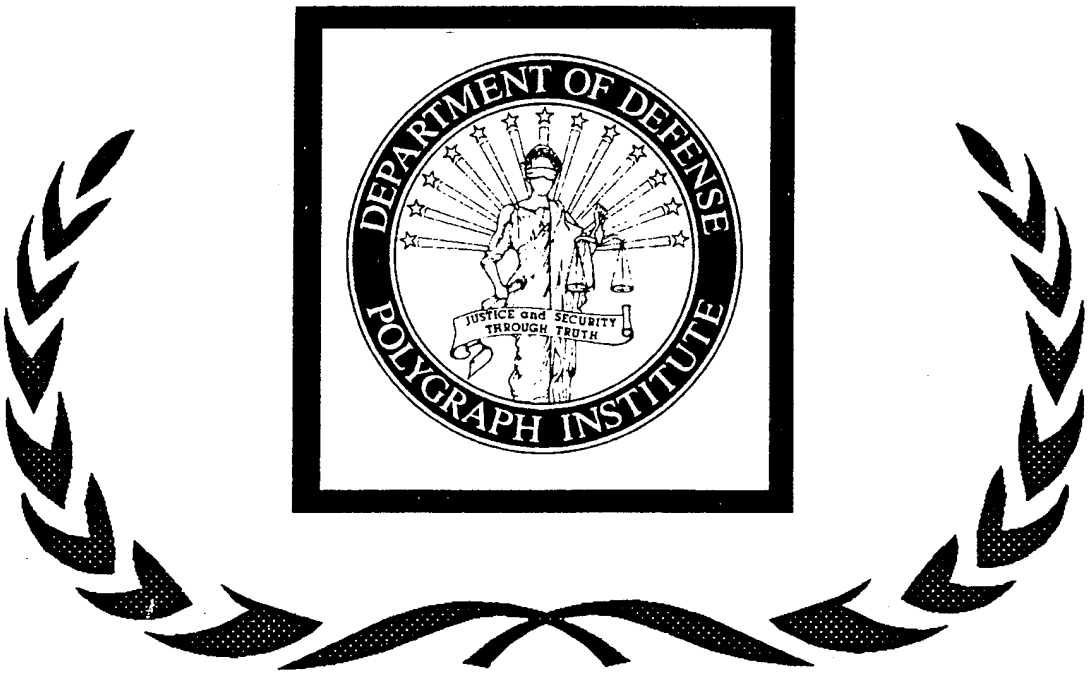

Verbal Conditioning of The Galvanic Skin Response to Deception

Michael Oberlin, Ph.D

June 1994

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A "noise instruction" procedure designed to produce an anticipatory autonomic response in subjects during deception was examined. Sixty college students were randomly assigned to a "no instruction" group or a "noise instruction" group; after all had participated in a mock theft and all were instructed to lie. All subjects were tested twice. In Phase I, none of them received the noise instruction. In Phase II, the experimental subjects were told they would hear 1 or 2 very intense blasts of sound sometime during testing; if they lied. A Lafayette field polygraph and CODAS hardware/software was used with a computer to record electrodermal responses. Independent t-tests were used to assess group differences, and paired t-tests were computed for within group comparisons. There were no significant differences between Phase I and Phase II measured responses of either the relevant or control questions for the control group. There were significant differences between responses to relevant questions for the Noise Instruction group and the control group during Phase II. The noise instruction would contribute little to the detection of deception during initial testing because both groups exhibited differential responding to control and relevant questions during Phase I testing. During Phase II the GSR of subjects exposed to the noise instructions remained high for the relevant questions while that of control subjects showed a substantial decrease.

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Key words: conditioning, verbal conditioning, detection of deception, autonomic response, galvanic skin response, GSR, control question test

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Fort McClellan, Alabama 36205

Director's Foreword

This study was designed to explore the use of an instructional parameter on human conditioning that was designed to produce consistent and marked anticipatory autonomic response during deception. If effective and reliable, it would directly impact the accuracy of most psychophysiological detection of deception (PDD) examinations which are currently dependent on deception resulting in autonomic nervous system arousal. While other studies have shown deception can serve as a reliable stimulus in a classical conditioning paradigm, differential conditioning by instruction has not been adequately explored, even though it could easily be incorporated into standard (PDD) testing paradigms.

During this study, some of the deceptive subjects were provided instructions to the effect that during their PDD exam, lies would be followed by a loud blast of sound. Based on electrodermal responding, the "noise instruction" was not necessary to discriminate between relevant and control questions during initial testing of deceptive subjects. However, during subsequent testing, the noise instruction had the effect of countering subjects habituation to questions about the mock crime they committed and of maintaining subjects differential responses to relevant and control questions.

While these findings appear promising, the procedure did not work with all subjects. Personality variables, one being subjects' latent anxiety, appeared to have an influence on whether they responded strongly. Research should be undertaken to determine any correlation between latent anxiety and responsiveness to noise instructions. This may lead to noise or other conditioning instructions being incorporated into selected PDD procedures and a possible reduction in problems associated with psychophysiological habituation.

Michael H. Capps
Director

Abstract

OBERLIN, M. Verbal conditioning of the galvanic skin response to deception. June 1994, Report No. DoDPI94-R-0018. Department of Defense Polygraph Institute, Ft. McClellan, AL 36205.--A "noise instruction" procedure designed to produce a consistent and marked anticipatory autonomic response in subjects during deception was examined. Sixty college students were randomly assigned to a "no instruction" control group or a "noise instruction" experimental group; after all had independently participated in a mock theft of one of two items from a drawer and all were instructed to lie about what they had taken. All subjects were tested twice. In Phase I, none of them received the noise instruction. In Phase II, the experimental group subjects were told they would hear 1 or 2 very intense blasts of sound sometime during testing; if they lied. A Lafayette field polygraph and CODAS data acquisition hardware/software was used to interface with a computer to record electrodermal responses. Instructions and test questions were delivered by tape recorder. Independent t-tests were used to assess group differences, and paired t-tests were computed for within group comparisons. There were no significant differences between Phase I and Phase II measured responses of either the relevant or control questions for the control group. There were significant differences between responses to relevant questions recorded from the Noise Instruction group and the control group during Phase II. The noise instruction would appear to contribute little to the detection of deception during initial testing because both groups exhibited differential responding to control and relevant questions during Phase I testing. However, during Phase II the GSR of subjects exposed to the noise instructions remained high for the relevant questions while that of control subjects showed a substantial decrease; probably a result of habituation.

Key words: conditioning, verbal conditioning, detection of deception, autonomic response, galvanic skin response, GSR, control question test

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VERBAL CONDITIONING OF THE GALVANIC SKIN RESPONSE TO DECEPTION

Critics have widely criticized traditional polygraph testing, arguing that the Control Question Technique, the procedure most commonly employed in criminal investigations, is both inaccurate and highly unreliable (Iacono & Patrick 1988; Lykken 1983; Bashore & Rapp 1993). The accuracy of polygraph testing rests on the premise that subjects will exhibit marked autonomic nervous system arousal during deception, and that this arousal can be distinguished from arousal from other sources(Bashore et al. 1993). The experiment described here addresses the problem of polygraph reliability. It examines a procedure designed to produce a consistent and marked anticipatory autonomic response in subjects during deception. The procedure is simple: subjects are told that they will hear an intense blast of sound through headphones when they lie. In fact, no tone is ever presented. The hypothesis is that subjects' mere anticipation of the tone will produce a marked rise in GSR. This simple technique, relying solely on the affect of instructions, is one that could easily be incorporated into the standard polygraph testing paradigm.

The effects of instructional parameters on human conditioning has been widely studied. In a classic study, Cook and Harris (1937) demonstrated that subjects' GSR increased in the presence of a light when subjects were simply told the light would signal shock, with no prior pairing of stimuli required. Several other early studies examined the role of instructional set on the acquisition and extinction of conditioned responding (Grings and Lockhart 1963; Silverman 1960; Lindley and Moyer 1961). Researchers, however, failed to extend this paradigm to polygraph testing and the detection of deception.

Other studies have shown that deception can serve as a reliable stimulus in a classical conditioning paradigm. Differencial conditioning of a simple motoric response to deception was demonstrated by Golden (1967) and Crowe, Peters, Suarez and Claeren (1990). Conditioning of autonomic responding has also been demonstrated; Jaffee, Millman and Gorman (1966) successfully conditioned an eyeblink response to verbal deception. Worrall (1970) demonstrated that contingent shock increased subjects' galvanic skin response (GSR) during deception, and that this effect later transferred to questions concerning a mock theft subjects had participated in. The present study represents an application of this previous work on conditioning and deception, and the effects of instruction.

METHOD

Subjects

60 subjects were recruited from undergraduate college biology and psychology classes. Subjects were recruited as follows: 1) an announcement was made at the beginning of classes that the Psychology Department needed subjects for a lie detector experiment 2)Students who expressed an interest received a handout describing the experiment in greater detail, along with a map indicating the location of a sign up sheet(see Appendix A). The handout further explained that participants would receive 10.00 if they were able to "beat the polygraph" and 5.00 if they could not. The 60 subjects selected in this way were randomly assigned to either a experimental group or a control group.

Setting

A 20 X 30 commons area within the Psychology Department served as the setting for the mock theft. This room was usually unoccupied, however 1 or 2 students occasionally used this area for study. Polygraph testing occurred in a small office within the Psychology Department. A student assistant was present at all times during testing.

Apparatus

A Lafayette "Factfinder" field polygraph was used for recording subjects' electrodermal response. A field polygraph was employed to better simulate conditions as they might occur in a field setting, should such an application eventually be deemed appropriate. Data acquisition hardware and software (CODAS) was used to interface the polygraph with a desktop computer. Data was acquired and later scored on the computer--the polygraph charts served as backup in case of a computer problem. Since the field polygraph did not permit electrodermal activity to be measured in absolute units, range correction was employed. Range correction is commonly used in electrodermal studies, and is determined using the following formula:

$$\text{Range Corrected } GSR_i = GSR_i / GSR_{max}$$

The data acquisition softwares' scaling feature allowed the experimentor to assign GSRmax the value of 100 prior to scoring each subjects chart, thus simplifying data analysis. Care was taken during the recording session to insure that the amplification of the electrodermal channel remained constant throughout the session. By taking this step, and range correcting the data, it was possible to make both

within and between subject comparisons of electrodermal responses. This also provided an experimental procedure that mimicked how this procedure would ultimately be applied in field settings.

A portable audiometer was positioned on a table adjacent to subjects. The audiometer was clearly visible throughout the experiment. The experimentor affixed a 1 X 3 inch label to the frontplate of the audiometer that read "WARNING! MEDICAL TECHNOLOGIES CORPORATION IS NOT LIABLE WHEN THIS EQUIPMENT IS SET ABOVE 100 DECIBELS". The masking noise channel of the audiometer was used to deliver a continuous 30 db. broadband audio signal (freq. range 20-20,000) through headphones during the experimental phase. The purpose of this noise was to convince subjects that the sound equipment was operational.

To insure consistency between the experimental and control groups, a small tape recorder was used to deliver instructions and all questions to subjects.

Procedure

This section begins with an overview of the experimental procedures. Detailed descriptions of each condition follow this overview.

Overview. The 60 subjects recruited for the experiment were randomly assigned to either a "no instruction" control group, or a "noise instruction" group. All subjects initially committed a mock theft by stealing a single item from a file cabinet containing a 50 dollar bill and a silver necklace. During Phase I neither the control nor experimental subjects received noise instruction in order to determine baseline GSR levels. Before polygraph testing

began, subjects were told to lie when asked about the item they had taken and to answer all other questions truthfully. Eight recorded questions were then presented: 4 neutral questions, 2 questions regarding the theft of the silver necklace and 2 questions regarding the theft of the 50 dollar bill. Depending upon which item the subject had taken, 2 of these theft questions became relevant questions and 2 control questions. During Phase II, conditions remained the same for subjects in the control group except that the questions were presented in a different order. During Phase II, subjects in the experimental group received the noise instruction: a recorded statement that informed them that "lies will now be followed by a blast of sound". In fact, no sound was ever presented. The hypothesis was that subjects' anticipation of the tone would produce a marked increase in GSR to relevant i.e. lied to questions.

Mock Theft. A handout was provided to subjects during recruitment that explained the mock theft procedure (see Appendix A). The handout detailed subjects' responsibilities as follows:

> Walk into Rm. 104 and open the top file drawer labelled "Dr. Williams, Psychology Dept. President". Remove one of the envelopes at the rear of the box. There may be people in the area, so try not to act suspiciously. Once you've removed an envelope, examine the envelope contents. Put the item you discover into your pocket or your bag, and place the envelope back in the file cabinet. Then come immediately to Dr. Oberlin's office for your polygraph test.
> Note: Not everyone knows about this experiment, so there is a risk that someone may confront you. If that happens, lead the person to my office and I will explain what we are doing.

The file cabinet itself contained 2 padded envelopes prominently positioned behind file folders. One envelope contained a 50 dollar bill, and the other a silver necklace of similar value. Padded envelopes were used to convince subjects that the experimentor and his assistant could not

know which item they took--and in fact did insure this. In order to further heighten subjects' anxiety, the front of the file cabinet contained a folder prominently labelled "PSYCHOLOGY EXAMS."

Phase I: Baseline. Phase I established baseline GSR levels for subjects. Conditions were identical for all subjects. Subjects were connected to the polygraph, the GSR channel was adjusted for appropriate subject recording, and subjects received the following taped instructions:

I will begin by asking you 8 questions. Answer each question with either a "yes" or "no" answer. I want you to lie when asked about the item you did in fact take. If I ask if you took it or have the item on you, lie and say "no". Answer all other questions truthfully. I don't know which item you took, but I'll be able to tell when you are lying by looking at the polygraph. Before we actually start the experiment, let me tell you the questions I'll be asking, although they probably won't appear in the same order in the experiment. Here they are: Is today Sunday? Are you now 40 years old? Did you take the silver necklace? Are you now in Dr. Oberlin's office? Did you take the 50.00 dollar bill? Are you now at the University of St. Thomas? Do you have a stolen silver necklace with you at this moment? Do you have a stolen 50.00 dollar bill with you at this moment? Once again, remember to lie about the item you did in fact take and answer all other questions truthfully. Once we start please don't talk, just answer my questions. Before we begin, do you have any questions? Please keep you eyes directed to the spot on the wall when answering questions. OK, here we go.

The eight questions presented to subjects during Phase I appear below. Note that this series contains two relevant and two control questions, relevant and control being determined by the item the subject actually took.

1. Is today Sunday?
2. Are you now at the University of St. Thomas?
3. Did you take the 50 dollar bill?
4. Did you take the silver necklace?
5. Are you now 40 years old?
6. Are you now in Dr. Oberlin's Office?
7. Do you have a stolen silver necklace with you at this moment?
8. Do you have a stolen 50 dollar bill with you at this moment?

To control for order effects, question order was varied both across subjects, and for individual subjects between Phase I and II. This was accomplished by duplicating and editing 12 different audio tapes on which relevant and control questions appeared in counterbalanced order(see Appendix B).

Phase II: Experimental Manipulation.

Control Group

Phase II followed immediately after Phase I. Control subjects were required to read a new consent form before beginning Phase II, since subjects in the Noise Manipulation group were required to do so. Otherwise, conditions during this phase were identical to those during Phase I, except that the order in which relevant and control questions were presented changed. The following taped instructions were presented to control group subjects at the beginning of this phase:

Now I'm going to ask you these same 8 questions, but in a different order. Again I want you to lie when asked about the item you did in fact take. Answer all other questions truthfully. Before we begin, do you have any questions? OK, here we go.

Noise Manipulation Group

Subjects in the Noise Manipulation group were required to read and sign a new consent form prior to beginning Phase II. This form ostensively described the noise manipulation procedure, and explained to subjects that they would hear "one or two very intense blasts of sound" sometime during

the questioning, and that these blasts would follow lies--never truthful answers (see Appendix C). In fact, no tones were ever delivered. Headphones were then placed on subjects, and the experimentor gave the following instructions to his cohort:

We begin a new procedure with this subject, with new sound levels. Adjust the white noise channel to 40 decibels and the tone channel to 110 decibels.

The cohort then adjusted the 2 dials of the audiometer, in plain view of the subject, to the designated settings. The white noise channel of the audiometer was operable, and produced a low backgound hiss through the headphones to convince subjects that the sound equipment was in fact operational. The following taped instructions were then presented to the Noise Manipulation group:

Now I'm going to ask you these same 8 questions again, but in a different order. Again I want you to lie when asked about the item you did in fact take. Answer all other questions truthfully. At some time during the next 8 questions you will hear 1 or 2 very intense blasts of sound. The noise level is very loud. but within safe limits. These blasts will occur after you tell a lie, never when you answer truthfully. Not every lie will necessarily be followed by the blast, but one or two lies will. The sound will occur approximately 5 seconds after you lie. If you decide that the noise level is too extreme after hearing the first blast, you may withdraw at that time. It's no problem, we have had a couple people withdraw. Before we begin, do you have any questions? OK, here we go.

RESULTS

Independent t-tests were used to assess differences between groups, whereas paired t-tests were computed for analyses involving within group comparisons. To simplify the analyses, a subject's responses to the two questions were combined, resulting in one score for the two relevant and one for the two control questions under each condition.

Figure 1 shows data for the control group. No significant differences were found between Baseline and Phase II for either the relevant questions(Baseline:M=122.50, SD=39.18; Phase II:M=114.67, SD=56.34; t=.86,ns) or the control questions(Baseline:M=105.00, SD=39.12; Phase II:M=103.83, SD=44.96; t=.13,ns).

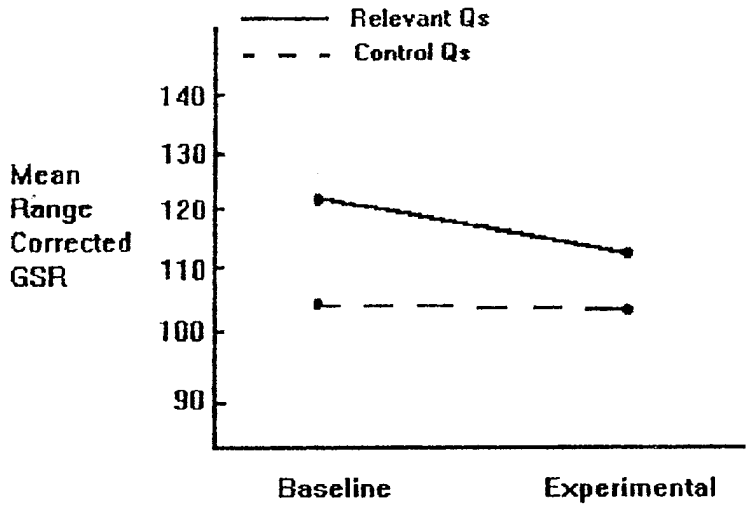

Fig. 1. Mean GSR for the control group on relevant and control questions during Baseline and Phase II.

Figure 2 shows data for both the Noise Instruction and Control group. Comparing the GSR of the Noise Instruction group on the relevant questions after receiving the noise instruction to that of the Control group yielded a significant effect ($t=2.17$, $p<.05$). Subjects who received the noise instruction had significantly greater GSR responses than those who did not.

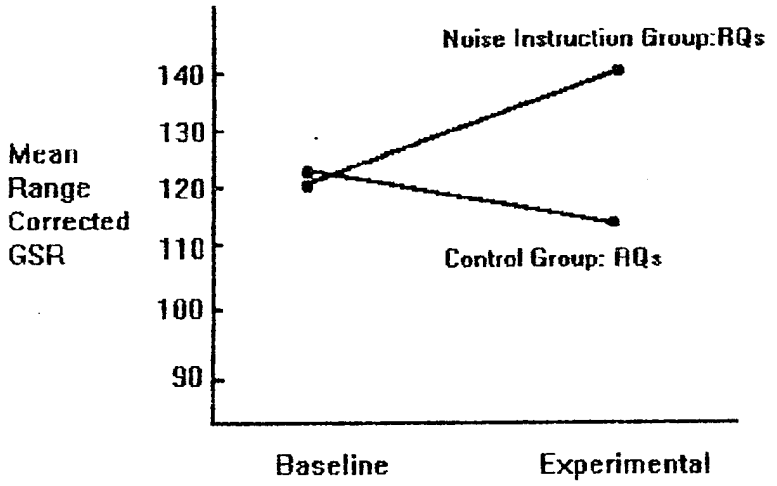

Fig. 2. Comparison of the GSR of the Noise Instruction Group on relevant questions after receiving the noise instruction to that of the Control group.

Figure 3 shows the mean GSR amplitude on the control and relevant questions for subjects in the Noise Manipulation group. There was a trend for subjects' GSR to increase on the relevant questions from Baseline (M=121.47, SD=46.31) to the Experimental phase (M=140.53, SD=32.88), however this trend did not attain significance(t=-1.72,p=.10). No significant differences were found between Baseline and the Experimental phase on the control questions (Baseline:M=102.10, SD=49.32; Experimental:M=105.53, SD=43.82; t=-.44,ns).

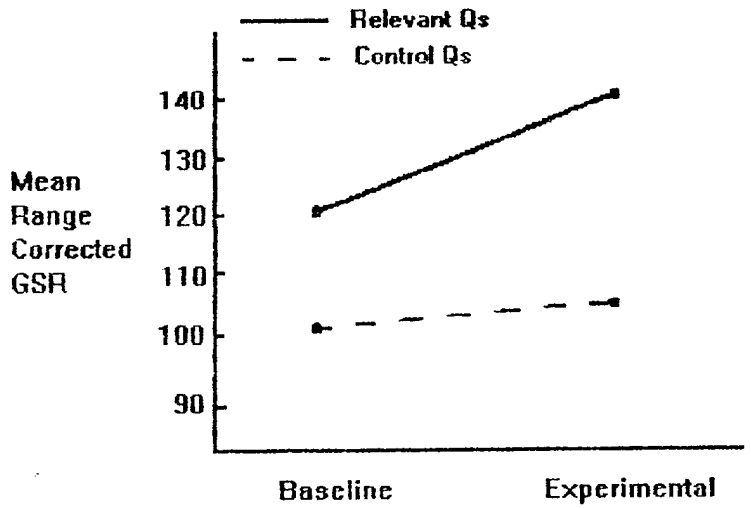

Fig. 3. Mean GSR for the Noise Instruction group on relevant and control questions during Baseline and Phase II.

DISCUSSION

During baseline, both the Control and Noise Instruction subjects exhibited differential GSR responding to control and relevant questions. Based on this finding, the noise instructions would appear to contribute little to the detection of deception during the early presentation of questions in polygraph exams. Examinees can be expected to exhibit high GSRs to relevant questions without resorting to a noise threat. Comparing the GSR of control and experimental subjects to relevant questions during Phase II, however, suggests the utility of this procedure. As questioning proceeded in Phase II, the noise instruction had the effect of countering subjects' habituation to questions concerning the stolen item--the GSR of subjects exposed to the noise manipulation remained high during Phase II while that of control subjects showed a substantial decrease. The noise instructions had the effect of maintaining subjects' differential GSR response to relevant and control questions.

This differencial response--high GSR to relevant questions, low to control--is the basis for detecting deception in polygraph exams.

This procedure did not work with all subjects. Inspection of individual subject data indicated that, while some subjects exhibited a tremendous increase in reactivity to relevant questions after the noise threat, for others the noise instructions had little or no effect. Personality variables appeared to have a strong influence on whether subjects responded strongly to the threat of the loud noise. In fact, it was often apparent to the experimentor even before questioning had begun which subjects would be responsive to the instructions. These subjects frequently showed clear signs of anxiety when informed about the loud noise. A typical response was to ask "Is it going to be <u>really</u> loud?" This anecdotal evidence suggests a correlation between subjects' level of latent anxiety and responsiveness to the noise instructions. It would have been interesting to administer a personality test to subjects prior to this experiment to assess this relationship. A simple test for latent anxiety could have been employed for this purpose. If a strong correlation was found to exist between latent anxiety and responsiveness to the noise instructions, a simple personality test could then be used to identify and select the most promising candidates for this procedure.

Comments made by several subjects suggested that a loud noise may not have been the most effective threat stimulus. In fact, several subjects actually expressed regret at not having heard the tone. As one subject put it "I listen to allot of really loud music, and I wanted to see how loud the tone was." It would be interesting to replicate this experiment using shock, an aversive stimulus less familiar to subjects, as the threat stimulus.

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APPENDIX A
HANDOUT USED DURING SUBJECT RECRUITMENT

DIRECTIONS TELLING YOU EXACTLY WHAT YOU NEED TO DO DURING THE "THEFT" COMPONENT OF DR. OBERLIN'S PSYCHOLOGY EXPERIMENT

As part of Dr. Oberlin's experiment, you will have to steal an item from a file cabinet located in Rm. 104 B of the Psychology Dept. The map below shows you where this area and file will be located. Follow the instructions below.

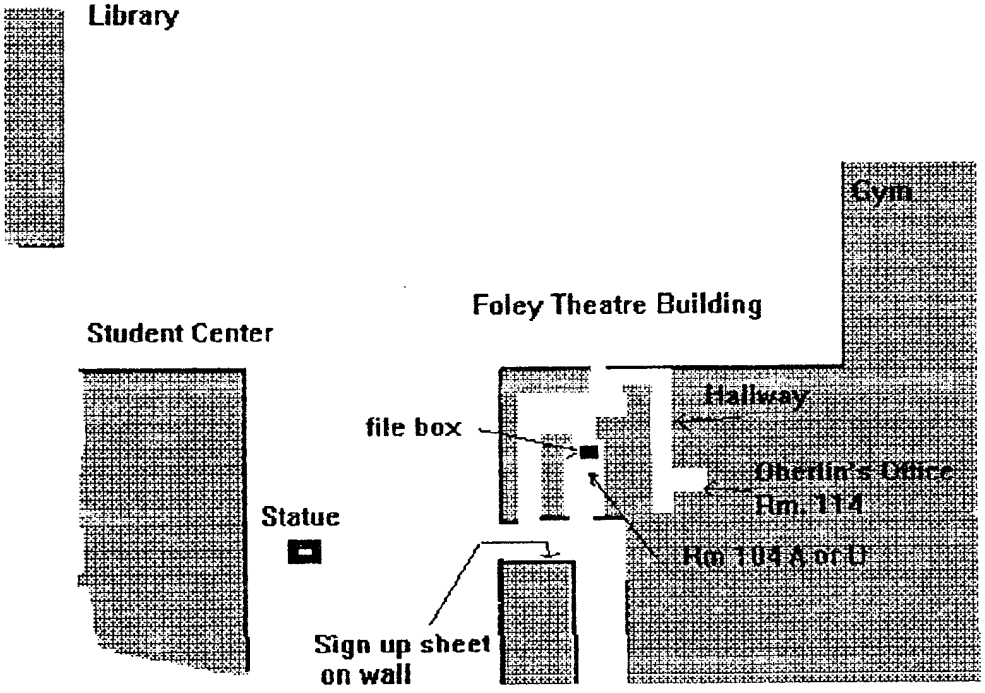
1) Sign up for a time to commit this theft. The map below shows you the location of the sign up sheet. It's on the wall as you walk into the Foley Theater building. Select one time block and clearly print your name and phone number in this block. Make a note of your time.

2) While you're in the building, locate both Dr. Oberlin's office, and Rm. 104 and the file cabinet so you'll know where they are the day of the theft. Rm. 104 contains computers and a coffee machine. The file cabinet will be labelled "Dr. Williams, Psychology Dept. President". Dr. Oberlin's office is down the long hallway (see map).

3) When your day and time arrive, walk into Rm. 104 and open the top file drawer labelled "Dr. Williams, Psychology Dept. President". Remove one of the envelopes at the rear of the box. There may be people in the area, so try not to act suspiciosly.

4) Once you've removed an envelope, examine the envelope contents. Put the item you discover into your pocket or your bag, and place the envelope back in the file cabinet. Then come immediately to Dr. Oberlin's office for your polygraph test.

Note: Not everyone knows about this experiment, so there is a risk that someone may confront you. If that happens, lead the person to my office and I will explain what we are doing. Also, **arrive on-time--not a minute before or after.**



APPENDIX B
QUESTION COUNTERBALANCING

To insure consistency of presentation, 6 question tapes and a master tape of instructions were made. Instructions and questions were then extracted from these master tapes in a recording studio and recorded onto the 12 tapes used during the experiment.

To control for order effects, the order of control and relevant questions was counterbalanced as indicated below. The order of neutral questions remained the same on all tapes. This produced 6 different presentation series, and a total of 12 tapes, six of which contained control group instructions plus questions and 6 experimental group instructions plus questions.
All 6 series were presented to both the experimental and control groups e.g. the first 5 subjects in both the experimental and control groups received question series 1, the second five subjects series 2, etc.

QUESTION SERIES

1.	2.	3.	4.	5.	6.
N	N	N	N	N	N
N	N	N	N	N	N
A1	B2	A2	B1	A1	B1
B1	A2	B2	A1	B2	A2
N	N	N	N	N	N
N	N	N	N	N	N
B2	A1	B1	A2	B1	A1
A2	B1	A1	B2	A2	B2

N	N	N	N	N	N
N	N	N	N	N	N
B2	A1	B1	A2	B1	A1
A2	B1	A1	B2	A2	B2
N	N	N	N	N	N
N	N	N	N	N	N
A1	B2	A2	B1	A1	B1
B1	A2	B2	A1	B2	A2

KEY

N= "Is today Sunday?"
N= "Are you now at the University of St. Thomas
A1= "Did you take the 50 dollar bill?"
B1= "Did you take the silver necklace?"
N= "Are you 40 years old?"
N= "Are you now in Dr. Oberlin's office?"
A2= " Do you have a stolen 50 dollar bill with you at this moment?"
B2= "Do you have a stolen silver necklace with you at this moment?"

APPENDIX C
CONSENT FORM PROVIDED TO "NOISE INSTRUCTION" SUBJECTS AT THE BEGINNING OF PHASE II

This experiment will examine lie detector testing, and the effect of pairing lying with a very loud sound.

As part of this experiment you will be attached to a polygraph (lie detector) and asked a number of questions, to which you must reply with a "YES" or "NO".

You will also have to listen to one or two very loud sound blasts. The level of this sound will be extreme, but will be kept within safe limits. If after hearing the sound the first time, you decide that it's too severe, you can drop out of the experiment at that time. There is no risk to you in participating in this experiment. You may ask Dr. Oberlin any questions you may have about the experiment at this time. If you are willing to participate, please sign below.

Signature:_____

Date:_____

SUBJECT DATA (cont)

CONTROL SUBJECTS (NOT EXPOSED TO THE NOISE MANIPULATION)

Baseline Phase		Experimental Phase	
Relevant Qs	Control Qs	Relevant Qs	Control Qs
82,15	32,45	23,43	42,40
68,64	85,10	51,36	12,23
53,42	100,34	72,26	27,26
76,90	100,60	44,33	22,62
55,26	55,38	24,66	8,100
63,59	61,61	51,85	81,36
61,63	76,90	99,99	75,23
19,44	100,24	23,58	49,35
92,79	67,58	100,84	76,93
59,81	69,34	83,55	44,23
71,90	82,54	95,57	77,51
92,66	35,85	75,43	43,54
77,100	47,77	89,90	73,47
86,59	46,63	54,74	100,87
50,26	22,45	100,41	82,14
63,77	38,13	46,100	52,68
84,100	51,94	78,88	71,50
92,64	100,64	88,60	51,70
99,17	27,38	23,15	21,15
34,39	21,29	55,33	37,100
100,49	26,74	28,28	89,15
100,8	73,1	2,4	6,1
49,47	61,33	69,100	44,97
57,2	43,2	53,78	77,4
49,76	45,48	71,78	65,100
73,27	99,49	2,2	41,80
61,99	88,80	99,95	73,75
0,29	0,19	11,5	2,6
69,52	36,37	36,34	100,21
61,90	46,60	86,100	96,63

APPENDIX D

SUBJECT DATA

SUBJECTS EXPOSED TO THE NOISE MANIPULATION

Baseline Phase		Experimental Phase	
Relevant Qs	Control Qs	Relevant Qs	Control Qs
100,23	51,26	39,34	41,8
34,23	0,0	100,71	2,0
83,70	80,61	78,96	90,100
99,60	66,100	72,66	62,51
60,26	29,12	69,100	56,56
71,81	87,100	80,71	68,59
3,1	10,9	98,52	13,14
53,79	52,34	100,31	83,34
22,17	55,24	64,50	64,75
65,94	42,68	65,46	61,57
61,62	63,77	78,16	49,55
64,60	77,57	80,54	45,55
83,76	100,64	62,88	77,79
89,99	74,91	77,96	92,56
76,41	59,50	75,64	78,40
100,78	64,60	58,57	76,59
10,14	26,23	100,78	26,24
83,67	66,76	100,83	86,43
64,76	90,30	57,100	55,21
47,54	17,37	100,79	86,64
35,41	42,40	100,46	61,29
76,86	54,67	100,88	87,58
96,13	29,8	19,100	16,10
100,77	69,66	16,56	17,38
80,52	64,79	82,100	59,92
86,76	48,61	68,73	77,43
69,8	1,4	67,91	100,15
41,100	53,50	49,61	37,37
63,65	58,54	64,27	46,55
74,38	64,45	100,25	76,53

PRO IF (GROUP=1).
T-TEST /PAIRS EXPR EXPC.

Paired samples t-test: EXPR
EXPC

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
EXPR	30	140.5333	32.880	6.003
EXPC	30	105.5333	43.819	8.000

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
35.0000	45.915	8.383	.310	.096	4.18	29	.000

This procedure was completed at 23:13:00
PRO IF (GROUP=1).
T-TEST /PAIRS BASER EXPR.

Paired samples t-test: BASER
EXPR

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
BASER	30	121.4667	46.313	8.456
EXPR	30	140.5333	32.880	6.003

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
-19.0667	60.796	11.100	-.154	.415	-1.72	29	.097

This procedure was completed at 23:13:08
PRO IF (GROUP=1).
T-TEST /PAIRS BASEC EXPC.

Paired samples t-test: BASEC
EXPC

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
BASEC	30	102.1000	49.321	9.005

*RO IF (GROUP=1).
DES BASER EXPR BASEC EXPC.

Number of Valid Observations (Listwise) = 30.00

Variable	Mean	Std Dev	Minimum	Maximum	N	Label
BASER	121.47	46.31	4.00	188.00	30	
EXPR	140.53	32.88	72.00	188.00	30	
BASEC	102.10	49.32	.00	187.00	30	
EXPC	105.53	43.82	2.00	190.00	30	

This procedure was completed at 23:06:18

SET PRI=ON.
PRO IF (GROUP=2).
DES BASER EXPR BASEC EXPC.

Number of Valid Observations (Listwise) = 30.00

Variable	Mean	Std Dev	Minimum	Maximum	N	Label
BASER	122.50	39.18	29.00	184.00	30	
EXPR	114.67	56.34	4.00	198.00	30	
BASEC	105.00	39.12	19.00	168.00	30	
EXPC	103.83	44.96	7.00	187.00	30	

This procedure was completed at 23:06:31

PRO IF (GROUP=2).
DES BASER EXPR BASEC EXPC.

Number of Valid Observations (Listwise) = 30.00

Variable	Mean	Std Dev	Minimum	Maximum	N	Label
BASER	122.50	39.18	29.00	184.00	30	
EXPR	114.67	56.34	4.00	198.00	30	
BASEC	105.00	39.12	19.00	168.00	30	
EXPC	103.83	44.96	7.00	187.00	30	

This procedure was completed at 23:06:47

EXPC	30	105.5333	43.819	8.000

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
-3.4333	43.196	7.887	.575	.001	-.44	29	.667

This procedure was completed at 23:13:10
T-TES /GROU GROUP (1,2) /VAR EXPR EXPR.

Independent samples of GROUP

Group 1: GROUP EQ 1 Group 2: GROUP EQ 2

t-test for: EXPR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	30	140.5333	32.880	6.003
Group 2	30	114.6667	56.343	10.287

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.94	.005	2.17	58	.034	2.17	46.70	.035

Independent samples of GROUP

Group 1: GROU EQ 1 Group 2: GROU EQ 2

t-test for: EXPR

	Number of Cases	Mean	Standard Deviation	Standard Error
Group 1	30	140.5333	32.880	6.003
Group 2	30	114.6667	56.343	10.287

		Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.94	.005	2.17	58	.034	2.17	46.70	.035

PRO IF (GROUP=2).
T-TEST /PAIRS EXPR EXPC.

Paired samples t-test: EXPR
EXPC

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
EXPR	30	114.6667	56.343	10.287
EXPC	30	103.8333	44.961	8.209

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
10.8333	44.858	8.190	.628	.000	1.32	29	.196

This procedure was completed at 23:24:37
PRO IF (GROUP=2).
T-TEST /PAIRS BASER EXPR.

Paired samples t-test: BASER
EXPR

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
BASER	30	122.5000	39.181	7.153
EXPR	30	114.6667	56.343	10.287

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
7.8333	50.092	9.145	.498	.005	.86	29	.399

This procedure was completed at 23:24:38
PRO IF (GROUP=2).
T-TEST /PAIRS BASEC EXPC.

Paired samples t-test: BASEC
EXPC

Variable	Number of Cases	Mean	Standard Deviation	Standard Error

BASEC	30	105.0000	39.123	7.143
EXPC	30	103.8333	44.961	8.209

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.1667	48.535	8.861	.340	.066	.13	29	.896

This procedure was completed at 23:24:40
REV.

FIN

End of Include file.