STRESS INDUCED DISRUPTION OF
RELATIONAL RESPONDING IN
THE ALBINO RAT

A Thesis
Presented to
the Faculty of the Department of Psychology
University of Houston

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Lendell Williams
August 1970

ACKNOWLEDGMENTS

I would like to express special appreciation to Dr. William G. Braud for encouraging me to do this study. I would also like to thank Dr. James C. Baxter for serving on this committee and for being an excellent advisor since I entered graduate school. Thanks are also due to Dr. Robert L. Hazelwood for leaving his scientific endeavors to serve on a psychology committee.

I am also grateful to Mrs. Marion Reed for burning so much midnight oil in behalf of this paper.

To my parents, I wish to express deep appreciation for seeing me through many years of education. It is to them that this thesis is dedicated.

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ABSTRACT

Twenty female albino rats were trained on a black-gray discrimination task in a Y-maze to an 18 out of 20 correct choice criterion. Gray was always reinforced. After criterion was reached the animals were divided into 2 matched groups. Both groups were now run for 10 trials on a gray-white choice without reinforcement to test for transposition. Half of these subjects were given 5 sec. of shock in the start box before each trial while the other half received no treatment in the start box. The emotional group (shock) showed significantly less transposition than the non-shock group. A control group was run without reinforcement on a gray-white preference choice for 10 trials and then were given 10 trials with shock to see if shock alone would alter initial preferences. No significant difference in preference was found in the non-shock vs. shock conditions for the control group. The results are discussed in relation to Bridger's (1956) hypothesis concerning emotionally induced shifts from second to first signalling system functioning.

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Stress Induced Disruption of Relational Responding in the Albino Rat

In an early article by Bridger and Gantt (1956) the authors discuss the effect of mescaline upon a classically conditioned response in dogs. Under the normal non-drugged state, a tone (conditioned stimulus) was paired with a shock to the paw (unconditioned stimulus) until the tone alone elicited the response of lifting the paw. However, under mescaline, the dog ceased to make the conditioned skeletal response and howled and barked during the tone even though the shock was no longer present. The authors concluded that under the non-drugged state the animals could distinguish the CS from the UCS but that under mescaline, this relationship was disturbed. The signifier was no longer differentiated from the signified. Bridger equates this process in humans with the Pavlovian concepts of signal systems. The primary signals (first signalling system) of reality are concrete signals while the secondary signalling system is composed of abstractions of reality. Bridger contends that when there is a shift from the second to the first signalling system the gap between the signifier (CS) and the signified (UCS) lessens and the result is a lack in differentiation between the two stimuli.

The physiological mechanism that is postulated to explain this shift involves the inhibition of the neocortex and the simultaneous activation of the limbic system. Studies by Killam and Killam (1956), Marrazzi and Hart (1955), and Purpura (1956) all suggest that LSD and mescaline inhibit neocortical synapses while activating areas of the limbic system.

Bridger (1967, p. 596) postulates an additional cause for such shifts. He states that "if an idea becomes highly emotionally charged subcortical structures including the limbic system are activated and perhaps the neocortex is also under a state of partial inhibition". Such an emotional experience would also cause a shift from the second to the first signalling system. Bridger states that such an emotional experience will also "shift the level of thinking from abstract symbols toward concrete signals" (Bridger 1967, p. 593). It should be made clear here that Bridger does not consider animals to possess a second signalling system. He contends that "man, unlike all other animals, uses signals not only to indicate things, but also to represent them" (Bridger 1960, p. 438). He states that animals only react to symbols as signals. However, recent evidence indicates that animals do form rudimentary and complex concepts or abstractions. Herrnstein and Loveland (1964) taught pigeons to peck a key for a food reward. Then a procedure was instigated in which reinforcement was made contingent upon the presentation of a picture containing a human being. Twelve thousand 35-mm color slides were used. During each session 80 photographs of natural settings, including countrysides, cities, meadows, lawns were used. Half of these photographs contained at least one human being. The humans were distributed at different areas of the photographs: top, bottom, center and sides. The human beings differed in color, size, clothes, and general appearance. Some humans were nude or semi-nude, some were partially obscured by other objects. The human figures assumed different positions: standing, sitting or lying. Each day the slides were changed. Some slides were used again in later sessions but never in the same order as they were originally presented. The pigeons easily learned the concept "person". In fact, the authors stated that the speed with which the pigeons' performance improved suggested that the animals entered the experiment with the concept already formed.

Gardner and Gardner (1969) have taught a chimpanzee (Washoe) a form of the American sign language. They found that once Washoe had learned a sign she would often spontaneously connect it with another appropriate sign. Therefore, it would appear that the sign was not only a signal for a specific thing in a specific context but that the general meaning of the sign was understood sufficiently so that it could be connected with other appropriate signs to form meaningful phrases in new contexts.

Pryor, Haag and O'Reilly (1969) have provided evidence for the acquisition of a "novelty" concept in the porpoise, and Gallup (1970) has presented data suggesting a "self-concept" in chimpanzees.

The present author felt that a transposition task might be employed to test Bridger's hypothesis of signal shifts under emotional stress. Under this paradigm the tendency to transpose would be considered relational responding (e.g., responding to the concept "lighter than").

The opposite situation, non-transposition, would be considered a more concrete or absolute response. Therefore, under different emotional states different degrees of transposition might be exhibited.

The literature on transposition was surveyed to identify the nature and optimal conditions of transposition. In the present experiment, Köhler's (1939) interpretation of transposition as a relational phenomenon is assumed. Although there has been considerable debate concerning this interpretation, Lawrence and De Rivera (1954) in an extremely well designed experiment, found good evidence for relational transposition. Rats were taught a discrimination task in which the bottom half of the cards was always a medium gray (#4 brightness) while the top halves of the cards were either brighter than the bottom (values 1-3) or darker than the bottom half (values 5-7). In the initial learning phase both windows contained identical cards and the animals had to jump from a Lashley jumping stand. If the top half of the cards was lighter than the bottom half, the rat had to jump to the right to obtain a food reward; if the top half was darker, a jump to the left was required to receive a reward. During training the rat could learn to respond in a relational manner by responding to the relationship between the two halves: top lighter than bottom, jump right; top darker than bottom, jump left. The animal could also learn an absolute brightness discrimination by just responding to the top half of the card: values 1-3, jump right; values 5-7, jump left, since the bottom half of the card was always the same (value #4). During transposition testing, the brightness of the bottom half of the card was changed to determine which strategy the animals had employed during learning. If the stimulus card used during testing was 3/1 then two possible responses could result. If the animal had learned an absolute discrimination it should jump to the right since both stimuli 1 and 3 were rewarded for a jump to the right. However, if the animal had learned the initial task relationally it should jump to the left since the top half of the card was darker than the bottom half. If the testing stimulus was 5/6 then the animal could respond in an absolute manner by jumping to the left since both 5 and 6 had previously been rewarded for a left jump, but if it had learned the initial task relationally it should jump right--responding to the fact that the top half of the card was lighter than the bottom half. The authors found that 80% of the responses made during transposition testing were of a relational nature while only 20% of the responses were of an absolute nature. Therefore, the vast majority of rats did employ the concepts "lighter than" and "darker than" in the initial learning phase.

The literature was also surveyed to determine the optimal conditions under which transposition occurs. Baker and Lawrence (1951) found that simultaneous presentation of the discriminative stimuli will facilitate transposition while successive presentation will diminish transposition. Other experimenters (Honig, 1962; Riley, Goggins and Wright, 1963) have also shown that the simultaneous-stimuli procedure produces transposition while a successive-stimuli procedure does not. These findings would also indicate that an opportunity to learn the relationships among stimuli is an essential feature of transposition. Riley, Goggins and Wright (1963) also found that overtraining of the initial learning (60 trials beyond criterion) facilitated later transposition. In light of these studies, the present author designed the experiment using simultaneous presentation of the stimuli. The animals were brought to an 18 out of 20 correct responses criterion and were then given five more trials the day before transposition testing both to facilitate transposition and to provide all animals with equal exposure to the stimuli immediately before transposition testing since they had reached criterion on different days.

METHOD

Subjects. Thirty female Houston-Cheek albino rats were randomly assigned to three groups of 10 Ss each. The subjects were maintained at approximately 80% of their preexperimental body weight. They were allowed access to water for 20 minutes a day. Feeding and watering took place immediately after experimental session.

Apparatus. The experimental chamber consisted of an unpainted wooden Y-maze equipped with a hinged Plexiglas top. The entire floor of the maze was composed of 1/8-inch diameter brass rods spaced 1/2 inch center to center. The start box (9 x 12 in.) was separated from the center section by an unpainted door that was lifted to begin each trial. The center section was a pentagonal area that measured 17 inches wide with two perpendicular $12\frac{1}{2}$ inch sides and two 12 in. diagonal sides which open into the two arms of the Y-maze. Each arm was 9 x 18 inches. The training stimuli consisted of painted Masonite baffles 4 3/4 x 7 3/4 inches. During training, one arm of the maze contained two gray baffles while the other contained two black ones. The arm position (right or left) of these brightnesses was randomly varied. White and grey baffles were used during transposition testing and again their side position was varied. The baffles in each arm were staggered 4 inches from each other on opposite sides of the arm so that the animal would have to run between the two baffles to reach the goal. The goal cup, a small metal jar top, was placed behind the second baffle.

During the transposition testing phase, Ss of the shock group were administered a 1.0 ma. 5 sec. shock, applied through the grid bars of the start box. A constant current source was employed, which consisted of a variable voltage autotransformer through a 10K fixed series resistor.

Preliminary Training. Twenty subjects were given 5 training trials a day for 6 days. Each trial consisted of 20 sec. in the start box whereupon the door was opened and the animal was allowed to choose either arm of the Y-maze by running between 2 gray or 2 black baffles. If the animal chose the arm with the gray baffle (correct response) it was rewarded with 0.5cc of an 8% sucrose/distilled water solution that was placed in a goal cup behind the second baffle. If the incorrect arm (black baffle) was chosen, the animal was given a corrective procedure in which he was allowed to find the correct arm and thereby receive reinforcement. The position of the positive stimulus was randomly varied by use of the Gellermann (1933) series.

Discrimination Training. On the 7th day the procedure was altered so that if the animal made the correct choice he was blocked into that arm of the maze for 20 sec. and was rewarded. However, if the animal made the incorrect choice he was blocked into that arm of the maze for 20 sec. and was not given reinforcement. Each subject was trained until a criterion of 18 consecutive correct trials was reached. Since criterion was reached on different days all animals were given 5 more reinforced trials the day before testing. Throughout training both choice and latency were recorded.

A control group of 10 Ss was given 5 trials on each of 2 days without reinforcement and 5 trials for 2 days with shock to see if shock alone would have any effect on their initial gray-white preference.

Transposition Phase. Following training the 20 experimental Ss were divided into two matched groups on the basis of the number of trials they took to reach criterion. The Ss were then run for 2 days, 5 trials a day, using white and gray baffles without reinforcement. Half of the subjects received 1.0 ma. shock for 5 sec. in the start box. The shock group was placed in the start box for 5 sec. then received a 5 sec. shock and remained in the start box for 10 more sec. before the door was opened. The non-shock group was placed in the start box for 20 sec. before the door was opened. Both choice and latency were recorded for all animals.

RESULTS

Learning Phase

The mean numbers of trials to criterion were 93.3 and 93.2 for the non-shock and shock groups, respectively. Therefore, there was no difference on the initial learning phase when the animals were all run under the same conditions. Figure 1 shows the learning curve for the two groups over 10 trial blocks.

The mean choice latencies during the learning phase over all trials were 12.6 seconds and 13.5 seconds per trial ($t = 0.85$, $df = 9$, not significant) for the non-shock and shock groups, respectively.

Transposition Phase

The transposition phase consisted of 5 trials a day for 2 days. During this transposition testing gray and white baffles were used. Choosing white would be considered a "correct" response since it would indicate relational responding or responding to the "lighter than" stimulus. The mean numbers of responses to the white stimulus during the 10 trial testing were 5.4 and 3.0 for the non-shock and shock groups respectively. The non-shock group made significantly more relational responses than did the shock group ($t = 3.65$, $df - 9$, $p < .01$).

Figure 1. Mean Number of Correct Responses During the Learning Phase for the "Shock" and "No Shock" Groups.

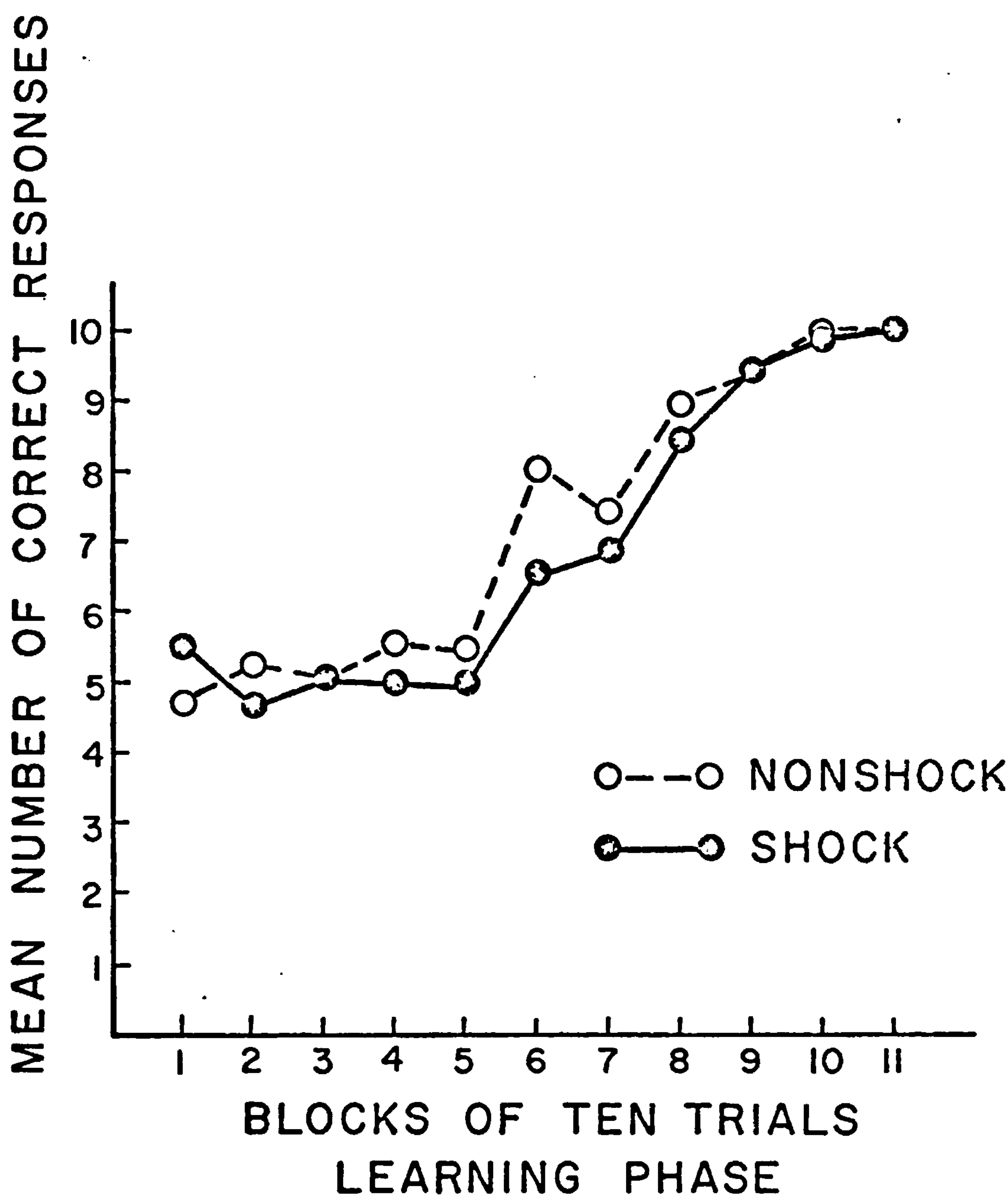
MEAN NUMBER OF CORRECT RESPONSES
10
9
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11
NONSHOCK
SHOCK
BLOCKS OF TEN TRIALS
LEARNING PHASE

Figure 2. Number of Relational Responses
During the Transposition Phase
For the Shock and No Shock Groups

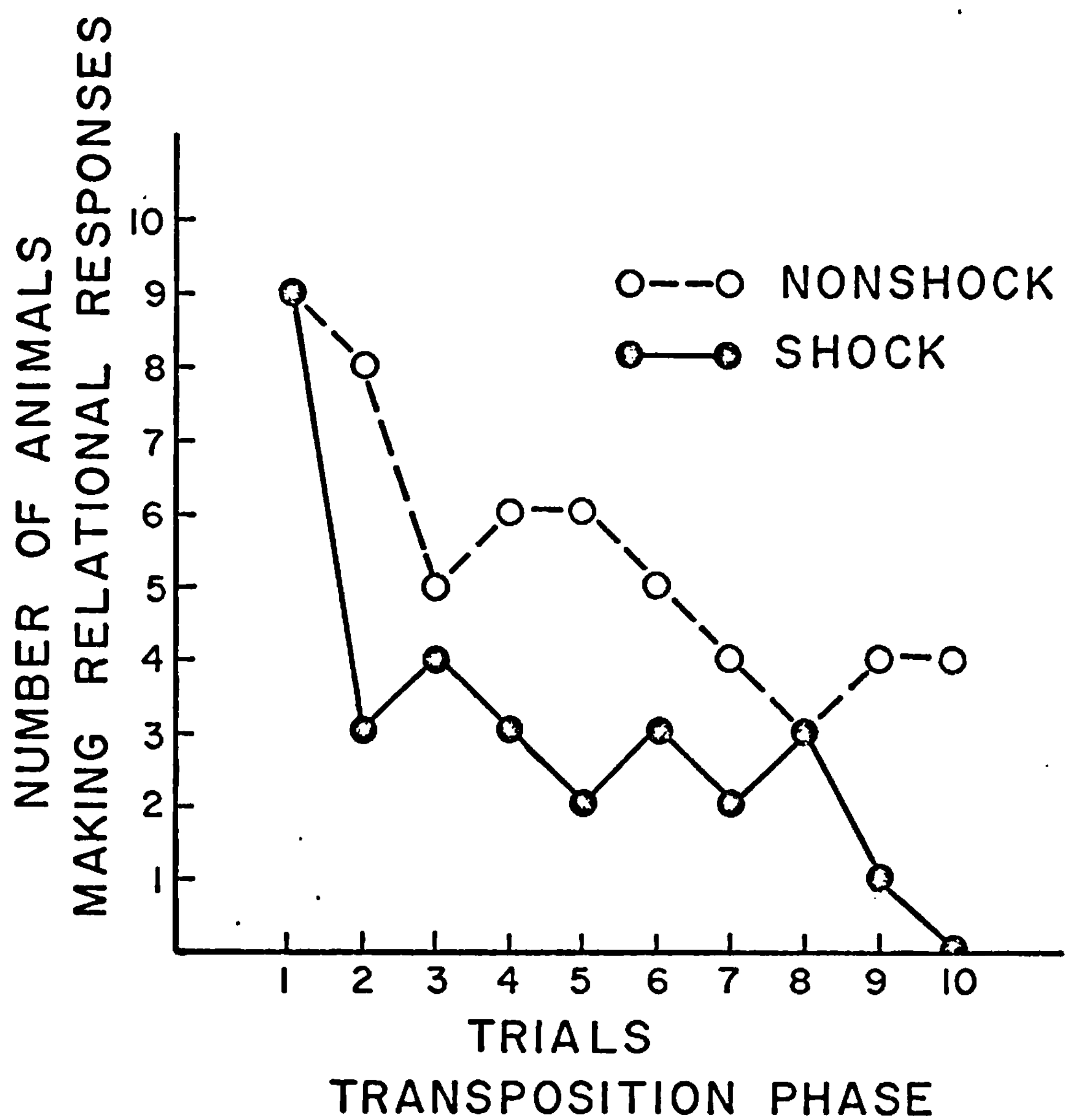
NUMBER OF ANIMALS
MAKING RELATIONAL RESPONSES
10
9
8
7
6
5
4
3
2
1
NONSHOCK
SHOCK
1
2
3
4
5
6
7
8
9
10
TRIALS
TRANSPOSITION PHASE

Figure 2 shows the trial by trial responding for the two groups. It should be noted that there is no difference in the response pattern on the first trial. This might indicate that the two groups were closely matched. However, since the shock apparatus was not working properly on the first trial, this might also account for this lack of difference. If therefore, the data are analyzed by dropping the first trial, the mean numbers of relational responses for the non-shock and shock group are changed to 4.5 and 2.1 respectively ($t = 4.44$, $df = 9$, $p < .002$).

The mean choice latencies during the testing phase were 5.8 and 4.7 seconds per trial for the non-shock and shock groups, respectively ($t = 2.44$, $df = 9$, $p < .05$).

An estimated omega square (Hays, 1963) was calculated to determine the approximate degree of association between the experimental effect and the obtained scores. When this analysis was run, the original $t(t = 3.65)$ it was found that the experimental variable could account for about 38 percent of the variance. When the estimated omega square was calculated using the t based on the last 9 trials ($t' = 4.44$) the experimental variable now accounted for about 48 percent of the variance.

A matched t-test was run for the control group comparing their gray-white preference under shock and non-shock conditions. The mean numbers of responses to the gray stimulus were 5.1 and 4.9 under the shock and non-shock conditions, respectively. This difference was not significant ($t = .44$, $df = 9$). Therefore, shock alone did not significantly effect gray-white preferences.

DISCUSSION

The twenty experimental subjects were matched so that there was no significant difference in their performance on the learning phase. During the transposition phase the non-shock group made significantly more relational responses than did the shock group. Therefore, it would appear that conceptual responding is affected by emotionality.

It should be noted that although relational responding declined sharply in the shock group it also declined over trials in the non-shock group. Other investigators (Köhler, 1938; Spence, 1937; Ehrenfreund, 1952; and Lawrence and De Rivera, 1954) have rewarded all responses made in transposition testing. In the present study neither response was rewarded. When reinforcement is used (during testing) it would tend to maintain the response that is made initially. If, however, no reinforcement is present the initial response would tend to be extinguished. It is also possible that the non-reinforcement procedure could have produced a "frustration effect" (Amsel, 1967) or emotionality in the non-shock group. Although the degree of emotionality would not be as great as that present in the shock group it might have a similar effect on the response pattern. Of course, this same "frustration effect" would also be present in the shock group. If however, non-reinforcement did produce some emotionality over trials it might account for why the high level of relational responding present on the two initial trials was not uniformly maintained over the last eight test trials in the non-shock group. Zeiler (1964) contends that the most significant transposition trial is the first test trial since it is not complicated by learning due to reinforcement nor by a non-reinforcement effect. In the present study the first trial was somewhat invalidated by the apparatus failure and therefore, it would seem that the second trial would be the next best index of the expected effect. It was found that the greatest difference between the two groups was present on this second trial.

The author intends to extend this study in the future to explore perceptual and conceptual responses in humans under stress. The perceptual task would include closure task, finding embedded figures and transposition, while the conceptual task might include verbal analogies and interpretation of proverbs.

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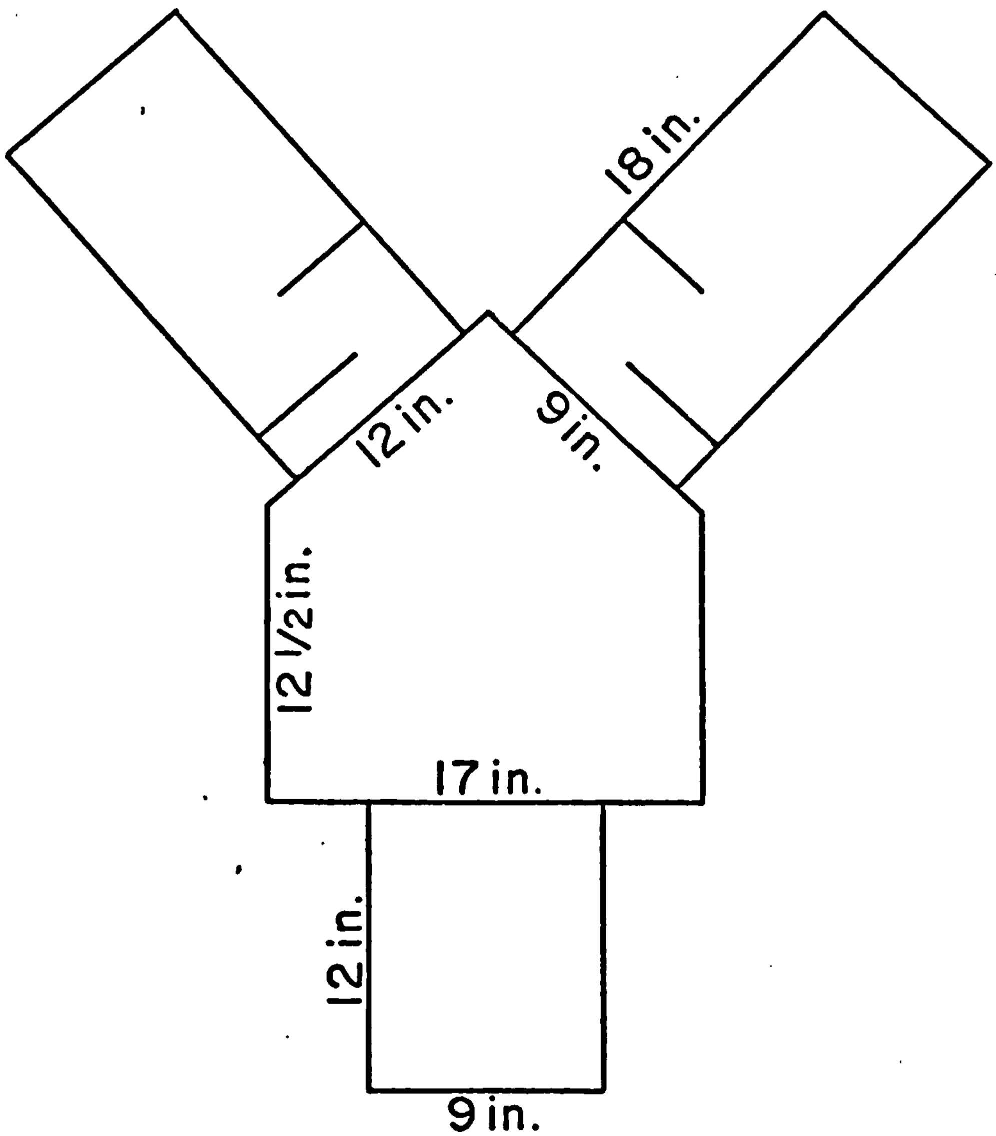
APPENDIX A

APPARATUS


18 in.
12 in.
9 in.
12 1/2 in.
17 in.
12 in.
9 in.

APPENDIX B

RAW DATA

TABLE A-1

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(60)	G(40)	G(33)	G(20)	G(10)	B(28)	G(5)	B(19)	B(50)	B(40)
2	B(255)	B(35)	B(33)	B(72)	G(10)	B(36)	G(60)	B(37)	G(9)	G(5)
3	G(60)	G(70)	B(110)	G(65)	B(70)	B(60)	B(75)	B(170)	G(120)	G(120)
4	G(120)	G(20)	B(53)	G(11)	B(60)	B(43)	G(7)	B(20)	B(42)	B(20)
5	B(110)	B(47)	G(10)	G(35)	G(9)	B(50)	B(15)	G(11)	B(80)	G(10)
6	B(160)	G(60)	B(53)	G(27)	B(35)	G(15)	B(30)	B(33)	B(40)	B(50)
7	G(155)	G(15)	B(65)	G(8)	G(22)	B(40)	G(12)	G(11)	G(10)	B(15)
8	G(275)	B(103)	B(50)	G(120)	G(45)	B(20)	G(20)	B(65)	G(50)	G(20)
9	B(120)	B(65)	B(72)	G(30)	B(33)	B(40)	B(33)	B(30)	B(12)	B(29)
10	B(60)	B(37)	G(17)	G(10)	G(8)	B(30)	G(7)	B(20)	G(7)	G(4)

MEAN CORRECT: 4.7
MEAN LATENCY: 48.3

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	B(280)	B(65)	G(180)	G(65)	B(70)	B(55)	B(70)	B(35)	G(6)	B(29)
2	G(60)	G(40)	G(22)	B(185)	G(75)	B(60)	B(35)	G(6)	G(8)	G(6)
3	B(135)	G(20)	B(37)	G(17)	G(8)	G(10)	G(7)	G(10)	G(5)	B(23)
4	B(95)	B(75)	B(47)	B(60)	B(50)	B(47)	B(50)	B(57)	G(35)	G(6)
5	G(95)	G(75)	G(120)	G(180)	G(240)	G(120	G(55)	G(21)	G(20)	G(120)
6	G(275)	G(95)	B(120	G(20)	G(37)	B(120)	B(57)	B(17)	B(5)	G(5)
7	B(95)	G(25)	B(35)	G(9)	B(40)	G(11)	G(12)	B(37)	G(9)	B(28)
8	G(75)	G(20)	G(20)	G(12)	G(7)	G(32)	G(7)	G(7)	B(60)	G(7)
9	B(80)	B(30)	B(20)	B(70)	B(40)	B(55)	B(35)	B(37)	B(50)	B(14)
10	B(75)	G(17)	B(65)	G(11)	G(10)	G(8)	B(40)	B(35)	G(18)	G(15)

MEAN CORRECT: 5.5
MEAN LATENCY: 51.2

TABLE A-2

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(5)	B(35)	G(7)	B(26)	B(24)	G(6)	B(15)	G(4)	B(15)	G(3)
2	G(7)	B(17)	G(4)	B(23)	G(5)	G(11)	G(5)	B(9)	G(5)	B(9)
3	B(95)	G(40)	B(63)	G(27)	B(45)	B(27)	B(32)	G(14)	G(35)	G(10)
4	B(35)	G(4)	G(9)	B(25)	G(11)	G(5)	B(14)	B(9)	G(3)	G(3)
5	G(5)	B(90)	G(5)	B(32)	B(20)	G(7)	G(4)	B(17)	G(3)	B(14)
6	B(16)	G(9)	B(30)	B(65)	G(11)	B(23)	G(6)	B(19)	G(5)	G(5)
7	G(15)	G(7)	G(9)	G(6)	B(25)	G(4)	B(28)	B(15)	B(14)	B(8)
8	G(70)	B(95)	G(180)	G(61)	B(180)	G(18)	B(56)	G(47)	G(11)	B(27)
9	G(23)	B(10)	G(5)	B(35)	G(15)	G(15)	G(4)	B(15)	B(11)	B(13)
10	G(3)	G(6)	B(28)	B(28)	B(45)	G(3)	B(14)	B(8)	G(5)	B(14)

MEAN CORRECT: 5.2
MEAN LATENCY: 23.0

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(15)	B(55)	G(7)	B(35)	B(20)	B(12)	B(25)	B(14)	B(25)	B(9)
2	G(5)	G(4)	G(50	B(25)	B(20)	G(3)	B(15)	B(10)	G(7)	B(11)
3	B(20)	G(5)	G(7)	B(34)	B(28)	G(4)	B(15)	B(14)	B(26)	B(25)
4	G(55)	G(6)	B(23)	B(26)	G(6)	G(5)	B(20)	B(20)	G(7)	B(13)
5	G(180)	G(90)	B(140)	G(180)	B(180)	G(45)	G(10)	G(45)	G(29)	G(27)
6	B(40)	G(3)	G(3)	B(25)	B(15)	G(4)	G(10)	B(9)	G(3)	B(6)
7	G(9)	B(16)	B(11)	B(39)	G(6)	G(12)	B(15)	B(24)	G(6)	G(4)
8	G(4)	G(4)	B(17)	G(10)	B(55)	B(21)	G(10)	G(5)	B(22)	B(28)
9	G(17)	B(17)	B(27)	B(20)	G(5)	G(7)	B(9)	B(10)	B(12)	G(3)
10	G(6)	B(16)	B(29)	G(14)	B(35)	G(7)	G(11)	B(27)	G(9)	B(20)

MEAN CORRECT: 4.7
MEAN LATENCY: 23.4

TABLE A-3

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(15)	G(4)	G(4)	G(3)	G(4)	G(3)	B(18)	B(23)	B(7)	B(12)
2	G(3)	B(15)	B(20)	B(3)	B(15)	G(3)	G(3)	B(13)	B(7)	G(7)
3	G(75)	B(58)	B(33)	G(24)	G(8)	G(4)	B(15)	B(15)	B(10)	G(5)
4	B(17)	B(17)	G(19)	G(8)	G(15)	G(4)	G(3)	B(24)	G(4)	B(35)
5	B(10)	B(9)	B(8)	G(3)	B(12)	G(3)	B(10)	B(8)	B(4)	G(6)
6	G(5)	B(28)	G(8)	G(5)	B(20)	G(3)	G(3)	B(15)	B(8)	B(12)
7	B(40)	G(20)	B(8)	G(6)	G(7)	B(15)	G(7)	B(12)	G(4)	G(10)
8	G(20)	B(85)	B(31)	G(7)	B(15)	G(7)	G(7)	B(30)	G(9)	G(15)
9	G(8)	B(15)	B(8)	G(4)	G(14)	G(8)	B(10)	B(10)	G(7)	B(22)
10	G(8)	B(23)	B(7)	B(7)	B(7)	G(3)	G(2)	B(5)	G(3)	B(8)

MEAN CORRECT: 5.1
MEAN LATENCY: 12.8

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(7)	B(30)	B(19)	B(25)	B(8)	G(7)	G(4)	B(10)	B(23)	G(3)
2	G(3)	G(7)	B(17)	G(8)	B(15)	G(7)	B(20)	B(10)	B(9)	G(4)
3	B(30)	G(7)	B(8)	G(3)	B(35)	B(28)	G(5)	B(15)	G(7)	B(25)
4	B(35)	G(10)	B(16)	B(30)	G(9)	G(3)	B(10)	B(17)	B(12)	G(14)
5	B(90)	B(35)	G(4)	G(6)	G(5)	B(35)	B(20)	B(15)	B(11)	B(25)
6	G(10)	G(4)	G(4)	G(4)	G(5)	G(3)	G(3)	B(10)	B(8)	B(7)
7	G(8)	G(8)	B(26)	G(3)	G(4)	G(5)	B(23)	G(4)	B(28)	B(15)
8	G(35)	G(5)	B(21)	G(3)	B(15)	B(5)	G(4)	G(17)	G(3)	G(5)
9	G(20)	G(3)	B(7)	G(3)	B(30	G(3)	G(5)	G(5)	B(7)	B(10)
10	G(8)	G(4)	B(30)	G(3)	B(17)	G(4)	G(4)	B(14)	B(14)	B(10)

MEAN CORRECT: 5.1
MEAN LATENCY: 13.0

TABLE A-4

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(3)	G(3)	B(3)	G(3)	B(3)	B(3)	G(4)	G(3)	B(3)	B(3)
2	G(3)	B(4)	B(3)	B(3)	G(4)	G(3)	B(4)	G(2)	B(3)	B(3)
3	G(3)	G(3)	B(3)	B(4)	G(6)	B(15)	B(4)	B(5)	G(5)	G(3)
4	G(3)	G(3)	B(3)	B(3)	B(4)	G(4)	G(4)	B(4)	B(3)	G(14)
5	G(4)	G(4)	B(4)	G(5)	G(5)	B(4)	G(7)	G(6)	B(3)	B(5)
6	G(3)	G(3)	B(3)	G(4)	G(7)	G(4)	G(5)	G(3)	B(4)	G(3)
7	G(13)	B(5)	B(3)	G(8)	B(7)	G(15)	G(5)	G(4)	B(4)	B(4)
8	G(8)	G(4)	B(3)	G(7)	B(5)	G(30)	G(12)	G(4)	B(4)	B(4)
9	G(4)	G(3)	B(3)	G(8)	B(3)	B(7)	B(4)	B(4)	G(5)	G(4)
10	G(4)	G(3)	B(3)	G(3)	B(3)	G(5)	G(3)	G(3)	G(3)	B(3)

MEAN CORRECT: 5.6
MEAN LATENCY: 4.7

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	B(5)	G(3)	B(3)	G(120)	G(65)	G(30)	G(12)	G(15)	B(4)	B(3)
2	G(3)	G(4)	B(3)	G(3)	G(3)	B(3)	B(3)	B(4)	B(3)	B(3)
3	G(5)	G(3)	B(3)	G(5)	G(3)	B(4)	B(4)	B(4)	G(5)	G(5)
4	G(3)	B(8)	B(5)	G(5)	B(4)	B(4)	B(5)	G(12)	B(3)	B(3)
5	G(10)	B(7)	B(4)	G(6)	B(5)	G(50)	G(6)	B(4)	B(4)	G(5)
6	G(3)	G(3)	B(3)	G(3)	B(4)	B(4)	B(4)	G(15)	B(4)	B(4)
7	G(5)	G(3)	B(3)	B(3)	G(3)	B(8)	G(7)	G(12)	B(4)	B(4)
8	B(4)	G(5)	G(3)	G(3)	B(3)	B(5)	B(3)	G(3)	B(4)	B(3)
9	G(4)	G(3)	B(3)	G(4)	B(4)	G(3)	B(4)	G(10)	B(4)	B(3)
10	G(7)	G(4)	G(3)	G(3)	G(3)	B(4)	B(4)	B(4)	B(4)	G(4)

MEAN CORRECT: 4.9
MEAN LATENCY: 7.7

TABLE A-5

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(22)	G(3)	G(2)	B(3)	G(4)	B(5)	B(4)	G(4)	G(4)	B(6)
2	G(5)	G(3)	B(4)	G(3)	G(4)	B(4)	G(4)	G(4)	G(4)	B(4)
3	G(9)	B(3)	B(4)	G(8)	B(4)	G(4)	G(4)	G(4)	B(4)	G(4)
4	G(4)	B(7)	G(8)	G(6)	G(9)	G(4)	B(5)	G(20)	B(5)	G(10)
5	G(5)	B(4)	G(4)	G(3)	B(4)	B(4)	G(4)	G(4)	G(4)	B(5)
6	G(7)	G(4)	G(4)	B(4)	G(8)	B(5)	G(5)	B(5)	G(4)	G(4)
7	B(6)	G(9)	B(4)	B(6)	G(10)	B(5)	B(6)	G(4)	G(4)	B(4)
8	B(5)	B(5)	G(12)	B(5)	B(11)	B(5)	G(5)	B(5)	G(8)	B(5)
9	G(8)	B(4)	B(4)	G(4)	B(4)	G(4)	G(4)	B(4)	B(4)	B(4)
10	B(4)	G(70)	G(4)	G(15)	B(4)	B(4)	B(4)	B(4)	G(3)	B(4)

MEAN CORRECT: 5.4
MEAN LATENCY: 5.9

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(35)	B(6)	G(7)	B(4)	B(8)	G(30)	B(4)	B(35)	G(30)	B(10)
2	B(3)	G(6)	B(4)	B(3)	B(4)	B(4)	B(4)	G(4)	G(4)	B(5)
3	G(6)	B(3)	B(4)	G(10)	B(4)	G(4)	G(4)	B(5)	G(6)	B(5)
4	G(30)	G(6)	G(3)	B(5)	G(4)	B(5)	G(8)	G(5)	G(4)	G(4)
5	G(5)	G(4)	B(4)	B(5)	B(4)	G(7)	B(5)	B(6)	B(5)	G(34)
6	B(4)	G(5)	B(4)	B(4)	G(3)	G(4)	B(4)	G(5)	G(3)	G(4)
7	B(6)	B(3)	B(5)	G(9)	B(4)	B(4)	B(4)	B(5)	B(5)	G(3)
8	B(5)	G(4)	G(3)	B(3)	G(3)	B(4)	B(4)	G(5)	G(3)	B(4)
9	B(5)	B(5)	B(4)	B(7)	B(4)	G(4)	G(4)	G(5)	G(3)	G(4)
10	G(5)	B(5)	G(3)	G(3)	B(4)	B(4)	B(5)	G(6)	G(3)	G(2)

MEAN CORRECT: 4.9
MEAN LATENCY: 6.5

TABLE A-6

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(8)	G(3)	B(3)	G(5)	G(3)	G(10)	G(3)	B(4)	G(4)	G(3)
2	G(3)	G(2)	B(3)	G(4)	G(2)	G(6)	G(5)	G(5)	G(4)	G(3)
3	B(6)	G(12)	B(5)	G(6)	B(5)	G(15)	G(10)	G(16)	G(4)	G(4)
4	G(5)	G(5)	G(3)	G(2)	B(4)	B(5)	G(8)	G(6)	G(6)	G(4)
5	G(4)	G(5)	G(5)	B(5)	G(5)	G(4)	B(4)	G(9)	G(5)	B(4)
6	B(5)	G(7)	B(5)	G(5)	G(9)	B(6)	G(7)	B(7)	G(4)	G(5)
7	G(8)	G(19)	G(8)	G(5)	G(6)	G(4)	G(4)	B(8)	G(12)	G(4)
8	G(20)	G(5)	G(5)	G(4)	B(15)	G(6)	B(4)	B(7)	G(8)	G(4)
9	G(30)	G(9)	G(3)	B(3)	G(10)	G(7)	G(15)	G(7)	G(8)	G(4)
10	G(5)	G(5)	G(10)	G(3)	G(2)	G(3)	G(3)	G(2)	G(2)	G(6)

MEAN CORRECT: 8.0
MEAN LATENCY: 6.1

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(20)	G(15)	B(5)	G(8)	G(5)	B(15)	B(13)	G(15)	G(6)	G(4)
2	B(10)	G(17)	B(5)	G(7)	G(7)	G(10)	G(4)	G(7)	B(5)	G(4)
3	G(5)	G(4)	G(5)	G(4)	G(4)	B(5)	B(30)	B(10)	B(8)	G(10)
4	G(5)	G(3)	B(4)	G(6)	G(12)	G(10)	B(5)	G(6)	G(5)	G(5)
5	B(6)	G(3)	B(5)	G(15)	B(5)	B(5)	G(3)	B(5)	G(6)	G(8)
6	G(4)	G(3)	G(5)	G(4)	G(2)	G(3)	G(3)	G(3)	G(4)	G(6)
7	B(6)	G(7)	G(3)	G(3)	B(4)	B(4)	G(5)	G(5)	G(3)	G(3)
8	G(3)	G(3)	B(4)	B(5)	G(6)	G(3)	B(4)	B(6)	G(5)	G(5)
9	B(4)	B(5)	G(3)	G(3)	B(3)	B(4)	G(5)	B(4)	B(4)	G(8)
10	G(5)	B(5)	G(3)	G(3)	B(4)	B(4)	B(5)	G(6)	G(3)	G(2)

MEAN CORRECT: 6.6
MEAN LATENCY: 5.9

TABLE A-7

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(4)	B(4)	G(4)	B(5)	G(10)	G(10)	G(5)	G(7)	G(3)	G(4)
2	G(4)	B(4)	G(4)	G(6)	B(5)	G(5)	B(5)	G(5)	G(3)	G(4)
3	G(9)	B(4)	G(5)	B(5)	G(7)	G(7)	G(4)	G(3)	B(3)	B(3)
4	G(5)	G(10)	G(7)	G(5)	G(30)	G(8)	G(8)	G(2)	B(4)	G(9)
5	G(4)	B(5)	G(4)	G(4)	G(6)	G(4)	G(5)	G(3)	B(4)	G(3)
6	G(8)	G(6)	G(4)	B(5)	B(7)	G(11)	G(5)	G(4)	G(3)	G(3)
7	G(7)	G(5)	B(5)	B(6)	B(5)	G(10)	G(7)	G(5)	G(5)	G(7)
8	B(7)	B(7)	G(5)	B(5)	G(6)	G(10)	G(5)	B(4)	G(5)	G(10)
9	G(5)	G(4)	G(3)	G(7)	B(5)	G(5)	G(5)	G(3)	B(3)	B(3)
10	G(4)	B(5)	G(4)	G(5)	G(6)	G(5)	G(3)	G(3)	B(2)	G(4)

MEAN CORRECT: 7.4
MEAN LATENCY: 5.4

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(50)	G(7)	G(4)	G(6)	G(5)	B(3)	G(5)	B(4)	G(3)	B(2)
2	B(15)	G(6)	G(6)	G(5)	G(4)	G(6)	B(6)	B(5)	G(9)	G(5)
3	G(6)	B(4)	B(4)	G(7)	B(5)	G(6)	G(5)	G(3)	B(4)	B(4)
4	G(4)	G(5)	G(4)	G(7)	G(6)	B(5)	G(5)	B(4)	B(5)	G(5)
5	G(7)	B(4)	G(3)	B(6)	B(6)	B(6)	G(10)	B(4)	G(15)	G(9)
6	G(4)	G(3)	G(3)	B(5)	G(3)	G(7)	G(3)	B(4)	G(2)	G(10)
7	G(10)	G(7)	B(5)	G(6)	G(8)	G(5)	G(8)	G(3)	G(5)	G(3)
8	G(5)	B(6)	G(12)	B(5)	B(5)	G(7)	G(5)	G(10)	G(4)	G(4)
9	G(10)	G(3)	B(4)	G(15)	G(5)	B(10)	G(5)	B(4)	B(4)	B(4)
10	G(6)	B(3)	G(5)	G(6)	G(7)	G(10)	G(5)	B(4)	G(3)	B(4)

MEAN CORRECT: 6.8
MEAN LATENCY: 6.0

TABLE A-8

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

	TRIALS									
SUBJECTS	1	2	3	4	5	6	7	8	9	10
1	B(6)	G(8)	G(20)	G(4)	G(4)	G(10)	G(5)	G(4)	G(3)	B(6)
2	G(4)	G(4)	G(3)	G(3)	G(4)	G(5)	B(4)	G(15)	G(5)	G(3)
3	B(10)	B(5)	G(8)	G(8)	G(3)	G(5)	B(5)	B(10)	G(10)	G(4)
4	B(3)	G(5)	G(4)	G(8)	G(5)	G(3)	G(3)	G(3)	G(3)	G(3)
5	B(4)	G(3)	G(3)	B(4)	G(3)	G(3)	B(4)	G(3)	G(6)	G(4)
6	G(6)	G(7)	G(5)	G(3)	G(4)	G(5)	G(4)	G(6)	G(3)	G(4)
7	G(5)	G(8)	G(5)	G(7)	G(15)	B(10)	B(5)	G(7)	B(10)	G(4)
8	G(7)	G(5)	G(3)	G(3)	G(3)	B(8)	G(7)	G(9)	B(3)	G(10)
9	G(3)	B(4)	G(3)	G(3)	G(3)	G(5)	G(4)	G(4)	G(3)	G(3)
10	G(3)	G(4)	G(5)	G(4)	G(2)	G(5)	G(2)	G(3)	B(3)	G(3)

MEAN CORRECT: 8.8
MEAN LATENCY: 5.1

"SHOCK" GROUP

	TRIALS									
SUBJECTS	1	2	3	4	5	6	7	8	9	10
1	G(6)	B(6)	G(10)	G(7)	G(4)	B(6)	G(8)	G(6)	G(3)	G(3)
2	G(4)	B(6)	G(6)	G(3)	G(4)	G(7)	G(3)	G(3)	G(5)	G(4)
3	G(7)	G(8)	G(20)	B(4)	G(8)	G(4)	G(5)	G(5)	G(5)	G(5)
4	G(5)	B(5)	G(7)	G(3)	G(4)	G(7)	G(3)	G(3)	B(4)	G(3)
5	G(10)	G(7)	G(13)	G(4)	G(3)	G(6)	G(4)	G(8)	B(3)	G(10)
6	G(3)	G(7)	G(5)	G(2)	G(3)	G(4)	B(4)	G(3)	G(3)	B(4)
7	G(5)	G(4)	G(3)	G(4)	G(3)	G(30)	B(7)	G(3)	G(5)	G(7)
8	G(3)	G(4)	G(3)	G(5)	G(3)	G(6)	G(5)	G(4)	G(3)	G(3)
9	B(5)	G(5)	G(4)	B(5)	G(12)	G(5)	G(3)	G(3)	G(3)	G(15)
10	G(3)	B(3)	G(20)	G(3)	B(4)	G(3)	G(3)	B(3)	G(7)	G(3)

MEAN CORRECT: 8.4
MEAN LATENCY: 5.5

TABLE A-9

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(5)	G(3)	G(3)	G(4)	G(4)	G(3)	G(4)	G(4)	G(4)	G(4)
2	G(3)	G(4)	G(3)	G(3)	G(3)	G(3)	G(4)	G(8)	G(3)	G(3)
3	G(6)	B(4)	G(4)	B(3)	G(7)	B(3)	G(4)	G(5)	G(6)	G(4)
4	G(12)	G(4)	G(4)	G(4)	G(3)	G(5)	-	-	-	-
5	G(6)	B(4)	G(5)	G(3)	G(4)	G(3)	G(10)	G(3)	G(6)	G(6)
6	-	-	-	-	-	-	-	-	-	-
7	G(5)	G(5)	G(3)	G(10)	G(3)	G(3)	G(4)	G(4)	G(7)	G(4)
8	G(6)	G(4)	B(4)	G(10)	G(4)	G(3)	B(4)	B(4)	G(5)	G(4)
9	G(4)	G(3)	G(4)	G(4)	G(4)	G(3)	G(7)	-	-	-
10	G(4)	G(10)	G(3)	G(2)	G(3)	G(2)	G(3)	G(3)	G(3)	G(5)

MEAN CORRECT: 9.3
MEAN LATENCY: 4.3

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	B(6)	G(6)	G(3)	G(4)	G(4)	G(3)	B(4)	G(6)	G(5)	G(4)
2	G(5)	G(6)	G(4)	G(20)	G(3)	G(3)	G(6)	-	-	-
3	G(5)	G(4)	G(3)	G(4)	G(4)	G(4)	G(3)	G(5)	G(5)	G(8)
4	G(5)	B(4)	G(3)	G(4)	G(4)	G(3)	G(5)	G(5)	G(5)	G(4)
5	G(4)	G(5)	B(4)	B(4)	G(5)	B(4)	G(7)	G(5)	G(5)	G(5)
6	G(4)	G(4)	G(3)	G(5)	G(3)	G(5)	G(3)	G(4)	G(4)	G(3)
7	G(3)	G(10)	G(3)	G(3)	G(3)	G(5)	G(3)	G(5)	G(3)	G(2)
8	-	-	-	-	-	-	-	-	-	-
9	G(3)	G(10)	G(5)	G(4)	G(5)	G(4)	G(6)	G(5)	G(5)	-
10	G(3)	G(4)	G(3)	G(4)	G(3)	G(4)	G(5)	G(4)	G(5)	G(4)

MEAN CORRECT: 9.4
MEAN LATENCY: 4.3

TABLE A-10

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(5)	G(4)	G(4)	G(3)	G(3)	-	-	-	-	-
2	G(3)	G(3)	-	-	-	-	-	-	-	-
3	G(6)	B(7)	G(5)	G(5)	G(3)	G(3)	G(6)	G(10)	G(5)	G(4)
4	-	-	-	-	-	-	-	-	-	-
5	G(4)	G(5)	G(3)	G(3)	G(4)	G(8)	G(4)	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	G(3)	G(4)	-	-	-	-	-	-	-	-
8	G(4)	G(3)	G(3)	G(4)	G(7)	G(4)	G(3)	G(3)	G(3)	G(3)
9	-	-	-	-	-	-	-	-	-	-
10	G(8)	G(3)	G(4)	G(3)	-	-	-	-	-	-

MEAN CORRECT: 9.9
MEAN LATENCY: 4.5

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(4)	B(4)	G(4)	G(4)	G(3)	G(3)	G(3)	G(3)	G(4)	G(3)
2	-	-	-	-	-	-	-	-	-	-
3	G(7)	G(5)	G(4)	G(5)	G(7)	-	-	-	-	-
4	G(3)	G(3)	G(3)	G(3)	G(3)	G(3)	-	-	-	-
5	G(7)	B(5)	G(3)	G(5)	G(3)	G(3)	G(6)	G(7)	G(6)	G(5)
6	G(3)	G(2)	G(3)	G(2)	G(3)	-	-	-	-	-
7	G(4)	G(3)	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	G(3)	G(4)	G(2)	G(4)	-	-	-	-	-	-

MEAN CORRECT: 9.8
MEAN LATENCY: 4.2

TABLE A-11

RAW DATA: LEARNING PHASE
CHOICE (BLACK-B or GRAY-G) and LATENCY (sec.)

"NON-SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	G(3)	G(6)	G(4)	G(5)	G(3)	G(3)	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-
8	G(3)	G(3)	G(3)	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-

MEAN CORRECT: 10.0
MEAN LATENCY: 4.1

"SHOCK" GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(3)	G(3)	G(6)	G(6)	G(3)	G(2)	G(3)	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-
5	G(7)	G(6)	G(3)	G(3)	G(3)	G(4)	G(2)	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-

MEAN CORRECT: 10.0
MEAN LATENCY: 3.8

TABLE B

RAW DATA: TRANSPOSITION PHASE
CHOICE (GRAY-G or WHITE-W) and LATENCY (sec.)

NON-SHOCK GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	G(5)	G(12)	G(5)	G(6)	W(5)	W(5)	G(5)	G(7)	G(7)	G(5)
2	W(3)	W(4)	W(3)	G(4)	G(4)	W(3)	G(3)	W(3)	G(5)	G(15)
3	W(7)	W(4)	G(6)	W(7)	W(3)	G(5)	W(3)	G(10)	G(5)	W(4)
4	W(3)	W(4)	W(6)	G(11)	W(7)	G(5)	G(5)	W(10)	G(5)	G(30)
5	W(4)	W(3)	G(3)	W(4)	G(5)	W(3)	G(5)	G(3)	W(5)	G(10)
6	W(6)	W(5)	G(5)	G(4)	W(5)	G(15)	W(10)	G(25)	W(5)	W(10)
7	W(4)	W(3)	W(4)	W(4)	G(5)	W(3)	G(15)	G(4)	G(7)	G(5)
8	W(7)	W(2)	W(15)	W(4)	W(4)	G(3)	G(7)	G(5)	W(3)	W(3)
9	W(4)	G(4)	W(3)	W(8)	W(11)	W(4)	W(3)	W(3)	G(4)	G(6)
10	W(3)	W(5)	G(5)	W(4)	G(4)	G(4)	W(3)	G(4)	W(4)	W(10)

MEAN CORRECT: 5.4
MEAN LATENCY: 5.8

SHOCK GROUP

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	W(5)	G(5)	W(5)	G(5)	G(10)	W(2)	W(3)	W(3)	G(5)	G(2)
2	W(7)	G(10)	G(7)	G(5)	G(12)	G(3)	G(3)	W(3)	G(5)	G(5)
3	W(7)	W(5)	G(3)	W(5)	W(5)	W(10)	G(3)	G(7)	G(10)	G(3)
4	W(7)	W(7)	W(6)	G(2)	G(6)	G(3)	G(3)	G(5)	G(3)	G(3)
5	W(3)	G(3)	G(6)	G(3)	W(15)	G(5)	G(7)	G(5)	G(3)	G(10)
6	W(3)	G(2)	G(3)	G(4)	G(4)	G(4)	G(3)	W(3)	G(3)	G(3)
7	W(8)	G(5)	G(3)	G(5)	G(5)	G(7)	G(6)	G(5)	W(3)	G(3)
8	W(6)	G(4)	G(3)	W(4)	G(7)	W(3)	G(5)	G(6)	G(3)	G(3)
9	W(5)	W(5)	W(5)	G(3)	G(3)	G(3)	G(6)	G(3)	G(3)	G(3)
10	G(3)	G(4)	W(4)	W(5)	G(3)	G(3)	G(5)	G(3)	G(3)	G(2)

MEAN CORRECT: 3.0
MEAN LATENCY: 4.7

TABLE C

RAW DATA: CONTROL GROUP
CHOICE (GRAY-G or WHITE-W) and LATENCY (sec.)

NON-SHOCK CONDITION

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	W(25)	W(29)	G(7)	G(6)	W(3)	G(18)	G(8)	W(11)	G(24)	G(22)
2	G(35)	G(15)	G(15)	W(15)	G(15)	W(80)	G(70)	W(15)	W(41)	W(54)
3	G(37)	G(36)	W(30)	W(25)	G(12)	W(120)	W(60)	W(15)	G(9)	W(21)
4	W(10)	W(16)	G(14)	G(13)	G(5)	W(12)	W(10)	W(20)	G(5)	G(10)
5	G(28)	G(9)	W(13)	W(8)	W(10)	G(11)	G(5)	G(23)	W(8)	W(10)
6	W(29)	W(13)	G(13)	G(18)	G(16)	G(23)	W(6)	W(32)	W(16)	W(8)
7	G(28)	W(15)	G(13)	W(5)	W(10)	G(3)	G(6)	G(7)	W(23)	W(10)
8	G(15)	W(5)	W(6)	W(7)	W(11)	W(36)	G(9)	G(6)	G(7)	G(22)
9	W(22)	G(30)	G(18)	W(9)	W(12)	G(7)	G(12)	W(13)	W(9)	G(10)
10	G(17)	G(12)	G(15)	W(19)	W(6)	W(13)	G(9)	W(21)	G(11)	W(10)

MEAN NUMBER OF GRAY CHOICES: 4.9

SHOCK CONDITION

SUBJECTS	TRIALS 1	2	3	4	5	6	7	8	9	10
1	W(12)	W(6)	G(15)	W(5)	W(15)	G(7)	W(8)	G(60)	G(30)	W(60)
2	W(16)	G(45)	W(60	G(70)	G(65)	W(26)	G(5)	W(40)	G(40)	G(60)
3	W(25)	W(11)	W(6)	G(8)	W(10)	W(15)	G(9)	G(35)	G(35)	W(15)
4	G(7)	W(8)	G(8)	W(12)	G(8)	G(7)	G(20)	W(7)	G(10)	W(15)
5	G(14)	G(14)	W(30)	G(24)	G(30)	G(10)	W(30	W(26)	W(27)	W(30)
6	G(8)	G(9)	W(25)	G(11)	W(12)	W(10)	W(15)	G(20)	G(35)	G(10)
7	W(4)	W(17)	W(5)	G(17)	G(7)	W(80)	G(35)	G(29)	W(20)	G(10)
8	W(9)	G(60)	W(40)	G(75)	W(65)	W(80)	W(11)	G(19)	G(15)	G(12)
9	W(5)	G(16)	W(9)	W(12)	G(8)	G(12)	W(20)	W(17)	G(10)	G(30)
10	G(12)	G(20)	W(10)	W(5)	W(17)	G(13)	G(9)	W(35)	G(19)	W(15)

MEAN NUMBER OF GRAY CHOICES: 5.1

APPENDIX C

STATISTICAL ANALYSES

TABLE OF MEANS AND DIFFERENCES

EXPERIMENTAL Ss

MEASURE	NON-SHOCK GROUP	SHOCK GROUP	DIFFERENCE
Mean Number of Trials to Criterion	93.3	93.2	n.s.
Mean Choice Latency (sec.) in Training	12.6	13.5	n.s.
Mean Number of Relational Responses In Transposition			
Including Trial 1	5.4	3.0	$p < .01$ $\omega^2 = 38\%$
Excluding Trial 2	4.5	2.1	$p < .002$ $\omega^2 = 48\%$
Mean Choice Latency (sec.) in Testing	5.8	4.7	$p < .05$

CONTROL Ss

MEASURE	NON-SHOCK CONDITION	SHOCK CONDITION	DIFFERENCE
Mean Number of Gray Choices	4.9	5.1	n.s.