	23	29
4	23	15	44	20	24
5	18	14	45	20	19
6	20	20	46	23	21
7	17	12	47	27	21
8	9	7	48	17	20
9	9	17	49	18	23
10	15	16	50	17	24
11	15	16	51	21	23
12	12	19	52	20	21
13	12	12	53	19	22
14	21	22	54	23	22
15	13	19	55	21	20
16	20	19	56	14	25
17	18	14	57	15	5
18	24	23	58	18	19
19	16	23	59	18	11
20	26	25	60	19	23
21	18	19	61	20	19
22	23	19	62	16	13
23	27	18	63	16	15
24	16	20	64	17	19
25	18	19	65	24	20
26	24	20	66	16	17
27	19	21	67	19	11
28	18	22	68	20	13
29	15	15	69	27	23
30	15	22	70	16	12
31	16	14	71	20	17
32	18	22	72	19	16
33	16	17	73	17	17
34	15	19	74	23	16
35	16	21	75	12	15
36	18	24	76	21	18
37	22	15	77	22	18
38	20	25	78	18	23
39	21	24	79	16	21
40	22	23	80	23	14

SUMMARY OF DATA FROM EACH SESSION - GROUP ED160

BIRD 523

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	24	21	114	30	18
82	28	24	115	29	14
83	26	17	116	26	13
84	30	22	117	29	11
85	26	25	118	31	12
86	21	23	119	34	11
87	23	18	120	31	15
88	23	14	121	33	12
89	24	24	122	32	15
90	14	12	123	35	15
91	24	11	124	33	11
92	16	15	125	32	13
93	24	16	126	30	9
94	19	15	127	33	10
95	23	18	128	32	14
96	17	17	129	35	9
97	22	18	130	30	14
98	19	21	131	34	11
99	29	23	132	28	10
100	18	12	133	30	7
101	24	22	134	33	9
102	32	26	135	29	10
103	33	17	136	31	7
104	32	13	137	28	14
105	26	16	138	33	8
106	37	21	139	28	5
107	36	13	140	31	6
108	36	22	141	29	4
109	30	22	142	28	5
110	23	22	143	32	8
111	27	14	144	35	8
112	30	13	145	29	2
113	29	20			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 492

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	11	22	41	21	18
2	20	17	42	27	9
3	16	23	43	31	17
4	21	23	44	30	16
5	25	22	45	32	15
6	23	21	46	32	12
7	26	21	47	30	15
8	27	24	48	33	12
9	14	21	49	32	10
10	14	22	50	22	15
11	24	28	51	31	11
12	23	29	52	33	10
13	21	19	53	28	11
14	20	28	54	33	8
15	27	24	55	34	9
16	24	24	56	35	14
17	31	33	57	31	13
18	25	32	58	34	13
19	27	26	59	36	9
20	25	26	60	35	10
21	27	25	61	34	8
22	28	24	62	33	3
23	27	20	63	36	5
24	27	23	64	36	4
25	21	21	65	34	7
26	22	21	66	34	5
27	17	21	67	36	12
28	23	18	68	34	6
29	27	21	69	35	9
30	23	20	70	33	9
31	25	21	71	34	11
32	26	23	72	33	9
33	24	28	73	35	7
34	25	20	74	34	5
35	26	23	75	31	12
36	24	24	76	35	9
37	26	20	77	31	10
38	27	16	78	39	4
39	26	16	79	31	7
40	31	15	80	36	5

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 492

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	36	12	114	39	7
82	35	11	115	34	10
83	34	8	116	37	8
84	38	7	117	39	6
85	39	5	118	38	9
86	36	8	119	37	6
87	36	5	120	39	4
88	37	7	121	39	1
89	36	9	122	35	3
90	34	7	123	39	4
91	36	9	124	37	3
92	38	5	125	37	5
93	38	5	126	37	4
94	38	7	127	37	6
95	39	10	128	38	3
96	37	7	129	38	9
97	38	3	130	40	5
98	39	7	131	37	3
99	36	4	132	37	3
100	40	3	133	37	3
101	40	9	134	39	5
102	38	2	135	37	2
103	34	10	136	37	7
104	38	6	137	35	3
105	40	4	138	35	4
106	38	7	139	37	7
107	39	9	140	33	3
108	39	6	141	36	2
109	38	6	142	37	3
110	36	8	143	34	1
111	36	8	144	36	6
112	38	7	145	32	5
113	38	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 493

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	15	16	41	18	16
2	22	21	42	17	15
3	18	23	43	20	20
4	18	24	44	18	18
5	15	15	45	18	22
6	23	22	46	22	12
7	30	25	47	27	12
8	20	19	48	25	10
9	28	20	49	28	11
10	28	17	50	28	11
11	19	21	51	32	11
12	17	21	52	38	5
13	20	20	53	38	5
14	19	21	54	35	4
15	13	17	55	35	7
16	18	21	56	38	6
17	13	18	57	36	4
18	17	17	58	36	4
19	20	12	59	36	3
20	10	18	60	38	7
21	9	14	61	38	3
22	9	15	62	39	6
23	16	15	63	39	3
24	18	15	64	39	8
25	17	13	65	37	6
26	14	12	66	38	2
27	8	9	67	40	4
28	18	11	68	37	3
29	22	12	69	38	5
30	11	14	70	38	5
31	11	13	71	35	7
32	11	18	72	37	1
33	13	9	73	38	7
34	11	11	74	39	3
35	9	12	75	36	5
36	14	19	76	35	7
37	12	17	77	39	3
38	14	17	78	37	2
39	13	13	79	38	1
40	13	21	80	34	3

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 492

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	36	3	114	38	2
82	39	3	115	37	1
83	38	5	116	32	0
84	37	2	117	39	1
85	38	3	118	40	2
86	35	6	119	37	4
87	31	8	120	36	4
88	38	4	121	38	6
89	38	4	122	36	10
90	35	4	123	34	11
91	37	3	124	39	9
92	39	3	125	39	7
93	36	2	126	38	5
94	39	0	127	38	3
95	47	1	128	37	1
96	38	1	129	30	8
97	37	1	130	37	2
98	35	1	131	38	2
99	38	2	132	39	0
100	33	2	133	38	1
101	39	1	134	37	4
102	37	5	135	39	2
103	39	0	136	39	4
104	36	3	137	37	1
105	36	1	138	40	2
106	37	3	139	40	4
107	38	3	140	38	2
108	39	3	141	40	2
109	40	1	142	39	2
110	38	2	143	38	1
111	39	3	144	40	3
112	39	0	145	38	1
113	38	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 494

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	24	24	41	24	10
2	31	25	42	24	7
3	9	13	43	25	11
4	18	20	44	22	12
5	20	18	45	21	14
6	20	18	46	27	12
7	17	12	47	26	12
8	20	21	48	20	13
9	13	10	49	29	12
10	8	12	50	30	13
11	14	10	51	26	15
12	10	9	52	32	13
13	11	10	53	30	8
14	12	11	54	25	11
15	18	9	55	18	7
16	17	19	56	27	8
17	13	14	57	24	6
18	19	24	58	27	9
19	17	20	59	30	8
20	17	19	60	23	8
21	18	10	61	32	8
22	12	14	62	29	5
23	10	18	63	29	3
24	19	18	64	27	7
25	22	20	65	29	13
26	17	16	66	24	11
27	8	10	67	22	11
28	16	16	68	30	11
29	22	20	69	29	9
30	17	8	70	30	13
31	14	13	71	27	7
32	12	13	72	28	7
33	13	13	73	28	15
34	20	14	74	30	9
35	17	17	75	25	8
36	20	18	76	26	5
37	28	18	77	25	8
38	26	13	78	29	9
39	20	7	79	30	13
40	19	15	80	19	13

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 494

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	22	5	114	26	4
82	26	7	115	25	13
83	23	8	116	17	5
84	25	3	117	28	5
85	24	6	118	27	3
86	21	6	119	20	5
87	26	5	120	26	6
88	17	10	121	29	5
89	28	8	122	28	4
90	22	9	123	27	3
91	23	6	124	31	3
92	25	5	125	23	9
93	23	7	126	24	5
94	30	5	127	29	2
95	24	7	128	29	4
96	26	3	129	29	5
97	27	1	130	35	6
98	24	5	131	26	6
99	24	10	132	28	4
100	25	8	133	35	2
101	33	9	134	22	4
102	24	3	135	26	6
103	28	4	136	32	5
104	21	7	137	28	6
105	32	4	138	27	3
106	33	7	139	30	6
107	24	1	140	32	6
108	30	3	141	37	4
109	30	2	142	38	6
110	21	6	143	39	12
111	23	5	144	31	12
112	30	5	145	25	16
113	30	6			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 495

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	28	25	41	23	20
2	19	17	42	18	20
3	10	23	43	15	22
4	15	25	44	14	11
5	21	22	45	23	19
6	16	22	46	22	15
7	19	16	47	20	24
8	14	19	48	21	22
9	12	12	49	16	16
10	72	13	50	20	18
11	20	18	51	19	20
12	16	17	52	23	22
13	18	18	53	16	17
14	25	24	54	10	11
15	17	18	55	16	15
16	18	18	56	19	19
17	18	21	57	21	18
18	20	16	58	18	16
19	14	20	59	20	18
20	14	14	60	19	10
21	11	12	61	21	13
22	15	13	62	18	17
23	18	6	63	20	17
24	22	19	64	16	13
25	24	16	65	19	17
26	11	20	66	19	22
27	15	26	67	21	11
28	22	13	68	10	14
29	19	13	69	28	16
30	21	19	70	15	14
31	15	9	71	18	16
32	17	15	72	18	19
33	16	9	73	18	15
34	11	14	74	19	24
35	22	10	75	19	17
36	8	17	76	15	11
37	13	18	77	11	8
38	8	8	78	12	14
39	10	13	79	14	22
40	20	12	80	19	16

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 495

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	14	13	114	16	13
82	16	13	115	18	15
83	13	15	116	16	10
84	27	18	117	25	14
85	22	15	118	19	12
86	18	15	119	14	6
87	11	12	120	13	11
88	16	8	121	14	9
89	12	12	122	24	14
90	15	11	123	16	14
91	21	18	124	17	9
92	24	12	125	16	13
93	11	5	126	14	8
94	19	12	127	19	14
95	23	16	128	18	13
96	15	13	129	11	8
97	11	6	130	19	17
98	21	12	131	23	18
99	13	10	132	24	12
100	21	17	133	15	14
101	22	17	134	23	15
102	17	15	135	17	16
103	23	12	136	23	17
104	20	12	137	16	9
105	16	13	138	21	13
106	29	19	139	22	21
107	26	18	140	21	21
108	27	12	141	22	17
109	20	17	142	29	16
110	20	18	143	26	25
111	19	19	144	29	16
112	15	17	145	26	26
113	18	11			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 496

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	14	41	24	12
2	23	14	42	24	10
3	18	25	43	26	9
4	18	28	44	29	18
5	16	18	45	33	13
6	23	20	46	34	15
7	26	23	47	30	13
8	21	23	48	31	10
9	31	24	49	26	10
10	20	23	50	32	9
11	17	20	51	32	10
12	19	26	52	34	10
13	19	22	53	37	5
14	15	17	54	35	5
15	25	19	55	34	5
16	16	25	56	33	5
17	20	19	57	35	7
18	17	16	58	30	5
19	18	21	59	27	12
20	22	11	60	36	7
21	24	21	61	33	10
22	19	21	62	34	9
23	24	27	63	32	8
24	22	19	64	32	8
25	13	20	65	33	6
26	23	22	66	32	7
27	13	22	67	33	6
28	17	20	68	34	8
29	23	22	69	32	11
30	17	14	70	35	8
31	19	16	71	35	9
32	19	15	72	30	10
33	19	13	73	31	9
34	13	15	74	33	8
35	20	12	75	40	6
36	20	12	76	36	11
37	15	12	77	36	10
38	11	14	78	35	11
39	22	10	79	34	10
40	21	8	80	34	3

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 496

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	33	6	114	31	7
82	35	8	115	39	5
83	34	7	116	32	1
84	37	10	117	34	3
85	34	8	118	36	3
86	38	6	119	35	1
87	34	6	120	35	3
88	36	4	121	39	3
89	30	7	122	33	5
90	38	5	123	35	4
91	34	4	124	29	3
92	39	4	125	36	5
93	37	4	126	35	3
94	36	2	127	36	4
95	35	3	128	36	3
96	31	6	129	36	4
97	31	5	130	35	3
98	31	9	131	39	3
99	38	3	132	36	4
100	37	0	133	37	0
101	34	4	134	35	4
102	35	2	135	38	3
103	34	0	136	38	5
104	30	1	137	34	3
105	36	4	138	39	2
106	31	2	139	37	5
107	37	1	140	40	3
108	36	2	141	38	3
109	32	5	142	36	6
110	36	4	143	34	2
111	32	6	144	36	5
112	37	5	145	37	0
113	38	4			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 497

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	24	19	41	25	19
2	29	17	42	21	19
3	19	16	43	22	13
4	24	21	44	15	13
5	19	23	45	19	14
6	21	23	46	22	16
7	18	18	47	17	16
8	18	12	48	17	11
9	16	19	49	22	13
10	11	19	50	19	17
11	21	17	51	24	14
12	19	16	52	16	12
13	14	14	53	11	15
14	17	14	54	26	10
15	21	21	55	15	14
16	21	23	56	23	11
17	16	20	57	15	13
18	30	19	58	10	14
19	17	22	59	17	14
20	18	20	60	20	10
21	19	22	61	14	5
22	24	16	62	12	13
23	17	18	63	16	8
24	17	18	64	18	16
25	20	14	65	20	9
26	19	17	66	17	14
27	19	15	67	14	12
28	11	17	68	12	11
29	13	18	69	17	17
30	25	18	70	18	13
31	23	19	71	23	16
32	16	14	72	24	13
33	23	14	73	14	10
34	21	18	74	15	13
35	16	15	75	18	13
36	22	23	76	20	17
37	18	23	77	16	7
38	24	27	78	23	11
39	23	25	79	21	8
40	20	19	80	27	17

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 497

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	27	29	114	26	10
82	21	17	115	22	14
83	25	10	116	24	13
84	16	11	117	27	14
85	21	11	118	30	12
86	27	22	119	29	10
87	24	9	120	25	11
88	24	17	121	32	11
89	21	15	122	24	19
90	24	14	123	31	9
91	22	17	124	28	14
92	32	8	125	36	18
93	29	17	126	31	20
94	21	16	127	33	12
95	20	5	128	31	10
96	25	15	129	29	12
97	24	11	130	32	9
98	29	10	131	25	11
99	24	6	132	28	10
100	25	16	133	25	14
101	21	18	134	31	11
102	25	7	135	38	12
103	14	13	136	33	11
104	18	13	137	33	17
105	17	9	138	30	6
106	16	13	139	30	14
107	27	20	140	34	10
108	22	12	141	27	9
109	22	16	142	32	6
110	20	9	143	31	14
111	25	12	144	33	17
112	13	12	145	32	13
113	15	14			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 498

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	23	26	41	17	13
2	20	24	42	22	23
3	22	22	43	18	11
4	23	21	44	12	11
5	31	20	45	14	11
6	19	26	46	14	9
7	25	27	47	15	14
8	22	23	48	16	17
9	26	24	49	19	19
10	31	26	50	17	13
11	31	32	51	17	16
12	31	29	52	13	14
13	28	19	53	12	10
14	28	28	54	15	7
15	30	22	55	17	8
16	23	28	56	6	10
17	22	20	57	13	12
18	15	18	58	7	9
19	21	24	59	17	10
20	27	30	60	19	16
21	23	27	61	13	14
22	26	25	62	22	9
23	29	23	63	14	15
24	21	24	64	8	12
25	23	26	65	18	13
26	22	23	66	14	15
27	26	27	67	12	11
28	22	21	68	23	15
29	23	18	69	18	11
30	22	18	70	17	14
31	24	24	71	23	16
32	24	13	72	18	18
33	16	19	73	22	14
34	22	22	74	21	13
35	22	28	75	20	14
36	22	16	76	24	16
37	19	16	77	22	14
38	23	16	78	25	20
39	16	19	79	23	20
40	22	17	80	17	19

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 498

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	23	18	114	21	9
82	26	21	115	26	10
83	30	20	116	32	9
84	27	14	117	24	5
85	22	16	118	30	10
86	27	20	119	23	7
87	32	24	120	28	9
88	30	20	121	27	0
89	31	14	122	33	4
90	29	16	123	35	18
91	33	14	124	31	9
92	28	16	125	31	9
93	28	11	126	33	8
94	27	16	127	31	7
95	31	10	128	34	8
96	26	20	129	34	8
97	29	22	130	31	6
98	29	14	131	31	5
99	30	15	132	29	4
100	29	12	133	35	9
101	31	12	134	29	10
102	23	8	135	29	2
103	30	12	136	30	5
104	34	10	137	30	2
105	29	12	138	34	6
106	35	12	139	28	7
107	30	12	140	32	11
108	33	11	141	22	7
109	25	15	142	28	6
110	31	8	143	29	15
111	31	11	144	33	9
112	36	11	145	32	7
113	27	14			

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 499

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	26	14	41	30	6
2	27	13	42	31	8
3	16	20	43	33	3
4	19	18	44	34	7
5	21	19	45	30	2
6	19	19	46	28	9
7	19	20	47	27	4
8	24	19	48	24	7
9	22	16	49	34	8
10	21	15	50	30	3
11	23	20	51	30	1
12	28	26	52	25	6
13	19	24	53	32	7
14	24	17	54	31	5
15	15	16	55	33	4
16	20	15	56	18	8
17	19	15	57	35	7
18	21	14	58	30	6
19	21	9	59	36	3
20	19	9	60	32	3
21	22	17	61	29	4
22	19	9	62	29	5
23	19	11	63	35	5
24	22	10	64	29	8
25	22	10	65	31	7
26	16	13	66	27	5
27	24	12	67	31	5
28	27	9	68	35	4
29	22	7	69	28	5
30	30	4	70	30	7
31	25	9	71	36	6
32	24	6	72	29	8
33	27	7	73	25	4
34	27	5	74	36	6
35	26	5	75	28	5
36	22	5	76	32	6
37	15	12	77	26	2
38	26	3	78	34	6
39	26	7	79	34	6
40	32	4	80	34	3

SUMMARY OF DATA FROM EACH SESSION - GROUP ER

BIRD 499

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	30	8	114	36	1
82	36	4	115	30	3
83	33	7	116	32	7
84	30	5	117	32	3
85	33	5	118	36	5
86	31	4	119	36	4
87	34	4	120	37	14
88	40	2	121	32	6
89	32	8	122	34	7
90	36	1	123	39	3
91	25	3	124	39	3
92	39	7	125	39	4
93	33	6	126	35	3
94	33	4	127	40	2
95	36	1	128	37	3
96	33	2	129	40	8
97	32	1	130	38	5
98	34	2	131	39	7
99	32	2	132	38	1
100	35	3	133	39	4
101	32	4	134	36	7
102	33	1	135	36	3
103	36	2	136	37	6
104	38	2	137	31	5
105	37	1	138	32	5
106	29	2	139	37	4
107	37	5	140	39	6
108	37	3	141	31	4
109	33	2	142	38	2
110	38	0	143	33	3
111	36	0	144	37	3
112	31	1	145	33	3
113	33	3			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR .

BIRD 484

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	23	25	41	25	11
2	25	26	42	22	18
3	22	24	43	23	15
4	18	27	44	25	13
5	19	20	45	14	9
6	16	22	46	21	9
7	23	22	47	27	6
8	17	12	48	17	7
9	21	20	49	21	8
10	19	15	50	26	6
11	20	21	51	26	6
12	16	16	52	22	7
13	20	19	53	27	8
14	21	14	54	22	7
15	15	16	55	32	7
16	17	21	56	31	6
17	26	21	57	26	8
18	19	22	58	27	9
19	18	23	59	25	13
20	17	22	60	28	5
21	11	24	61	26	8
22	19	15	62	33	10
23	19	23	63	34	9
24	23	16	64	28	13
25	12	20	65	34	7
26	23	14	66	27	11
27	22	23	67	28	14
28	22	24	68	30	12
29	26	19	69	34	9
30	26	20	70	34	9
31	20	16	71	30	10
32	24	19	72	28	11
33	32	23	73	29	10
34	18	25	74	31	6
35	27	21	75	29	4
36	20	18	76	37	7
37	22	12	77	27	6
38	14	17	78	31	4
39	21	11	79	35	6
40	21	16	80	23	6

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 484

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	31	10	114	30	4
82	30	8	115	36	1
83	28	5	116	29	3
84	30	5	117	37	1
85	31	6	118	32	4
86	34	7	119	34	3
87	34	3	120	32	3
88	22	10	121	32	1
89	33	5	122	31	2
90	30	2	123	39	4
91	30	2	124	35	3
92	28	6	125	36	2
93	31	4	126	28	0
94	25	12	127	32	2
95	29	4	128	35	0
96	30	8	129	36	2
97	33	5	130	34	4
98	31	5	131	32	2
99	29	4	132	36	1
100	26	6	133	36	4
101	23	3	134	35	3
102	30	2	135	32	3
103	29	3	136	33	1
104	33	3	137	39	3
105	33	1	138	38	0
106	31	1	139	38	4
107	27	1	140	39	1
108	38	2	141	33	7
109	38	1	142	36	0
110	31	2	143	37	3
111	31	2	144	35	6
112	35	2	145	32	2
113	31	1			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 485

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	17	24	41	18	13
2	18	24	42	19	17
3	21	21	43	25	11
4	22	21	44	20	11
5	23	17	45	27	7
6	20	23	46	13	6
7	26	24	47	18	15
8	16	19	48	29	11
9	16	22	49	24	8
10	23	21	50	26	8
11	16	22	51	17	8
12	14	21	52	24	8
13	24	18	53	19	10
14	15	18	54	22	11
15	26	20	55	23	5
16	16	16	56	26	7
17	18	20	57	25	6
18	18	20	58	32	9
19	18	18	59	26	5
20	18	21	60	22	7
21	18	18	61	26	5
22	15	18	62	26	4
23	18	18	63	22	9
24	11	12	64	26	9
25	17	21	65	23	3
26	18	19	66	24	3
27	17	16	67	23	9
28	24	22	68	22	8
29	14	18	69	26	11
30	16	18	70	30	12
31	15	23	71	25	9
32	16	18	72	30	9
33	18	20	73	30	4
34	23	13	74	29	6
35	19	21	75	29	9
36	22	15	76	27	7
37	23	17	77	26	9
38	25	14	78	33	7
39	28	20	79	30	12
49	25	14	80	31	3

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 485

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	26	7	114	28	10
82	32	13	115	25	5
83	36	5	116	24	8
84	29	8	117	32	4
85	35	9	118	28	9
86	27	6	119	27	8
87	29	6	120	30	8
88	32	8	121	24	10
89	30	5	122	28	5
90	30	3	123	29	6
91	19	7	124	31	5
92	31	11	125	34	4
93	32	7	126	32	5
94	30	8	127	28	6
95	29	6	128	30	4
96	27	8	129	36	10
97	28	7	130	31	9
98	32	7	131	34	10
99	33	9	132	31	6
100	33	16	133	28	3
101	28	7	134	33	11
102	33	11	135	29	11
103	29	10	136	30	8
104	32	10	137	29	6
105	27	10	138	33	5
106	26	11	139	33	2
107	28	14	140	32	2
108	24	5	141	30	5
109	26	6	142	33	2
110	27	9	143	29	6
111	28	9	144	29	3
112	25	10	145	29	3
113	30	6			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 486

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	14	17	41	30	9
2	19	17	42	32	2
3	29	13	43	24	7
4	18	21	44	24	5
5	21	19	45	24	5
6	14	15	46	31	6
7	19	15	47	31	8
8	27	27	48	33	5
9	20	27	49	35	6
10	26	23	50	31	3
11	25	22	51	35	7
12	23	25	52	35	8
13	19	17	53	32	7
14	27	29	54	33	3
15	22	17	55	36	4
16	20	24	56	33	6
17	30	20	57	30	1
18	24	24	58	29	1
19	25	19	59	33	5
20	19	16	60	31	5
21	17	20	61	33	5
22	22	20	62	34	3
23	25	20	63	35	2
24	20	24	64	34	1
25	20	17	65	37	3
26	23	18	66	35	1
27	22	18	67	32	5
28	28	13	68	36	4
29	27	16	69	32	3
30	24	8	70	36	5
31	24	13	71	30	7
32	28	6	72	35	0
33	31	9	73	39	3
34	29	10	74	36	4
35	34	4	75	36	3
36	29	11	76	37	4
37	29	2	77	39	2
38	24	5	78	35	2
39	20	5	79	38	4
40	33	1	80	35	4

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 486

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	35	4	114	35	2
82	36	5	115	38	3
83	39	6	116	37	3
84	39	2	117	39	2
85	38	6	118	38	0
86	38	4	119	40	2
87	38	2	120	37	7
88	37	3	121	38	2
89	36	4	122	39	5
90	35	4	123	39	5
91	37	4	124	38	5
92	35	6	125	37	1
93	36	5	126	39	5
94	35	5	127	39	1
95	35	2	128	38	1
96	37	1	129	39	2
97	35	0	130	38	1
98	37	0	131	38	4
99	33	3	132	38	4
100	35	2	133	38	6
101	37	0	134	40	2
102	36	3	135	38	0
103	32	4	136	40	2
104	33	1	137	39	1
105	38	0	138	36	2
106	37	2	139	37	3
107	40	2	140	39	3
108	36	1	141	40	4
109	37	1	142	36	2
110	37	2	143	38	0
111	35	5	144	37	2
112	37	3	145	39	5
113	34	2			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 487

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	24	23	41	12	16
2	22	27	42	21	15
3	19	21	43	22	18
4	18	17	44	12	17
5	18	18	45	10	15
6	6	8	46	18	13
7	17	15	47	21	16
8	22	24	48	12	21
9	25	23	49	13	14
10	30	26	50	15	10
11	21	22	51	15	17
12	31	17	52	16	19
13	25	20	53	15	10
14	18	27	54	11	11
15	20	19	55	15	15
16	22	29	56	14	15
17	19	23	57	18	21
18	17	26	58	16	15
19	24	22	59	18	21
20	29	23	60	11	15
21	21	20	61	13	15
22	22	25	62	13	14
23	23	19	63	14	13
24	13	21	64	14	15
25	25	20	64	15	16
26	25	25	66	17	15
27	33	27	67	9	11
28	21	22	68	13	21
29	25	22	69	15	14
30	22	22	70	19	13
31	21	19	71	19	15
32	18	22	72	20	19
33	20	17	73	22	14
34	18	18	74	22	17
35	15	15	75	21	16
36	19	12	76	17	18
37	20	23	77	23	20
38	14	19	78	24	15
39	14	17	79	25	12
40	19	17	80	29	7

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 487

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	27	16	114	33	13
82	23	12	115	32	13
83	29	12	116	35	12
84	29	13	117	24	16
85	32	13	118	36	19
86	38	15	119	38	15
87	32	16	120	34	14
88	32	18	121	31	22
89	34	13	122	36	13
90	37	12	123	34	14
91	32	20	124	30	21
92	29	11	125	34	15
93	32	19	126	36	13
94	33	14	127	39	14
95	34	14	128	35	9
96	33	17	129	32	14
97	33	10	130	38	14
98	32	14	131	31	17
99	29	15	132	33	9
100	30	20	133	33	11
101	32	13	134	38	6
102	28	12	135	31	8
103	35	11	136	32	7
104	35	16	137	32	9
105	35	18	138	34	9
106	33	17	139	38	4
107	37	10	140	31	7
108	30	22	141	30	15
109	37	20	142	34	12
110	37	19	143	31	17
111	33	10	144	33	10
112	29	20	145	33	5
113	34	10			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 488

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	25	41	29	19
2	20	18	42	30	20
3	16	18	43	28	19
4	17	18	44	37	10
5	15	13	45	35	14
6	17	26	46	34	5
7	16	18	47	36	8
8	16	22	48	34	5
9	17	21	49	30	6
10	20	22	50	33	4
11	22	19	51	31	8
12	14	19	52	38	6
13	17	21	53	36	13
14	26	13	54	39	5
15	20	17	55	38	14
16	21	20	56	35	7
17	20	16	57	39	15
18	17	17	58	34	3
19	21	21	59	38	9
20	16	17	60	37	7
21	20	16	61	35	8
22	19	22	62	30	12
23	16	19	63	37	13
24	18	14	64	32	8
25	21	11	65	32	6
26	16	14	66	31	9
27	14	18	67	34	7
28	22	21	68	35	10
29	24	16	69	37	10
30	24	11	70	34	5
31	26	13	71	29	10
32	20	10	72	33	11
33	18	8	73	35	5
34	29	8	74	36	10
35	31	11	75	27	6
36	26	10	76	23	11
37	35	16	77	27	10
38	39	24	78	25	14
39	34	16	79	35	8
40	32	19	80	37	8

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 488

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	30	11	114	40	6
82	36	12	115	39	1
83	33	7	116	34	4
84	37	6	117	39	3
85	37	6	118	39	4
86	37	8	119	34	2
87	38	13	120	36	7
88	36	8	121	32	2
89	35	6	122	34	2
90	37	12	123	35	1
91	34	6	124	35	3
92	39	3	125	34	3
93	35	9	126	32	5
94	36	6	127	38	2
95	39	6	128	38	0
96	40	10	129	38	0
97	36	8	130	36	3
98	38	8	131	33	3
99	38	8	132	38	2
100	38	7	133	36	1
101	38	10	134	39	3
102	39	4	135	36	2
103	37	4	136	36	4
104	38	3	137	39	1
105	37	3	138	35	3
106	30	1	139	36	3
107	37	10	140	40	1
108	36	8	141	34	4
109	37	7	142	40	4
110	39	4	143	40	4
111	37	5	144	34	2
112	40	5	145	36	3
113	37	6			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 489

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	15	24	41	8	10
2	20	29	42	12	7
3	24	25	43	10	16
4	20	21	44	14	6
5	19	21	45	9	17
6	19	16	46	10	13
7	19	27	47	15	11
8	16	20	48	16	9
9	19	16	49	17	11
10	14	19	50	17	14
11	22	19	51	16	9
12	17	17	52	26	11
13	18	20	53	22	9
14	13	17	54	28	8
15	14	18	55	33	9
16	20	17	56	30	10
17	15	20	57	28	8
18	15	16	58	35	16
19	16	15	59	30	10
20	18	16	60	31	13
21	14	18	61	21	5
22	10	11	62	31	8
23	17	12	63	24	11
24	16	12	64	27	11
25	12	12	65	30	11
26	8	12	66	33	11
27	9	11	67	27	15
28	9	7	68	30	12
29	5	7	69	30	12
30	8	9	70	29	8
31	7	6	71	30	7
32	8	7	72	31	8
33	6	8	73	31	6
34	13	6	74	34	14
35	15	8	75	31	13
36	3	10	76	36	15
37	13	11	77	33	12
38	13	7	78	31	12
39	6	7	79	32	13
40	9	6	80	26	10

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 489

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	30	10	114	32	13
82	30	14	115	27	14
83	32	14	116	28	13
84	32	13	117	34	7
85	25	8	118	34	11
86	29	8	119	35	6
87	32	11	120	35	11
88	27	13	121	36	11
89	29	14	122	32	10
90	25	11	123	31	11
91	34	12	124	37	9
92	34	9	125	33	6
93	35	17	126	32	7
94	29	12	127	31	4
95	30	9	128	35	9
96	35	8	129	31	9
97	28	18	130	30	6
98	28	8	131	35	5
99	37	8	132	28	7
100	33	10	133	35	6
101	35	9	134	32	9
102	31	20	135	33	8
103	32	17	136	36	4
104	37	12	137	35	10
105	35	13	138	36	8
106	35	12	139	32	2
107	39	8	140	37	7
108	35	9	141	37	3
109	36	9	142	35	6
110	32	14	143	34	6
111	35	12	144	37	6
112	35	7	145	38	11
113	31	13			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 490

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	22	41	34	12
2	18	16	42	35	19
3	19	17	43	36	9
4	23	24	44	34	9
5	24	23	45	36	7
6	9	22	46	33	7
7	16	20	47	40	4
8	18	23	48	34	7
9	23	21	49	39	5
10	22	24	50	39	7
11	17	20	51	36	7
12	17	16	52	38	2
13	21	21	53	38	9
14	11	20	54	36	10
15	18	21	55	39	5
16	21	22	56	36	4
17	16	22	57	38	4
18	20	25	58	36	1
19	23	16	59	37	5
20	18	19	60	38	8
21	18	23	61	34	7
22	22	21	62	37	4
23	22	23	63	39	9
24	22	21	64	39	6
25	20	21	65	38	5
26	23	25	66	32	5
27	18	15	67	36	2
28	19	20	68	37	5
29	27	16	69	36	4
30	25	26	70	35	7
31	19	14	71	33	5
32	23	22	72	35	2
33	19	13	73	33	4
34	21	19	74	35	5
35	21	23	75	37	2
36	23	14	76	34	2
37	26	18	77	31	6
38	34	17	78	36	3
39	36	13	79	36	2
40	38	7	80	39	2

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR .

BIRD 490

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	32	3	114	38	2
82	38	4	115	37	3
83	37	3	116	37	5
84	37	4	117	37	0
85	40	2	118	39	2
86	36	4	119	39	4
87	39	2	120	40	4
88	37	3	121	37	7
89	39	0	122	39	4
90	38	2	123	36	0
91	38	6	124	38	3
92	38	2	125	37	3
93	39	3	126	36	5
94	38	2	127	39	6
95	37	4	128	36	1
96	39	5	129	37	3
97	39	4	130	38	3
98	37	5	131	38	4
99	38	2	132	40	1
100	37	2	133	39	0
101	37	4	134	39	1
102	39	3	135	39	1
103	37	3	136	37	3
104	39	2	137	37	4
105	38	4	138	40	0
106	34	5	139	37	1
107	35	0	140	38	2
108	39	3	141	37	2
109	37	2	142	39	2
110	35	0	143	38	0
111	37	3	144	36	4
112	39	4	145	38	7
113	39	5			

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 491

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
1	20	19	41	38	6
2	17	21	42	36	3
3	22	17	43	38	9
4	18	14	44	37	5
5	26	22	45	36	4
6	15	23	46	36	2
7	19	21	47	35	2
8	14	21	48	37	2
9	14	18	49	39	6
10	21	25	50	37	5
11	24	33	51	34	8
12	23	23	52	38	6
13	25	22	53	36	3
14	25	20	54	40	7
15	21	18	55	39	7
16	15	15	56	36	7
17	23	21	57	35	0
18	16	23	58	36	3
19	23	15	59	39	6
20	21	17	60	32	6
21	21	13	61	38	1
22	21	20	62	38	2
23	27	11	63	37	2
24	29	11	64	37	2
25	31	12	65	39	4
26	31	16	66	38	4
27	31	11	67	39	7
28	39	6	68	37	2
29	38	12	69	34	3
30	37	13	70	33	2
31	33	14	71	39	6
32	36	13	72	39	5
33	39	8	73	35	2
34	36	15	74	39	4
35	40	2	75	38	5
36	39	11	76	40	5
37	39	12	77	40	4
38	36	5	78	40	3
39	38	7	79	39	5
40	36	11	80	40	7

SUMMARY OF DATA FROM EACH SESSION - GROUP EIR

BIRD 491

<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>	<u>SESSION</u>	<u>R2S2</u>	<u>R2S1</u>
81	39	2	114	39	1
82	39	4	115	39	1
83	37	7	116	37	2
84	37	1	117	35	0
85	38	3	118	34	1
86	37	2	119	35	2
87	37	1	120	31	0
88	40	5	121	37	9
89	38	9	122	39	8
90	40	4	123	39	3
91	35	4	124	37	3
92	38	5	125	35	5
93	40	4	126	38	4
94	37	4	127	39	2
95	37	2	128	39	2
96	39	3	129	38	4
97	40	2	130	37	0
98	37	2	131	37	4
99	37	4	132	38	0
100	37	5	133	37	0
101	37	2	134	39	2
102	37	2	135	38	5
103	36	3	136	38	2
104	37	0	137	39	4
105	35	5	138	37	4
106	38	2	139	37	2
107	38	1	140	38	2
108	36	2	141	38	2
109	36	3	142	35	3
110	28	2	143	40	5
111	31	2	144	36	3
112	36	4	145	40	1
113	36	5			

APPENDIX B

ESTIMATION OF THE LENGTH OF THE PRESOLUTION PERIOD

An important consideration in the present study was the selection of a method of estimating the length of the presolution period. Since other investigators had not used presolution period length as a dependent variable, there were no established procedures available. In planning this study, a number of possible estimation techniques were considered and abandoned after problems developed with their use. For example, using acquisition functions such as those in Figures 3 through 5, it might be possible to estimate the length of the presolution period by inspection. A criterion such as the last time the two curves crossed might be used to identify the length of the presolution period. However, many subjects trained with difficult discrimination tasks have acquisition curves which continue to cross one another occasionally, even after the subject is performing above chance levels during most sessions.

Alternatively, some sort of statistical method, such as the sequential analysis techniques developed by Wald (1947), might be used to estimate the length of the presolution period. However, with these procedures, in order to obtain the earliest estimate of the end of the presolution period, it is necessary to accept a high risk of

deciding that the presolution period has ended when it has not.

In the present study, a curve fitting procedure was used to circumvent the problems posed by other methods of estimation. The accuracy of the estimates yielded by this procedure was determined by fitting the learning curves of a number of computer-generated stat-birds. Since the lengths of the presolution periods for the stat-birds were known, it was possible to compare the estimated presolution period lengths with the actual values. The program used to generate these stat-birds, TBIRD, was developed by Heinemann and has been shown to yield learning curves similar to those found for actual pigeons.

In order to obtain a varied sample of presolution periods, stat-birds were generated for four values of d' . The average error of the estimated presolution period lengths for each d' value is shown in Figure 8. On the average, the curve fitting procedure slightly overestimates the length of the presolution period for middle-range d' values. Nevertheless, the procedure yields reasonably accurate estimates and is superior to other methods considered. A listing of the computer program used to determine the estimated lengths of the presolution periods for subjects in the present study is shown in Table 3.

Figure 8. Average error in presolution period estimates.

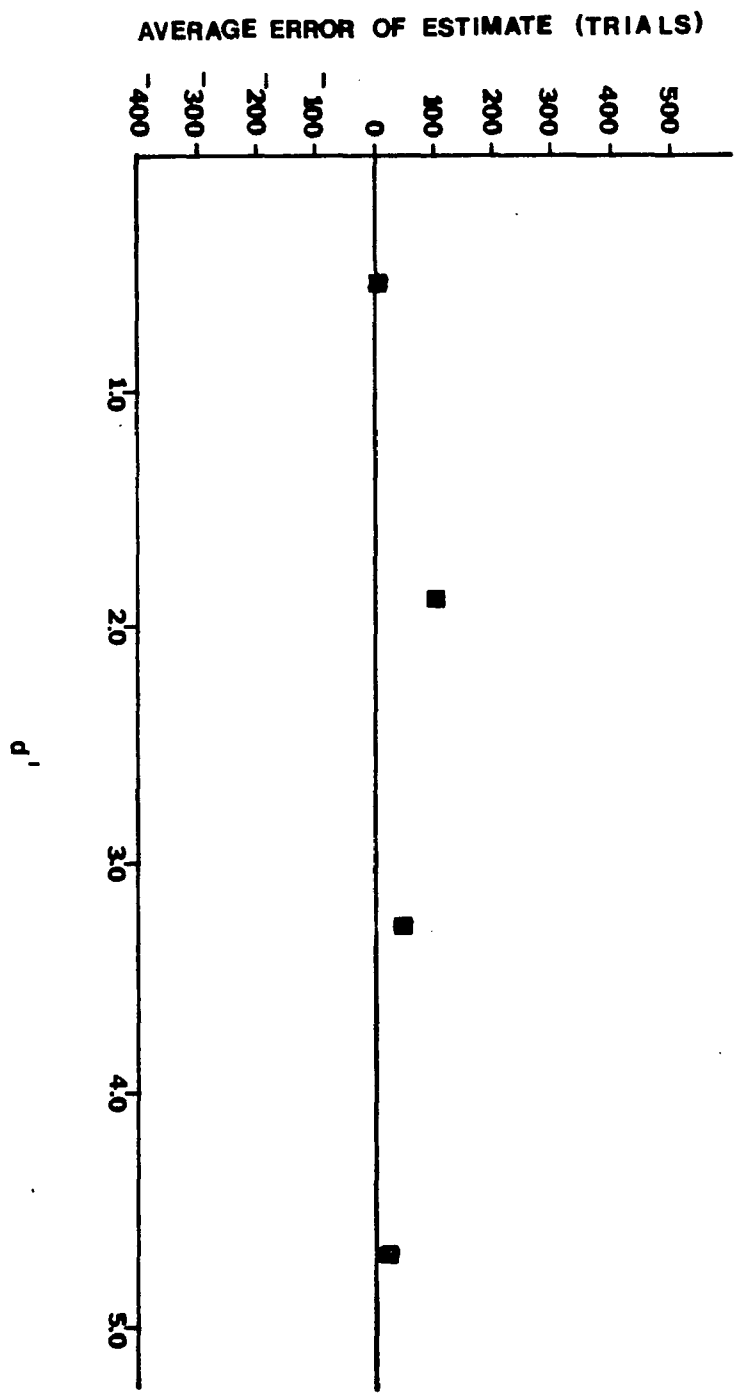


TABLE 3

THE CURVFIT PROGRAM

```

CURVFIT:PROCEDURE OPTIONS (MAIN) ;
  DECLARE
    (SDAY,EDAY,BIRD,M,J,L,H,N,K,I,A,ENDAY,NODAYS,IDAYS,NDAY,
    TENDAY) FIXED (5,0),
    (SSQ,BESTSSQ,C,D,E,THETA,BESTTHETA,STORE,B,EXP,X1,X)
    FLOAT,
    (BSTPND) FIXED (6,0),
    (P1,PI,BESTP1) FLOAT;
NEXTDATE: GET LIST (SDAY,EDAY);
  IF SDAY=0 THEN
    GO TO ALLDONE:
  PUT DATA (SDAY,EDAY);
  GET SKIP EDIT (NODAYS,PI,A,BIRD) ((4)F(10),X(40));
  PI=PI/100;
  PUT SKIP DATA (NODAYS,PI,A,BIRD);
LOOP1: BEGIN;
  DECLARE P(NODAYS) FLOAT;
  ON ENDFILE (SYSIN) GO TO DONE;
  GET EDIT (P) (SKIP,(25)E(2,2));
  DO IDAYS=1 TO NODAYS;
    IF P(IDAYS)=0.00 THEN
      P(IDAYS)=0.001;
  END;
DONE: C=10**06;
      D=10**06;
      E=10**06;
      NDAY =0;
PSLENGTH:
  DO L=1 TO EDAY-SDAY;
    NDAY=L;
    SSQ=0;
LINE: DO J=SDAY TO SDAY+NDAY;
      SSQ=SSQ+(1/(P(J)*(1-P(J))))*((0.5-P(J))**2;
      ENDAY=SDAY+NDAY;
    END LINE;
    D=SSQ;
    IF PI>0.19 THEN PISTART=100*(0.50-PI);
    ELSE
      P1START = 31;
PILOOP: DO K=1 TO P1START;
      IF PI<=0.19 THEN
        P1=0.19+K*0.01;

```

TABLE 3 (CONTINUED)

```

      IF PI>0.19 THEN
        P1=PI+K*0.01;
        B=PI-P1;
      IF B =0 THEN
        B=-0.000001;
      THETA =0;
THLOOP: DO H=1 TO 20;
      IF THETA<=0.001 THEN
        THETA =H*0.0001;
      ELSE
        THETA=(H-10)*0.001;
      SSQ=0;
      I2=0;
      DAY=0;
CURVE: DO N=ENDAY+1 TO NODAYS;
      I2=I2+1;
      DAY=FLOAT(I2);
      XPO=A*(DAY-1);
      X1=(1-THETA)**XPO;
      IF X1 10**-10 THEN
        X=PI;
      ELSE
        X=PI-B*X1;
      SSQ=SSQ+(1/P(N)*1/(1-P(N)))*(X-P(N))**2;
      END CURVE:
      IF SSQ<C THEN
        DO;
          C=SSQ;
          STORE=THETA;
          STORE2=P1;
        END;
      END THLOOP;
      END PLOOP;
      BESTSQ=C+D;
      PM=STORE2;
      APM=0;
      I=0;
      IF BESTSQ<E THEN
        DO;
          PSPEND=ENDAY*A;
          BESTP1=STORE2;
          BESTTHETA=STORE;
          E=BESTSQ;
          TENDAY=ENDAY;

```

TABLE 3 (CONTINUED)

```

      BSTPND=PSPEND;
      END;
AGAINA: END PSLENGTH;
      PUT SKIP EDIT ('P1=',BESTP1,'THETA=',BESTTHETA,'SSQ=',C)
          (X(5),A(5),F(5,3),X(5),A(10),F(8,6),X(5),A(5),E(16,7));
      PUT SKIP EDIT ('TOTAL SSQ=',E) (X(5),A(10),E(16,7));
      DO M=1 TO TENDAY;
          PUT SKIP EDIT (M,P(M),'0.500') (X(5),F(3,0),X(5),
              F(4,2),X(5),A(5));
      END;
      B=PI-BESTP1;
      T = 1.0-BESTTHETA;
      TENDAY=TENDAY+1;
      I=0;
      DO M=TENDAY TO NODAYS;
          I=I+1;
          DAY=FLOAT(I);
          X1=T**(A*(DAY-1.0));
          IF X1<10**-10 THEN
              X=PI;
          ELSE
              X=PI-B*X1;
          PUT SKIP EDIT (M,P(M),X) (X(5),F(3,0),X(5),F(5,2),
              X(5),F(6,4));
      END;
      PUT DATA (BSTPND);
      END LOOP1;
      PUT PAGE;
      GO TO NESTDATA;
ALLDONE: END CURVFIT;

```

APPENDIX C

THE USE OF THE RECIPROCAL TRANSFORM

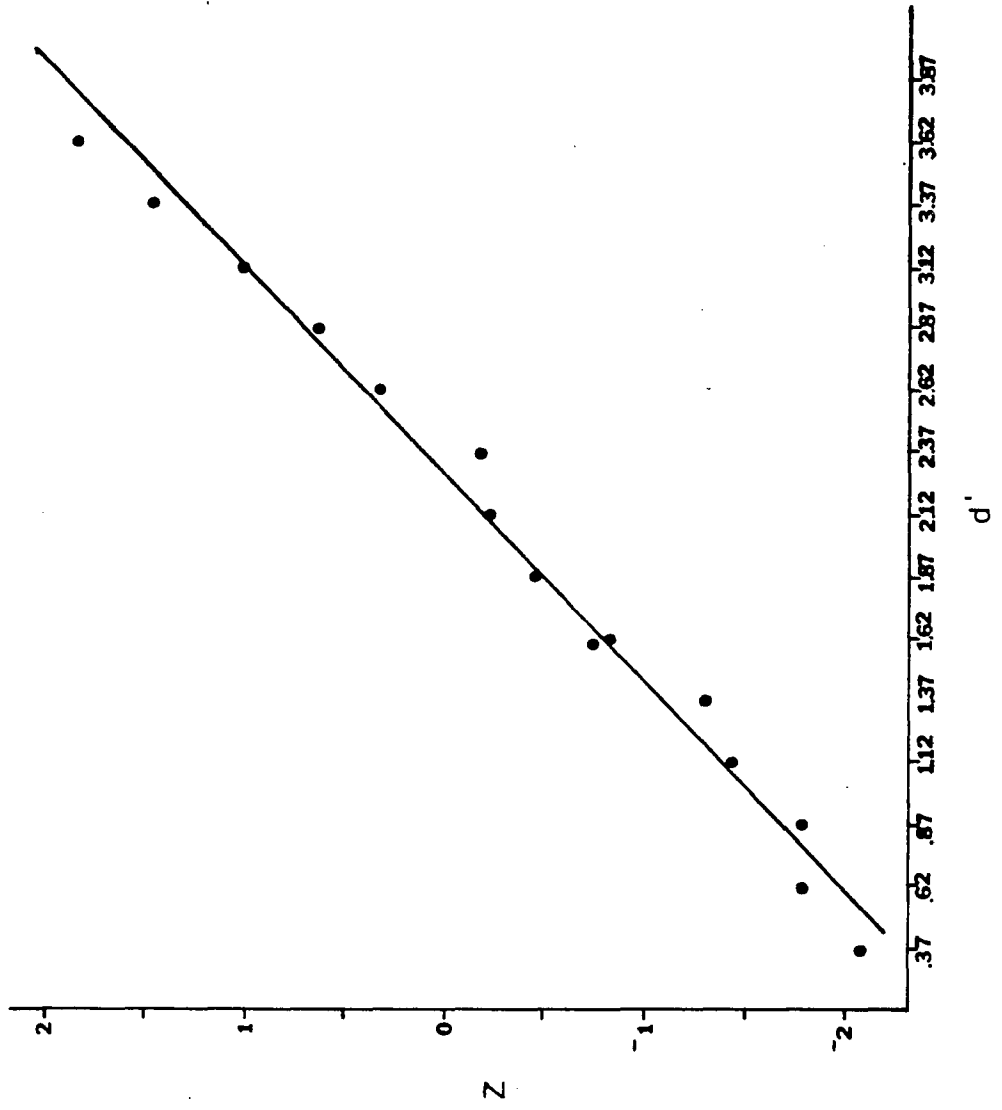
In the case of the present study, it is possible to offer an additional rationale for the use of the reciprocal transform, based on the assumptions of the statistical decision theory proposed by Heinemann and Knopp (1977).

According to statistical decision theory, d' is inversely related to the length of the presolution period. The ASN function describing this relationship is a hyperbola. Consequently, if d' is normally distributed, the length of the presolution period will have a skewed distribution. d' will be linearly related to the reciprocal of the length of the presolution period, and the distribution of the reciprocals will be normal. Therefore, if it can be shown that d' values for sound intensity are normally distributed, it would be appropriate to transform the presolution period lengths to reciprocals in order to normalize them.

To determine if the d' values for sound intensity are normally distributed, d' values were obtained for 56 pigeons trained on a task in which the discriminative stimuli were levels of white noise differing by 5 dB. The cumulative frequency distribution of the d' values was

obtained, and the cumulative frequencies were converted to z scores. If the d' values for this task were normally distributed, the function relating the z scores and d' values would be linear. Figure 9 illustrates the obtained relationship between z and d' . The points are reasonably fit by a straight line, and the figure suggests that d' values for sound intensity discriminations are normally distributed.

Figure 9. Distribution of d' values for a 5 dB sound intensity discrimination.



APPENDIX D

An alternative derivation of equations 14 and 15 which does not depend on the assumption that the slope of the decision lines are equal to zero. It makes use of the fact shown by Wald that if

$$\left| \frac{\delta}{\sigma} \sum_{\alpha=1}^m \chi_{\alpha} \right| \geq 3$$

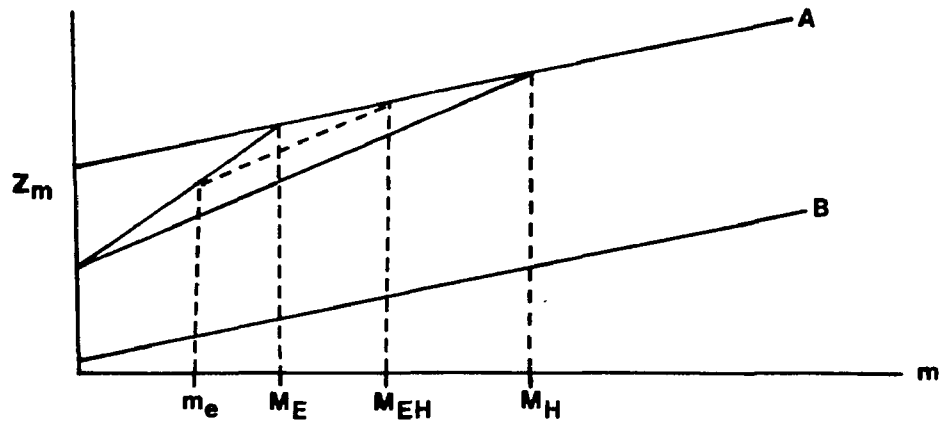
then Z_m is very nearly equal to

$$\left| \frac{\delta}{\sigma} \sum_{\alpha=1}^m \chi_{\alpha} \right| - \ln 2$$

When this approximation is used, the expected value of the decision variable is a linear function of m . In the present application, the expected value of $\left| \frac{\delta}{\sigma} \sum_{\alpha=1}^m \chi_{\alpha} \right|$ may be expressed as $\left| \frac{\delta \sqrt{N}}{2} d'm \right|$. In the previous derivation (Page 16), it was shown that the slope of the decision lines is less than 0.40 when $N=80$ and $\delta=0.89$. For these values of N and δ , $\left| \frac{\delta \sqrt{N}}{2} d'm \right|$ will exceed three after the first test ($m=1$) for all d' values larger than 0.7537. In the present study, all but three subjects have d' values larger than 0.7537, so that it is reasonable to apply this approximation. For larger values of δ , the approximation may be applied to subjects with even smaller values of d' when $m=1$. For smaller values of δ , the slopes of the decision lines will more closely approximate zero, and the basic assumption of the previous derivation will be valid.

Using Wald's approximation to Z_m , the predicted effects of easy-to-hard training during the presolution period are graphically represented in Figure 10. Line E shows how the expected value of the decision variable increased for an easy discrimination with the presolution period ending at $m=M_e$. Line H shows the same process for a hard discrimination, with the presolution period ending at $m=M_H$. For a subject given m_e training trials on the easy task and then shifted to a more difficult task, the presolution period will end at $m=M_{EH}$. By geometry, it is possible to derive an equation for the predicted effects of easy-to-hard training which is identical to equation 14. A similar treatment yields an equation for predicting the effects of easy-to-hard reversal training which is identical to equation 15.

Figure 10. Graphical representation of the predicted effects of easy-to-hard training during the presolution period.



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