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QUANTIFICATION OF SPECIAL OPERATIONS MISSION-RELATED PERFORMANCE: COGNITIVE MEASURES

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TECHNICAL REVIEW AND APPROVAL

NMRI 95-78

The experiments reported herein were conducted according to the principles set forth in the current edition of the "Guide for the Care and Use of Laboratory Animals," Institute of Laboratory Animal Resources, National Research Council.

This technical report has been reviewed by the NMRI scientific and public affairs staff and is approved for publication. It is releasable to the National Technical Information Service where it will be available to the general public, including foreign nations.

THOMAS J. CONTRERAS
CAPT, MSC, USN
Commanding Officer
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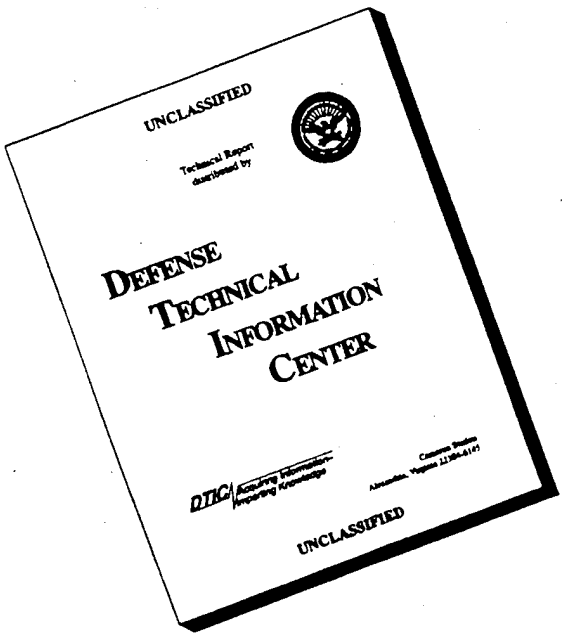

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13. ABSTRACT *(Maximum 200 words)*

In order to evaluate the impact of thermal and physical stress on mission-related performance in a quantifiable fashion, and to develop a technology to minimize the effects of such stresses, it has become important to develop standardized measures of mission-related performance. The present report presents fundamental information relating to the selection of measures to assess the impact of operational stressors on cognitive performance. The initial cognitive performance abilities presently considered and adopted for standardized measurement in thermally and physically stressful operational environments are: memory, reaction time, vigilance, calculations, logical reasoning, and learning. The six currently adopted measures of cognitive performance are matching-to-sample, complex reaction time, visual vigilance, serial addition-subtraction, logical reasoning, and repeated acquisition. The measures have been implemented in a standardized manner on portable battery-operated computers for use in both laboratory and field settings. The report provides detailed documentation for each of the measures, including computer code listings.

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QUANTIFICATION OF SPECIAL OPERATIONS MISSION-RELATED PERFORMANCE: COGNITIVE MEASURES

Contents

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QUANTIFICATION OF SPECIAL OPERATIONS MISSION-RELATED PERFORMANCE: COGNITIVE MEASURES

INTRODUCTION

Extreme thermal and physical stress can have a significant impact on Special Operations Forces (SOF) personnel during the conduct of their missions. In order to evaluate the impact of thermal and physical stress on mission-related performance in a quantifiable fashion, and to develop a technology to minimize the effects of such stress, it has become important to develop standardized measures of mission-related performance. Standardized performance measures would enable changes in performance to be accurately and reproducibly quantitated and would significantly enhance the applicability and usefulness of future SOF biomedical research. Standardized performance measurements would provide SOF operators with information useful in operational planning and facilitate comparison of data obtained by various biomedical research laboratories. Tasking has been developed by the Untied States Special Operations Command (USSOCOM) to address the issues of standard thermal and performance indices related to SOF mission effectiveness.

In response to the tasking requirement to develop standardized measures of performance, the present report presents fundamental information relating to the selection of measures to assess the impact of thermal and physical operational stressors on cognitive

performance. The selection of appropriate measures was driven by functional analysis of performance abilities based on information about critical performance abilities required for specific SOF activities. To evaluate information on critical abilities or skills, a database was developed providing data obtained from experienced, senior operators regarding critical performance abilities necessary for a wide range of specific SOF activities (Thomas et al, 1994). Additional input was obtained from experienced operators and specialists in the field of cognitive and physiological performance measurement at a Naval Special Warfare sponsored Thermal Workshop concerned with relevant thermal and performance measurements associated with SOF operations (Doubt and Curley, 1992). Many of the specific performance measures formulated at that Thermal Workshop have guided the present selection of appropriate measures to assess the impact of thermal and physical stressors on performance. Additionally, the selection of performance measures was aided by evaluation of an existing database of standardized measures of operational military performance available through the Tri-Service Office of Military Performance Assessment Technology. Many of the individual performance measures available, particularly those related to cognitive performance, were specifically designed to address cognitive performance relevant to operational military environments. The Uniform Tri-Service Cognitive Performance Assessment Battery (Perez et al, 1987) serves as a definitive source of documentation of specific cognitive measures and the technical specifications, reliability, validity, and sensitivity of those measures as do existing individual performance assessment batteries developed for their own needs by each of the services (Kane and Kay, 1992).

Based on the above USSOCOM requirements, the information obtained related to critical skills and abilities required during operational tasks, the formulation of appropriate cognitive measures, and the existence within the military research community of a wide range of rather standardized measures of cognitive performance, the present measures of cognitive performance were adopted, as a first approximation, to be evaluated as suitable standard measures for operational mission-related performances. As clearly indicated in the database of critical performance abilities required for specific SOF activities, a wide range of performance measures are required to encompass the tremendous range of performance abilities. It is important to realize that no small finite number of individual performance measures would be entirely comprehensive for all possible operational environments and activities. At present, it is appropriate to consider the development of a library of measures established for the assessment of specific individual SOF mission performance. The required set of performance measures to be applied in any given operational setting would be selected from that library, depending on the particular critical abilities or skills known to be associated with specific settings. As specific performance measurement requirements are identified, it would be appropriate to develop, modify, or adopt new or existing measures for inclusion in the library. The guiding principle requires that as new measures are added to the library, they become additional universally accepted standardized measurements in order to facilitate comparison of data obtained within and between various SOF research laboratories or field operations. Standardization implies not only the utilization of common measures selected from the library, but importantly,

standard methods of task implementation, specification, administration, and data recording and analysis.

The present adopted performance measures were selected following the guidance outlined previously. Additionally, the selection of cognitive measures was guided, in part, by evaluation of the overall summary of SOF performance abilities obtained in the performance database. In addition to the most frequently cited abilities listed for each activity, a summation was obtained across all the activities to generate the overall frequencies of abilities, that is, to obtain the most often cited abilities, considering all activities combined (Thomas et al, 1994). It appeared appropriate to select the initial cognitive performance measures as they may relate to measurement of critical abilities required in more universal SOF tasks. The initial cognitive performance abilities presently considered and adopted for standardized measurement in thermally and physically stressful operational environments are: memory, reaction time, vigilance, calculations, logical reasoning, and learning. The six adopted individual measures of cognitive performance selected are outlined below. The measures have been implemented in a standardized fashion on portable battery-operated computers for use in both laboratory and field settings. The measures have been modified so that they require the least amount of measurement time to obtain reliable data, in order to be as minimally invasive as possible to operators performing in stressful operational environments. Also, standardized testing protocols have been developed to facilitate sensitivity of measurement.

COGNITIVE MEASURES AUTHORING LANGUAGE

In order to provide a common platform that allows for the most ideal sharing of procedures and data, it was decided that the cognitive tasks should be developed employing a common, standardized, computer research language so that individuals with a variable range of computer knowledge and skills may modify the existing tasks or author new and different tasks. With an eye on easing the requirements of authoring specific tasks and providing complex data analysis capabilities the computer language, MEL (Micro Experimental Laboratory), an integrated software system designed for research use on PC compatible computers, was adopted. Incorporating fourth-generation programming techniques and a forms-based interface, MEL is optimized to take full advantage of existing computer memory, hard disk, and graphics adapters commonly available on portable computers. An author fills in the forms and MEL writes the specific task programs, runs the tasks, and analyzes the data. The forms system can guide both novices and experts through the task creation process. MEL includes a form-based user interface, automatic programming, a compiler, a real-time data acquisition system, database management, and statistical analysis. A unique feature of this system is the minimal computer programming knowledge required for its operation. The speed and ease of use of the system allows individuals with minimal computer skills to develop, execute, and analyze complex computerized programs in short periods of time that measure performance abilities. MEL also maintains millisecond timing with high-speed text and graphics presentations.

All of the present cognitive tasks adopted for the USSOCOM performance measures were written in the Forms format of MEL. Following the written details describing each of the cognitive measures are the specific Forms listings for each of the tasks. The Forms listings provide an exact technical description of each task. The complete Forms listings for each of the cognitive tasks as well as the executable code are also available on computer disk format from the authors. More inclusive descriptions of the MEL language and authoring system are available (Schneider, 1988, 1990). (Current information regarding MEL may be obtained from: Psychology Software Tools, Inc., 2014 Monongahela Avenue, Pittsburgh, PA 15218-2510 [Phone: 412-271-5040; E-Mail: info@pstnet.com]).

COGNITIVE MEASURES

Presented below are the six cognitive tasks currently implemented in the USSOCOM performance measures, in the order in which they occur in the present test battery.

Matching to Sample

The Matching to Sample task is designed to assess an individual's ability to quickly and accurately identify a comparison stimulus which is identical to a standard stimulus presented previously. The test is concerned with short term spatial memory and pattern recognition skills.

At the start of each trial an individual must first respond on the down arrow key on the computer keyboard (when the word 'Ready' appears at the top of the computer screen) to display an eight by eight matrix as the sample stimulus. The sample stimulus is on the screen for three seconds and is then removed from the screen and is followed by a delay interval (short or long) during which the screen is blank (except for the word 'Delay' at the bottom of the screen). The delay is either one or fifteen seconds in duration. After the delay interval, two matrices are presented on the screen, side by side. One matrix matches the original exactly, and the other matrix differs by two cells in the matrix. If the matrix that matches the previously presented matrix is on the right side of the screen, the individual is to press the right arrow key. If the matching matrix is on the left, then the individual is to press the left arrow key.

The Matching to Sample task consists of twenty trials, ten at each of the two delay intervals. The first down arrow key response (when the word 'Ready' is on the screen) must be made within thirty seconds to present the sample stimulus. A response on the left or right arrow keys to indicate the location of the matching matrix must be made within fifteen seconds. Accuracy data is recorded separately for each trial for short and long delays. Reaction time (in milliseconds) for each response is recorded for each trial. The program generates five left side correct and five right side correct conditions for both delays, randomly presented. Normally, the Matching to Sample tasks will require about five to six minutes to complete.

Complex Reaction Time

The Complex Reaction Time task is a reaction time test that is a modification of the four-choice reaction time task developed by Wilkinson and Houghton. The Complex Reaction Time task is primarily designed to evaluate the reaction time of an individual when multiple choices must be made as to the location of the reaction time response. The task is also designed to evaluate information processing related to encoding, categorization, and response selection.

On each trial of the task a small red square appears in one of four boxes presented near the center of the computer screen. The layout of the boxes is the same as the layout of the four arrow keys on the keyboard. Each box on the screen corresponds to one of the four arrow keys. When the red square appears in one of the boxes on the screen, the individual is to press the corresponding arrow key as quickly as possible. The red square will then jump to a different (or the same) box and the individual is to again press the corresponding arrow key. The individual is to continue to follow the red square as rapidly as possible while being as accurate as possible.

The Complex Reaction Time tasks consists of sixty trials, with the red square appearing in each of the four boxes fifteen times randomly. A response on an arrow key must be made within five seconds of the appearance of the red square. A red square will remain in a particular box until a response is made. Reaction times of all responses are recorded in milliseconds. Incorrect (wrong box) responses and lapses (responses that do not occur with two and a half seconds of the red square presentation) are tabulated

separately for each trial. The Complex Reaction Task usually requires about one minute to complete.

Visual Vigilance

The Visual Vigilance task is a modification of the Alpha-Numeric Visual Vigilance Task (ANVVT) and is concerned with sustained visual attention and choice reaction time. The purpose of the task is to test an individual's ability to continue making decisions and rapid responses to visual symbols over a prolonged time period.

In the Visual Vigilance task an individual must continuously monitor the computer screen on which letters and number characters are briefly (a half second) presented. If the character presented is either the letter "A" or the number "3" the individual is to press the down arrow key before the character is removed from the screen. If the character is any letter or number other than "A" or "3", no response is to be made.

The Visual Vigilance task contains one hundred and sixty stimuli consisting of forty target (twenty "A"s and twenty "3"s) and other letter and number characters. The number of correct responses made to a target are recorded (down arrow key responses following an "A" or a "3") during the task. The inter-character interval varies between one and five seconds with a mean of three seconds. Additionally, the number of errors of omission and the number of errors of commission are recorded. Reaction times for each response are recorded in milliseconds. The Visual Vigilance task consists of one hundred character presentations. The task is usually completed in about six minutes.

Serial Addition - Subtraction

The purpose of the Serial Addition-Subtraction task is to measure an individual's ability to perform simple mathematical calculations of addition and subtraction. On each trial of the Serial Addition-Subtraction task two single digits are presented on the computer screen, separated by either a plus or a minus sign. The individual is to add or subtract the two digits accordingly and then enter the last single digit of the answer. The top row of number keys on the keyboard is to be used to enter the single digit answer. If a subtraction problem yields a negative number, the individual must automatically add ten to the answer and enter the single positive digit that remains.

The Serial Addition-Subtraction task consists of fifty trials randomly selected from a predefined list of two hundred problems. On that list, one hundred problems are addition problems and one hundred problems are subtraction problems. Of the set of subtraction problems, fifty problems result in a negative number for the answer. A response on the one of the top row digit keys must be made within fifteen seconds of the problem presentation. Accuracy, the type of problem, and reaction time are recorded for each trial.

Logical Reasoning

The purpose of the Logical Reasoning task is to measure an individual's general reasoning ability. The Logical Reasoning task is a modification of the Grammatical Reasoning test developed by Baddeley. The task presents a series of

statements about the sequential arrangement of two letter characters presented on the computer screen. The individual must determine whether the statement about the order of the two letters and the actual letter pair presented correspond or not.

On each trial a statement about the sequential order of two letters is presented in the center of the computer screen. Each statement is followed by the two letters, "AB" or "BA". The individual must decide whether each statement correctly describes the order of the two letters or not, that is, whether the statement is 'true' or 'false'. For example, if an individual was presented with the statement "A IS FOLLOWED BY B" and the letter pair presented was "BA", then the individual should response 'false'. On the other hand, the individual should respond 'true' to the following statement "A IS PRECEDED BY B" if the letter pair presented was "BA".

Responses are recorded by pressing the "T" keyboard key for a correct (true) statement and the "F" keyboard key for in incorrect (false) statement. The statements presented can be either positive/negative, active/passive, and a given letter can precede/follow the other letter. The Logical Reasoning task consists of thirty two trials comprising the above combination of statements. A response must be made within fifteen seconds of the statement presentation. On each trial, response accuracy, the statement type, and reaction time is recorded.

Repeated Acquisition

The Repeated Acquisition task is designed to measure an individual's ability to learn, decode, or acquire, a new response key-press sequence each session. Specifically,

an individual must learn a sequence of twelve key presses that are implemented on the Up (U), Down (D), Left (L), and Right (R)arrow keys on the computer keyboard.

At the beginning of the Repeated Acquisition task, an outline of an empty rectangle is presented on the center of the computer screen. A sequence is selected at the start of the task from a list of different sequences. The individual must basically learn the selected sequence by trial and error. Each correct response fills in a portion (one twelfth) of the rectangle with a solid square, starting on the left of the rectangle and ending with the portion on the far right of the rectangle. Each incorrect response blanks the screen for a half second. When the screen displaying the rectangle returns, the individual will be at the same place in the sequence as before the incorrect response. When the individual correctly completes the sequence, the rectangle will be completely filled, the screen will blank, and the empty rectangle will then reappear ready for the next trial. The task ends after the individual completes the same correct sequence fifteen times.

Each time a new session is started, the correct sequence will differ from the previous session. Each time a new session is begun, a new sequence is selected from a list of thirty two different sequences. For example, during a session the correct sequence of arrow each responses might be UDULRDRLURDL while during the next session the sequence might be LRULDLDRUDRU. The individual must learn the new sequence of arrow key responses over the course of a session. Thus, each session requires fifteen repetitions through the same sequence of arrow key responses, and each new session begins with an entirely different sequence of key responses. The Repeated Acquisition task provides a continuous measure of an individual's learning ability. The number of

errors (incorrect responses) as well as the time to respond, in seconds, is recorded for each trial. Additionally, the specific sequence selected for each session is recorded.

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FORMS LISTING

Matching to Sample:

```
+--------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\matching-----+
|AUTHOR John Thomas          CREATION DATE 10-10-94 LAST UPDATE 12-02-94      |
|FILES:   EXP matching DATA matching  INSERT matching  INCLUDE               |
|BACKUP DISK VOLUME                   DEBUG fast           SPARE            |
|ABSTRACT Matching to Sample Program                                          |
|A 8 by 8 matrix is shown as a sample stimulus.  The sample is removed and    |
|after a variable delay interval two matrices are presented. The subject is to|
|select the comparison matrix (left or right) that matches the sample matrix. |
|NAMES OF: BLOCK INDEPENDENT VARS   1:          2:          3:          4:    |
| {to be logged for later analysis} 5:          6:          7:          8:    |
|         BLOCK DEPENDENT VARIABLES 1:          2:          3:          4:    |
| {logs as ACcuracy,SElection, RT}  5:          6:          7:          8:    |
|       TRIAL INDEPENDENT VARIABLES 1:delay     2:lef_rite  3:          4:    |
| {to be logged for later analysis} 5:          6:          7:          8:    |
|       TRIAL DEPENDENT VARIABLES   1:sresp     2:cresp     3:          4:    |
| {logs as ACcuracy,SElection, RT}  5:          6:          7:          8:    |
|EVENT   TYPE   FORM ID       COMMENT                MISC. INSERT FIELD       |
|  1   code     18       Initialize                                           |
|  2   frame    1        Instructions                                         |
|  3   frame    2        Blank screen                                         |
|  4   trial    1        Run test                                             |
```

```
+--------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\matching-----+
|COMMENT Matching to Sample Program                                           |
|TRIAL INSERTS 1              SEQUENCE random   NUMBER OF TRIALS #inserts     |
|VALUES OF TRIAL INDEPENDENT VARS  1:{T3}     2:{T5}     3:          4:       |
|TO BE LOGGED FOR LATER ANALYSIS   5:         6:         7:          8:       |
|RERUN ERROR TRIALS no                                                        |
|EVENT   TYPE    FORM ID       COMMENT                  MISC. INSERT FIELD   |
|  1   code      20       Randomize cell colors                               |
|  2   frame     7        Require sub resp                                    |
|  3   code      22       Draw sample stimulus                                |
|  4   frame     3        Present samp resp                                   |
|  5   frame     6        Delay screen (blank)                                |
|  6   code      {T1}     Draw comp stimuli (l/r)                             |
|  7   frame     {T2}     Record comp resp (l/r)                              |
```

```
+--------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\matching-----+
|COMMENT Say 'Get Ready'                                                      |
```

```
FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes
FOREGROUND COLOR white     BACKGROUND blue   CENTER no       DURATION response
DISPLAY TYPE normal
INPUT MODE key    LENGTH/PORT #             INDEX ANSWER no TERMINATE response
RESPONSE ' '                                ANSWER none
FEEDBACK none                               LOG DEPENDENT VARIABLE none
TEXT begins on next line and is continued on page 2

   At the start of each trial (when the word READY appears at the top of the

 screen) press the down arrow key to display a pattern of squares in the

 center of the screen.  The pattern will then be removed from the screen and

 be followed by a delay interval (short or long) during which the screen

 is blank (except for the word DELAY).  After the delay interval two test

 patterns will be presented, one matching the original and the other slightly

 different.  If the matching pattern is on the left, press the left arrow

 key.  If the matching pattern is on the right, press the right arrow key.

    You should try to decide whether the left or right pattern matches the

 original pattern as quickly as you can while still being as accurate as

 possible.

                      Press the SPACE BAR to begin


+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\matching-----+
COMMENT Briefly blanks screen
FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes
FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION 400
DISPLAY TYPE normal
INPUT MODE none   LENGTH/PORT #             INDEX ANSWER no TERMINATE timeout
RESPONSE none                               ANSWER none
FEEDBACK none                               LOG DEPENDENT VARIABLE none


+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\matching-----+
COMMENT Present Sample Stimulus
FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
```

```
|FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION 3000     |
|DISPLAY TYPE normal                                                         |
|INPUT MODE none   LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout  |
|RESPONSE none                            ANSWER none                        |
|FEEDBACK none                            LOG DEPENDENT VARIABLE none        |
|                                                                            |
|                                                                            |
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|                                                                            |
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|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|  The text above is a continuation of the first page and will allow you to  |
|display 25 lines of text (a full screen) in a single display                |
|                                                                            |
|Turn Graphics On Before Frame                                               |
|Turn Graphics Off After Frame yes                                           |


+--------------------------  FRAME SPECIFICATIONS    #6  -c:\mel\matching-----+
|COMMENT Delay Blank                                                         |
|FRAME INSERT         SEQUENCE none       START LINE 22      ERASE yes       |
|FOREGROUND COLOR yellow    BACKGROUND black  CENTER yes     DURATION {T4}   |
|DISPLAY TYPE normal                                                         |
|INPUT MODE none   LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout  |
|RESPONSE none                            ANSWER none                        |
|FEEDBACK none                            LOG DEPENDENT VARIABLE none        |
|TEXT begins on next line and is continued on page 2                         |
|                                                                            |
|DELAY                                                                       |


+--------------------------  FRAME SPECIFICATIONS    #7  -c:\mel\matching-----+
|COMMENT Ready Screen                                                        |
|FRAME INSERT         SEQUENCE none       START LINE 2       ERASE yes       |
|FOREGROUND COLOR hi_cyan   BACKGROUND black  CENTER yes     DURATION response|
|DISPLAY TYPE normal                                                         |
|INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response |
|RESPONSE £                               ANSWER £                           |
|FEEDBACK none                            LOG DEPENDENT VARIABLE sresp       |
|TEXT begins on next line and is continued on page 2                         |
|                                                                            |
```

```
|READY                                                                          |


+--------------------------- FRAME SPECIFICATIONS    #31 -c:\mel\matching-----+
|COMMENT Record Comparison Response (Left Correct on keypad)                    |
|FRAME INSERT          SEQUENCE none        START LINE 1       ERASE no         |
|FOREGROUND COLOR white     BACKGROUND black   CENTER no      DURATION 15000    |
|DISPLAY TYPE normal                                                            |
|INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response  |
|RESPONSE ùÖ                                ANSWER ù                            |
|FEEDBACK none                              LOG DEPENDENT VARIABLE cresp        |
|                                                                               |
|                                                                               |
|                                                                               |
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|                                                                               |
|  The text above is a continuation of the first page and will allow you to     |
|display 25 lines of text (a full screen) in a single display                   |
|                                                                               |
|Turn Graphics On Before Frame                                                  |
|Turn Graphics Off After Frame yes                                              |
|Graphics Commands:                                                             |
|+61                                                                            |


+--------------------------- FRAME SPECIFICATIONS    #33 -c:\mel\matching-----+
|COMMENT Record Comparison Response (Right Correct on keypad)                   |
|FRAME INSERT          SEQUENCE none        START LINE 1       ERASE no         |
|FOREGROUND COLOR white     BACKGROUND black   CENTER no      DURATION 15000    |
|DISPLAY TYPE normal                                                            |
|INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response  |
|RESPONSE ùÖ                                ANSWER Ö                            |
|FEEDBACK none                              LOG DEPENDENT VARIABLE cresp        |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
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|                                                                               |
|                                                                               |
```

```
  The text above is a continuation of the first page and will allow you to
display 25 lines of text (a full screen) in a single display

Turn Graphics On Before Frame
Turn Graphics Off After Frame yes
Graphics Commands:
+61
```

```
+---------------------------   CODE SPECIFICATIONS    #18 -c:\mel\matching-----+
COMMENT Initialize cells
Enter MEL code exactly as you want it written to the experiment file.

array_of_integer(correct_cell_color(64))
array_of_integer(incorr_cell_color(64))
integer(i,j,k,x,y)

for i=1 to 32 do begin
   correct_cell_color[i]=2
   end
for i=33 to 64 do begin
   correct_cell_color[i]=4
   end

permute(correct_cell_color,1,64)
permute(correct_cell_color,1,64)
permute(correct_cell_color,1,64)
permute(correct_cell_color,1,64)
```

```
+---------------------------   CODE SPECIFICATIONS    #20 -c:\mel\matching-----+
COMMENT Randomize color of cells for next trial
Enter MEL code exactly as you want it written to the experiment file.

permute(correct_cell_color,1,64)

for i=1 to 64 do begin
   incorr_cell_color[i] = correct_cell_color[i]
   end

repeat
   j=rrange(1,64)
until (incorr_cell_color[j]=2)
incorr_cell_color[j]=4
```

```
|
|repeat
|   k=rrange(1,64)
|until (incorr_cell_color[k]=4) and (k<>j)
|incorr_cell_color[k]=2


+---------------------------   CODE SPECIFICATIONS    #22 -c:\mel\matching-----
|COMMENT Draw Sample Matrix
|Enter MEL code exactly as you want it written to the experiment file.
|graphics_on('E:3')
|clear
|display_off
|k=1
|y=60
|for j=1 to 8 do begin
|   x=213
|   for i=1 to 8 do begin
|      graphics_color(14)
|      rectangle(x,y,25,10)
|      graphics_color(correct_cell_color[k])
|      fill_rectangle(x+1,y+1,23,8)
|      k=k+1
|      x=x+25
|   end
|   y=y+10
|end
|execute
|display_on


+---------------------------   CODE SPECIFICATIONS    #30 -c:\mel\matching-----
|COMMENT Draw Comparison Matrices (Left Correct)
|Enter MEL code exactly as you want it written to the experiment file.
|graphics_on('E:3')
|display_off
|clear
|k=1
|y=60
|for j=1 to 8 do begin
|   x=58
|   for i=1 to 8 do begin
|      graphics_color(14)
|      rectangle(x,y,25,10)
|      graphics_color(correct_cell_color[k])
|      fill_rectangle(x+1,y+1,23,8)
```

```
      k=k+1
      x=x+25
   end
   y=y+10
end
k=1
y=60
for j=1 to 8 do begin
   x=363
   for i=1 to 8 do begin
      graphics_color(14)
      rectangle(x,y,25,10)
      graphics_color(incorr_cell_color[k])
      fill_rectangle(x+1,y+1,23,8)
      k=k+1
      x=x+25
   end
   y=y+10
end
execute
display_on
```

```
+---------------------------   CODE SPECIFICATIONS    #32 -c:\mel\matching-----+
COMMENT raw Comparison Matrices (Right Correct)
Enter MEL code exactly as you want it written to the experiment file.
graphics_on('E:3')
display_off
clear
k=1
y=60
for j=1 to 8 do begin
   x=363
   for i=1 to 8 do begin
      graphics_color(14)
      rectangle(x,y,25,10)
      graphics_color(correct_cell_color[k])
      fill_rectangle(x+1,y+1,23,8)
      k=k+1
      x=x+25
   end
   y=y+10
end
k=1
y=60
for j=1 to 8 do begin
   x=58
```

```
    for i=1 to 8 do begin
       graphics_color(14)
       rectangle(x,y,25,10)
       graphics_color(incorr_cell_color[k])
       fill_rectangle(x+1,y+1,23,8)
       k=k+1
       x=x+25
    end
    y=y+10
end
execute
display_on
```

```
+--------------------------  INSERT SPECIFICATIONS   #1  -c:\mel\matching-----+
COMMENT Randomizes left and right comparison stimuli
 Enter inserts, use a "\" to delimit each slot of the insert.
! Draw left or right comp matrice code\record left or right resp correct\
! 1=short delay, 2=long delay\delay value\1=correct on left, 2=right
#5 30\31\1\1000\1
#5 32\33\1\1000\2
#5 30\31\2\15000\1
#5 32\33\2\15000\2
```

```
+--------------------------          NOTE PAD          #1  -c:\mel\matching-----+
                              Matching To Sample Task

   The subject must first respond on the down arrow key at the word "READY"
to present a 8 by 8 matrix as the sample stimulus.  It is on the screen
for three seconds.  The sample is removed after a variable delay interval
during which the screen is blank (except for the work DELAY at the bottom of
the screen).  The delay is either one or fifteen seconds. After the delay two
matrices are presented.  The subject is to select the comparison matrix
(left or right arrow key) that matches the sample matrix.

   The task consists of twenty trials, ten at each delay.  The READY response
must be made within 30 secs to present the sample (time is recorded).  A comp
response (left or right arrow key) must be made within fifteen seconds. Data
is recorded separately for short and long delays.  There are five left
correct and five right correct conditions for both delays, randomly presented.

   Session runs for twenty trials.

   Task should take about five to six minutes to run.
```

```
|   No feedback is provided during testing. During training use feedback of    |
|300 for incorrect tone and 800 for display.                                    |


+--------------------------- DEFAULT SPECIFICATIONS  #1  -c:\mel\matching-----+
|Collect subject information for data logging yes                             |
|Path to Setup,Run,Makedat,Analyze                                            |
|Does your screen flicker on displays (IBM CGA video adaptor) no              |
|Independent variables Minimum 0      Maximum 31                              |
|Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10   |
|  Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc  |
|# elements     10           10             10        10        5        5     |
|# characters   80           80             80        80        15       15    |
|Length of tone for incorrect responses 300   Length of feedback display 800  |
|Generate as an INCLUDE file no            Run file name run.exe              |
|Clear on feedback yes     At frame execution set CapsLock off and NumLock cur|
|Time resolution 1         Run limit inserts no                               |
|Counter balance none      Balance form number 255                            |
|Graphics mode             Warn on duration not multiple of refresh time yes  |
|Auto answer no            Subject init options ns                            |
|Overlay FORM with RUN no   Max questions allowed per questionnaire 100       |
|Minimum value for QANSWER 0       Respbox port        Sound device speaker   |
|End report      Wait type include Subject messages     Max subject number     |
```

Complex Reaction Time:

```
+---------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\reaction-----+
|AUTHOR Thomas                CREATION DATE 06-25-94 LAST UPDATE 02-08-95     |
|FILES:   EXP reaction DATA reaction  INSERT reaction  INCLUDE                |
|BACKUP DISK VOLUME                    DEBUG fast           SPARE             |
|ABSTRACT Complex Reaction Time (Wilkinson). Modified for arrow keys.         |
|                                                                             |
|                                                                             |
|NAMES OF: BLOCK INDEPENDENT VARS   1:          2:          3:          4:     |
| {to be logged for later analysis} 5:          6:          7:          8:     |
|          BLOCK DEPENDENT VARIABLES 1:         2:          3:          4:     |
| {logs as ACcuracy,SElection, RT}  5:          6:          7:          8:     |
|        TRIAL INDEPENDENT VARIABLES 1:position 2:          3:          4:     |
| {to be logged for later analysis} 5:          6:          7:          8:     |
|        TRIAL DEPENDENT VARIABLES   1:resp     2:          3:          4:     |
| {logs as ACcuracy,SElection, RT}  5:          6:          7:          8:     |
|EVENT   TYPE  FORM ID       COMMENT                  MISC. INSERT FIELD      |
|  1  frame    7        Get ready                                             |
|  2  frame    5        Draws squares                                         |
|  3  trial    1        Session trials                                        |
```

```
+--------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\reaction-----+
|COMMENT                                                                      |
|TRIAL INSERTS 1              SEQUENCE random   NUMBER OF TRIALS 60           |
|VALUES OF TRIAL INDEPENDENT VARS  1:{T1}     2:          3:          4:     |
|TO BE LOGGED FOR LATER ANALYSIS   5:         6:          7:          8:     |
|RERUN ERROR TRIALS no                                                        |
|EVENT  TYPE   FORM ID       COMMENT                  MISC. INSERT FIELD      |
|  1  frame    {T1}     Rand placement of dot                                 |
|  2  frame    6        Blanking of dot                                       |
```

```
+--------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\reaction-----+
|COMMENT Draws dot in upper square                                            |
|FRAME INSERT         SEQUENCE none       START LINE 1       ERASE no         |
|FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION 5000    |
|DISPLAY TYPE normal                                                          |
|INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response  |
|RESPONSE öùf£Ö                           ANSWER ö                            |
|FEEDBACK none                           LOG DEPENDENT VARIABLE resp          |
|                                                                             |
|                                                                             |
```

```
|                                                                          |
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|                                                                          |
|  The text above is a continuation of the first page and will allow you to|
|display 25 lines of text (a full screen) in a single display              |
|                                                                          |
|Turn Graphics On Before Frame                                             |
|Turn Graphics Off After Frame                                             |
|Graphics Commands:                                                        |
|+4 h m294,197 s f p(d20 r20 u20 l20)                                      |


+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\reaction-----+
|COMMENT Draws dot in lower left square                                    |
|FRAME INSERT          SEQUENCE none       START LINE 1       ERASE no     |
|FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION 5000|
|DISPLAY TYPE normal                                                       |
|INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response|
|RESPONSE öùf Ö                           ANSWER ù                         |
|FEEDBACK none                           LOG DEPENDENT VARIABLE resp       |
|                                                                          |
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|                                                                          |
|  The text above is a continuation of the first page and will allow you to|
|display 25 lines of text (a full screen) in a single display              |
|                                                                          |
|Turn Graphics On Before Frame                                             |
|Turn Graphics Off After Frame                                             |
|Graphics Commands:                                                        |
|+4 h m224,277 s f p(d20 r20 u20 l20)                                      |
```

```
+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\reaction-----
¦COMMENT Draws dot in lower center square
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION 5000
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE öùf£Ö                             ANSWER £
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp
¦
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¦
¦
¦  The text above is a continuation of the first page and will allow you to
¦display 25 lines of text (a full screen) in a single display
¦
¦Turn Graphics On Before Frame
¦Turn Graphics Off After Frame
¦Graphics Commands:
¦+4 h m294,277 s f p(d20 r20 u20 l20)


+--------------------------  FRAME SPECIFICATIONS    #4  -c:\mel\reaction-----
¦COMMENT Draws dot in lower right square
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION 5000
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE öùf£Ö                             ANSWER Ö
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp
¦
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```

```
  The text above is a continuation of the first page and will allow you to
display 25 lines of text (a full screen) in a single display

Turn Graphics On Before Frame
Turn Graphics Off After Frame
Graphics Commands:
+4 h m364,277 s f p(d20 r20 u20 120)
```

```
+--------------------------  FRAME SPECIFICATIONS    #5  -c:\mel\reaction-----+
COMMENT Draws four empty squares
FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION 50
DISPLAY TYPE waittop+flashup
INPUT MODE none   LENGTH/PORT #           INDEX ANSWER no TERMINATE timeout
RESPONSE none                             ANSWER none
FEEDBACK none                             LOG DEPENDENT VARIABLE none
```

```
  The text above is a continuation of the first page and will allow you to
display 25 lines of text (a full screen) in a single display

Turn Graphics On Before Frame yes
Turn Graphics Off After Frame
Graphics Commands:
+15 h m280,180 s p(d55 r49 u55 149) h m210,260 s p(d55 r49 u55 149)
    h m280,260 s p(d55 r49 u55 149) h m350,260 s p(d55 r49 u55 149)
```

```
+--------------------------  FRAME SPECIFICATIONS    #6  -c:\mel\reaction-----+
COMMENT Dot blanking delay after a response
FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION 120
DISPLAY TYPE normal
INPUT MODE none   LENGTH/PORT #           INDEX ANSWER no TERMINATE timeout
RESPONSE none                             ANSWER none
FEEDBACK none                             LOG DEPENDENT VARIABLE none
```

The text above is a continuation of the first page and will allow you to display 25 lines of text (a full screen) in a single display

Turn Graphics On Before Frame
Turn Graphics Off After Frame
Graphics Commands:
+0 h m294,197 s f p(d20 r20 u20 l20) h m224,277 s f p(d20 r20 u20 l20) h m294,277 s f p(d20 r20 u20 l20) h m364,277 s f p(d20 r20 u20 l20)

---------- FRAME SPECIFICATIONS #7 -c:\mel\reaction-----

COMMENT Instructions
FRAME INSERT SEQUENCE none START LINE 1 ERASE yes
FOREGROUND COLOR white BACKGROUND blue CENTER no DURATION response
DISPLAY TYPE waittop+flashup
INPUT MODE key LENGTH/PORT # INDEX ANSWER no TERMINATE response
RESPONSE ' ' ANSWER none
FEEDBACK none LOG DEPENDENT VARIABLE none
TEXT begins on next line and is continued on page 2

A small red square will appear in one of four boxes near the center of the screen. Each box corresponds to one of the four arrow keys as shown:

Top Arrow

Left Arrow Right Arrow

Middle Arrow

When the red square appears you are to press the corresponding arrow key as quickly as possible. The square will then jump to a different (or the same) box and you are to again press the corresponding arrow key, continue

```
 to follow the red square as rapidly as you can.

                          Press the SPACE BAR to begin
  The text above is a continuation of the first page and will allow you to
display 25 lines of text (a full screen) in a single display

Turn Graphics On Before Frame yes
Turn Graphics Off After Frame yes
Graphics Commands:
+15 h m280,180 s p(d55 r49 u55 149) h m210,260 s p(d55 r49 u55 149)
h m280,260 s p(d55 r49 u55 149) h m350,260 s p(d55 r49 u55 149)
+4 h m294,197 s f p(d20 r20 u20 120)


+--------------------------  INSERT SPECIFICATIONS   #1  -c:\mel\reaction-----+
COMMENT Chooses frame that draws placement of dot in squares
 Enter inserts, use a "\" to delimit each slot of the insert.
! Each frame is presented fifteen (#15) times for total of 60 trials
#15 1
#15 2
#15 3
#15 4


+--------------------------          NOTE PAD          #1  -c:\mel\reaction-----+
Complex Reaction Time

  On each trial a small red square appears in one of four boxes.  Each box
corresponds to one of the four arrow keys on the keyboard.  When the red
square appears the subject must press the corresponding key as quickly as
possible.  There are 60 trials, with each the red square appearing in each
of the four squares 15 times randomly.  An arrow key response must be made
within five seconds of the appearance of the red square.

   No feedback is provided during testing.  During training use feedback of
150 for incorrect tone and 800 for display.


+--------------------------  DEFAULT SPECIFICATIONS  #1  -c:\mel\reaction-----+
Collect subject information for data logging yes
Path to Setup,Run,Makedat,Analyze \mel
Does your screen flicker on displays (IBM CGA video adaptor) no
Independent variables Minimum 0      Maximum 31
Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10
 Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc
# elements    5            5              5         10        5        5
```

```
|# characters  240          240             80        80        40        15
|Length of tone for incorrect responses 150   Length of feedback display 8000
|Generate as an INCLUDE file no             Run file name run.exe
|Clear on feedback no     At frame execution set CapsLock off and NumLock cur
|Time resolution 1        Run limit inserts no
|Counter balance none     Balance form number 255
|Graphics mode            Warn on duration not multiple of refresh time yes
|Auto answer no           Subject init options ns
|Overlay FORM with RUN yes  Max questions allowed per questionnaire 100
|Minimum value for QANSWER 0       Respbox port        Sound device speaker
|End report no   Wait type exclude Subject messages 0   Max subject number 100
```

Visual Vigilance:

```
+--------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\vigil--------+
|AUTHOR John R. Thomas      CREATION DATE 07-02-94 LAST UPDATE 05-22-95       |
|FILES:   EXP vigil    DATA vigil     INSERT vigil     INCLUDE                |
|BACKUP DISK VOLUME                   DEBUG fast          SPARE             |
|ABSTRACT Alpha-Numeric Visual Vigilance Task.  Random letters and numbers are |
|presented in the center of the screen.  The subject is to press the arrow key |
|when an 'A' or '3' appears.  No response is to be given to other stimuli.     |
|                                                                              |
|NAMES OF: BLOCK INDEPENDENT VARS   1:         2:         3:         4:       |
| {to be logged for later analysis} 5:         6:         7:         8:       |
|         BLOCK DEPENDENT VARIABLES 1:         2:         3:         4:       |
| {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:       |
|       TRIAL INDEPENDENT VARIABLES 1:target   2:         3:         4:       |
| {to be logged for later analysis} 5:         6:         7:         8:       |
|       TRIAL DEPENDENT VARIABLES   1:resp     2:         3:         4:       |
| {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:       |
|EVENT   TYPE  FORM ID       COMMENT              MISC. INSERT FIELD           |
|  1  frame    3       Instruction                                             |
|  2  code     1       Sets large font                                         |
|  3  frame    2       Blanks screen                                           |
|  4  trial    1       Task                                                    |
|  5  code     2       Restores normal font                                    |
```

```
+---------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\vigil--------+
|COMMENT Task consists of one hundred stimulus presentation trials             |
|TRIAL INSERTS 1              SEQUENCE random   NUMBER OF TRIALS 100           |
|VALUES OF TRIAL INDEPENDENT VARS  1:{T1}     2:         3:         4:        |
|TO BE LOGGED FOR LATER ANALYSIS   5:         6:         7:         8:        |
|RERUN ERROR TRIALS no                                                         |
|EVENT  TYPE   FORM ID       COMMENT                MISC. INSERT FIELD         |
|  1  frame    1       Present stimuli                                         |
|  2  frame    2       Blanks screen                                           |
```

```
+---------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\vigil--------+
|COMMENT Stimulus presentation screen                                          |
|FRAME INSERT          SEQUENCE none        START LINE 14       ERASE yes      |
|FOREGROUND COLOR yellow    BACKGROUND black  CENTER yes      DURATION 500     |
|DISPLAY TYPE normal                                                           |
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response  |
|RESPONSE £                                ANSWER {T3}                         |
```

```
¦FEEDBACK none                                LOG DEPENDENT VARIABLE resp
¦TEXT begins on next line and is continued on page 2
¦{T2}


+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\vigil--------+
¦COMMENT Blanks screen randomly for a duration of one to five secs
¦FRAME INSERT 2       SEQUENCE random     START LINE 14       ERASE yes
¦FOREGROUND COLOR white     BACKGROUND black  CENTER yes     DURATION {f1}
¦DISPLAY TYPE normal
¦INPUT MODE none   LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout
¦RESPONSE none                            ANSWER none
¦FEEDBACK none                            LOG DEPENDENT VARIABLE none


+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\vigil--------+
¦COMMENT Instructions to subjects
¦FRAME INSERT         SEQUENCE none       START LINE 1        ERASE yes
¦FOREGROUND COLOR white     BACKGROUND blue   CENTER no       DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response
¦RESPONSE ' '                             ANSWER none
¦FEEDBACK none                            LOG DEPENDENT VARIABLE none
¦TEXT begins on next line and is continued on page 2
¦
¦
¦
¦
¦
¦   In this task you are to monitor the center of the screen on which letters
¦
¦ or numbers will be briefly presented.  One randomly selected letter or
¦
¦ number will appear every few seconds.  If the character is an 'A' or a '3'
¦
¦ you are to respond by pressing the down arrow key.  If the character is any
¦ other than an 'A' or '3' no response is to be made.  Respond as quickly
¦
¦ and as accurately as possible.
¦
¦
¦
¦
¦
```

```
¦                          Press the SPACE BAR to begin


+---------------------------   CODE SPECIFICATIONS    #1  -c:\mel\vigil--------
¦COMMENT Turns on large font for letters and numbers
¦Enter MEL code exactly as you want it written to the experiment file.
¦graphics_on()
¦graphics_font('system48.fnt')


+---------------------------   CODE SPECIFICATIONS    #2  -c:\mel\vigil--------
¦COMMENT Restores normal font at end of task
¦Enter MEL code exactly as you want it written to the experiment file.
¦graphics_font('system16.fnt')


+---------------------------  INSERT SPECIFICATIONS   #1  -c:\mel\vigil--------
¦COMMENT 160 stimuli. 40 target (20 As and 20 3s). 120 other characters
¦ Enter inserts, use a "\" to delimit each slot of the insert.
¦! 1=target stim, 2=not target\stimulus\appropriate response
¦#20 1\A\£
¦#20 1\3\£
¦#3 2\B\
¦#3 2\C\
¦#3 2\D\
¦#3 2\E\
¦#3 2\F\
¦#3 2\G\
¦#3 2\H\
¦#3 2\I\
¦#6 2\J\
¦#3 2\K\
¦#3 2\L\
¦#3 2\M\
¦#3 2\N\
¦#3 2\O\
¦#3 2\P\
¦#3 2\Q\
¦#6 2\R\
¦#3 2\S\
¦#6 2\T\
¦#3 2\U\
¦#3 2\V\
¦#3 2\W\
¦#3 2\X\
¦#3 2\Y\
```

```
¦#3 2\Z\
¦#4 2\1\
¦#4 2\2\
¦#4 2\4\
¦#4 2\5\
¦#4 2\6\
¦#4 2\7\
¦#4 2\8\
¦#4 2\9\
¦#4 2\0\


+--------------------------  INSERT SPECIFICATIONS   #2  -c:\mel\vigil--------
¦COMMENT Intertrial Interval (Randomly 1 to 5 secs, mean = 3 secs)
¦ Enter inserts, use a "\" to delimit each slot of the insert.
¦#5 1000
¦#5 2000
¦#5 3000
¦#5 4000
¦#5 5000


+--------------------------          NOTE PAD          #1  -c:\mel\vigil--------
¦Alpha-Numeric Visual Vigilance Task
¦
¦     The subject must continuously monitor the screen on which letters and
¦numbers will be briefly (0.5 sec) presented.  If the character presented
¦is either an "A" or a "3" the subject is to press the down arrow key before
¦the character is removed from the screen.  If the character is not one of the
¦above two, no response is to be made.
¦
¦     There are 160 stimuli consisting of 40 target (20 "A"s and 20 "3"s) and
other letter and number characters.  The inter-stimulus interval varies
¦between 1 and 5 secs (mean of 3 secs) and a session lasts for 100 trials.
¦A session lasts for about 6 mins.


+--------------------------  DEFAULT SPECIFICATIONS  #1  -c:\mel\vigil--------
¦Collect subject information for data logging yes
¦Path to Setup,Run,Makedat,Analyze \mel
¦Does your screen flicker on displays (IBM CGA video adaptor) no
¦Independent variables Minimum 0      Maximum 31
¦Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10
¦ Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc
¦# elements    5            5              5         10        5        5
¦# characters  240          240            80        80        40       15
```

```
Length of tone for incorrect responses 300   Length of feedback display 800
Generate as an INCLUDE file no              Run file name run.exe
Clear on feedback yes     At frame execution set CapsLock low and NumLock cur
Time resolution 1         Run limit inserts no
Counter balance none      Balance form number 255
Graphics mode             Warn on duration not multiple of refresh time yes
Auto answer no            Subject init options ns
Overlay FORM with RUN yes  Max questions allowed per questionnaire 100
Minimum value for QANSWER 0       Respbox port        Sound device speaker
End report no   Wait type exclude Subject messages 0   Max subject number 100
```

Serial Addition - Subtraction

```
+--------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\addsub-------+
|AUTHOR John R. Thomas      CREATION DATE 05-25-94 LAST UPDATE 02-08-95       |
|FILES:   EXP addsub   DATA addsub    INSERT addsub    INCLUDE                |
|BACKUP DISK VOLUME                   DEBUG fast          SPARE              |
|ABSTRACT Serial Addition/Subtraction.  Two digits are presented separated by a|
|plus or minus. The subject has to add or subtract the digits and enter the   |
|least significant digit.  Negative results must be subtracted from ten.      |
|                                                                              |
|NAMES OF: BLOCK INDEPENDENT VARS   1:         2:         3:         4:       |
| {to be logged for later analysis} 5:         6:         7:         8:       |
|         BLOCK DEPENDENT VARIABLES 1:         2:         3:         4:       |
| {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:       |
|       TRIAL INDEPENDENT VARIABLES 1:add_sub  2:problem  3:neg_pos  4:       |
| {to be logged for later analysis} 5:         6:         7:         8:       |
|       TRIAL DEPENDENT VARIABLES   1:resp     2:         3:         4:       |
| {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:       |
|EVENT   TYPE   FORM ID       COMMENT                MISC. INSERT FIELD        |
|  1   frame    3       Instructions                                           |
|  2   frame    2       Blank screen                                           |
|  3   code     1       Turn on large font                                     |
|  4   trial    1       Run test                                               |
|  5   code     2       Turn off large font                                    |
```

```
+--------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\addsub-------+
|COMMENT                                                                       |
|TRIAL INSERTS 1              SEQUENCE random   NUMBER OF TRIALS 50            |
|VALUES OF TRIAL INDEPENDENT VARS  1:{T6}     2:{T1}     3:{T7}     4:        |
|TO BE LOGGED FOR LATER ANALYSIS   5:         6:         7:         8:        |
|RERUN ERROR TRIALS no                                                         |
|EVENT  TYPE   FORM ID       COMMENT                  MISC. INSERT FIELD       |
|  1   frame    1       Present problem                                        |
```

```
+--------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\addsub-------+
|COMMENT Presents problem                                                      |
|FRAME INSERT         SEQUENCE none       START LINE 14      ERASE yes         |
|FOREGROUND COLOR white     BACKGROUND blue   CENTER yes     DURATION 15000    |
|DISPLAY TYPE waittop+flashup                                                  |
|INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response   |
|RESPONSE 123456789                       ANSWER {T5}                          |
|FEEDBACK none                            LOG DEPENDENT VARIABLE resp          |
|TEXT begins on next line and is continued on page 2                           |
```

```
| {T2}  {T3}  {T4}  =  ?                                                    |

+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\addsub-------+
|COMMENT Briefly blanks screen                                              |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes   |
|FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION 800 |
|DISPLAY TYPE waittop+flashup                                               |
|INPUT MODE none    LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout |
|RESPONSE none                             ANSWER none                      |
|FEEDBACK none                             LOG DEPENDENT VARIABLE none      |


+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\addsub-------+
|COMMENT Instructions                                                       |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes   |
|FOREGROUND COLOR white      BACKGROUND blue   CENTER no       DURATION response |
|DISPLAY TYPE normal                                                        |
|INPUT MODE key     LENGTH/PORT #          INDEX ANSWER no TERMINATE response |
|RESPONSE ' '                              ANSWER none                      |
|FEEDBACK none                             LOG DEPENDENT VARIABLE none      |
|TEXT begins on next line and is continued on page 2                        |
|                                                                           |
|                                                                           |
|   In this task two digits will be presented, separated by a plus or minus |
|                                                                           |
| sign.  You are to add or subtract them accordingly and enter the LAST SINGLE |
|                                                                           |
| DIGIT of your answer.  Thus 9 + 8 would require you to add 9 and 8 and then |
|                                                                           |
| enter 7 for 17.  While 7 - 4 would require you to subtract 4 from 7 and then |
|                                                                           |
| enter 3.  If subtraction yields a NEGATIVE number you must automatically add |
|                                                                           |
| 10 to it and enter the single positive digit that remains.  Thus 3 - 9 would |
|                                                                           |
| require you to subtract 9 from 3 to get -6 and then add 10 to get the answer |
|                                                                           |
| 4.  Use the top row of number keys to enter your SINGLE DIGIT answer.     |
|                                                                           |
|     Be attentive and try to be as accurate as you can while working as    |
|                                                                           |
| quickly as you can.                                                       |
|                                                                           |
|                                                                           |
|                        Press the SPACE BAR to begin                       |
```

```
+---------------------------   CODE SPECIFICATIONS    #1  -c:\mel\addsub-------
¦COMMENT Turn on large font
¦Enter MEL code exactly as you want it written to the experiment file.
¦graphics_on()
¦graphics_font('system48.fnt')


+---------------------------   CODE SPECIFICATIONS    #2  -c:\mel\addsub-------
¦COMMENT Turn off large font
¦Enter MEL code exactly as you want it written to the experiment file.
¦graphics_font('system16.fnt')


+---------------------------  INSERT SPECIFICATIONS   #1  -c:\mel\addsub-------
¦COMMENT List of 100 additon and 100 subraction problems
¦ Enter inserts, use a "\" to delimit each slot of the insert.
¦! Format:
¦! # of the problem\1st numb\sign\2nd numb\answer\add=1,sub=2\negative
¦!       answer=1,positive answer=2
¦1\6\+\7\3\1\2
¦2\5\+\8\3\1\2
¦3\1\+\5\6\1\2
¦4\8\+\3\1\1\2
¦5\5\+\9\4\1\2
¦6\2\+\1\3\1\2
¦7\9\+\2\1\1\2
¦8\4\+\5\9\1\2
¦9\3\+\3\6\1\2
¦10\8\+\4\2\1\2
¦11\8\+\6\4\1\2
¦12\7\+\1\8\1\2
¦13\5\+\6\1\1\2
¦14\9\+\2\1\1\2
¦15\3\+\8\1\1\2
¦16\9\+\7\6\1\2
¦17\7\+\2\9\1\2
¦18\5\+\1\6\1\2
¦19\3\+\4\7\1\2
¦20\7\+\6\3\1\2
¦21\1\+\3\4\1\2
¦22\5\+\6\1\1\2
¦23\4\+\5\9\1\2
¦24\2\+\4\6\1\2
¦25\7\+\6\3\1\2
¦26\3\+\1\4\1\2
¦27\2\+\1\3\1\2
```

```
|28\4\+\2\6\1\2
|29\7\+\4\1\1\2
|30\9\+\4\3\1\2
|31\8\+\1\9\1\2
|32\4\+\4\8\1\2
|33\3\+\8\1\1\2
|34\5\+\7\2\1\2
|35\2\+\1\3\1\2
|36\4\+\4\8\1\2
|37\6\+\5\1\1\2
|38\7\+\6\3\1\2
|39\1\+\4\5\1\2
|40\4\+\1\5\1\2
|41\3\+\5\8\1\2
|42\3\+\8\1\1\2
|43\1\+\8\9\1\2
|44\5\+\6\1\1\2
|45\1\+\7\8\1\2
|46\7\+\8\5\1\2
|47\7\+\2\9\1\2
|48\8\+\8\6\1\2
|49\5\+\1\6\1\2
|50\7\+\6\3\1\2
|51\3\+\6\9\1\2
|52\7\+\4\1\1\2
|53\1\+\5\6\1\2
|54\4\+\8\2\1\2
|55\1\+\5\6\1\2
|56\9\+\3\2\1\2
|57\6\+\6\2\1\2
|58\7\+\7\4\1\2
|59\7\+\6\3\1\2
|60\7\+\9\6\1\2
|61\8\+\3\1\1\2
|62\3\+\4\7\1\2
|63\2\+\6\8\1\2
|64\4\+\5\9\1\2
|65\4\+\4\8\1\2
|66\2\+\3\5\1\2
|67\3\+\3\6\1\2
|68\2\+\2\4\1\2
|69\1\+\7\8\1\2
|70\2\+\1\3\1\2
|71\7\+\2\9\1\2
|72\1\+\5\6\1\2
|73\4\+\7\1\1\2
|74\8\+\9\7\1\2
|75\7\+\8\5\1\2
```

¦76\9\+\6\5\1\2
¦77\3\+\8\1\1\2
¦78\5\+\7\2\1\2
¦79\1\+\4\5\1\2
¦80\4\+\9\3\1\2
¦81\4\+\3\7\1\2
¦82\7\+\2\9\1\2
¦83\5\+\4\9\1\2
¦84\8\+\4\2\1\2
¦85\6\+\8\4\1\2
¦86\7\+\5\2\1\2
¦87\1\+\7\8\1\2
¦88\1\+\1\2\1\2
¦89\5\+\2\7\1\2
¦90\7\+\9\6\1\2
¦91\7\+\7\4\1\2
¦92\7\+\6\3\1\2
¦93\5\+\7\2\1\2
¦94\3\+\2\5\1\2
¦95\7\+\8\5\1\2
¦96\3\+\4\7\1\2
¦97\8\+\6\4\1\2
¦98\6\+\6\2\1\2
¦99\4\+\9\3\1\2
¦100\2\+\1\3\1\2
¦101\9\-\7\2\2\2
¦102\5\-\7\8\2\1
¦103\7\-\3\4\2\2
¦104\1\-\6\5\2\1
¦105\2\-\1\1\2\2
¦106\2\-\1\1\2\2
¦107\3\-\5\8\2\1
¦108\9\-\4\5\2\2
¦109\6\-\2\4\2\2
¦110\4\-\8\6\2\1
¦111\6\-\3\3\2\2
¦112\6\-\3\3\2\2
¦113\3\-\4\9\2\1
¦114\2\-\8\4\2\1
¦115\4\-\7\7\2\1
¦116\3\-\1\2\2\2
¦117\5\-\1\4\2\2
¦118\7\-\8\9\2\1
¦119\5\-\7\8\2\1
¦120\5\-\9\6\2\1
¦121\1\-\7\4\2\1
¦122\7\-\3\4\2\2
¦123\6\-\9\7\2\1

¦124\6\-\1\5\2\2
¦125\7\-\8\9\2\1
¦126\8\-\1\7\2\2
¦127\2\-\8\4\2\1
¦128\1\-\8\3\2\1
¦129\5\-\4\1\2\2
¦130\4\-\2\2\2\2
¦131\5\-\8\7\2\1
¦132\5\-\6\9\2\1
¦133\3\-\5\8\2\1
¦134\4\-\1\3\2\2
¦135\6\-\1\5\2\2
¦136\4\-\5\9\2\1
¦137\7\-\6\1\2\2
¦138\1\-\2\9\2\1
¦139\6\-\9\7\2\1
¦140\4\-\9\5\2\1
¦141\9\-\3\6\2\2
¦142\2\-\1\1\2\2
¦143\6\-\4\2\2\2
¦144\8\-\2\6\2\2
¦145\2\-\3\9\2\1
¦146\6\-\5\1\2\2
¦147\7\-\6\1\2\2
¦148\4\-\5\9\2\1
¦149\2\-\8\4\2\1
¦150\1\-\8\3\2\1
¦151\6\-\2\4\2\2
¦152\7\-\2\5\2\2
¦153\2\-\9\3\2\1
¦154\1\-\9\2\2\1
¦155\8\-\5\3\2\2
¦156\9\-\6\3\2\2
¦157\3\-\8\5\2\1
¦158\2\-\3\9\2\1
¦159\8\-\5\3\2\2
¦160\9\-\1\8\2\2
¦161\4\-\3\1\2\2
¦162\1\-\3\8\2\1
¦163\1\-\8\3\2\1
¦164\5\-\9\6\2\1
¦165\8\-\6\2\2\2
¦166\8\-\2\6\2\2
¦167\6\-\9\7\2\1
¦168\3\-\5\8\2\1
¦169\8\-\9\9\2\1
¦170\3\-\6\7\2\1
¦171\9\-\2\7\2\2

```
¦172\8\-\2\6\2\2
¦173\7\-\4\3\2\2
¦174\5\-\8\7\2\1
¦175\4\-\1\3\2\2
¦176\3\-\6\7\2\1
¦177\9\-\8\1\2\2
¦178\1\-\9\2\2\1
¦179\5\-\1\4\2\2
¦180\3\-\7\6\2\1
¦181\5\-\2\3\2\2
¦182\7\-\9\8\2\1
¦183\8\-\5\3\2\2
¦184\5\-\7\8\2\1
¦185\3\-\9\4\2\1
¦186\7\-\9\8\2\1
¦187\7\-\8\9\2\1
¦188\3\-\8\5\2\1
¦189\1\-\3\8\2\1
¦190\9\-\2\7\2\2
¦191\2\-\1\1\2\2
¦192\4\-\2\2\2\2
¦193\6\-\1\5\2\2
¦194\3\-\1\2\2\2
¦195\1\-\2\9\2\1
¦196\5\-\4\1\2\2
¦197\9\-\4\5\2\2
¦198\3\-\9\4\2\1
¦199\6\-\8\8\2\1
¦200\5\-\4\1\2\2



+---------------------------          NOTE PAD          #1  -c:\mel\addsub-------+
¦Serial Addition/Subtraction Task
¦
¦     On each trial two digits are presented, separated by a plus or minus
¦sign.  The subject is to add or subtract them and enter the last single digit
¦of the answer.  If subtraction produces a negative number the subject must
¦add ten to the answer and enter the single positive digit that remains.
¦
¦    The top keyboard row of number keys are used.  A response must be made
¦within 15 seconds.  Each session consists of 50 trials randomly selected
¦from a predefined list of 200 problems. On that list, 100 problems are
¦addition and 100 problems are substraction.  Of the substraction, 50 problems
¦result in a negative number.
+---------------------------  DEFAULT SPECIFICATIONS  #1  -c:\mel\addsub-------+
¦Collect subject information for data logging yes
¦Path to Setup,Run,Makedat,Analyze \mel
```

```
Does your screen flicker on displays (IBM CGA video adaptor) no
Independent variables Minimum 0      Maximum 200
Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10
 Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc
# elements    5            7              7         10        5         5
# characters  240          240            80        80        40        15
Length of tone for incorrect responses 300   Length of feedback display 800
Generate as an INCLUDE file no             Run file name run.exe
Clear on feedback yes    At frame execution set CapsLock low and NumLock num
Time resolution 1        Run limit inserts no
Counter balance none     Balance form number 255
Graphics mode            Warn on duration not multiple of refresh time yes
Auto answer no           Subject init options ns
Overlay FORM with RUN yes  Max questions allowed per questionnaire 100
Minimum value for QANSWER 0       Respbox port        Sound device speaker
End report no   Wait type exclude Subject messages 0   Max subject number 100
```

Logical Reasoning:

```
+---------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\gram---------
¦AUTHOR John Thomas          CREATION DATE 05-16-94 LAST UPDATE 02-08-95
¦FILES:   EXP gram     DATA gram      INSERT gram      INCLUDE
¦BACKUP DISK VOLUME                   DEBUG fast          SPARE
¦ABSTRACT Grammatical Reasoning
¦Pairs of letters (AB or BA) and a statement about their sequential arrangement
¦are presented.  The task is to determine whether the statement and letter
¦pairs match or fail to match.
¦NAMES OF: BLOCK INDEPENDENT VARS   1:         2:         3:         4:
¦  {to be logged for later analysis} 5:         6:         7:         8:
¦          BLOCK DEPENDENT VARIABLES 1:        2:         3:         4:
¦  {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:
¦        TRIAL INDEPENDENT VARIABLES 1:posneg  2:actpas   3:folpre   4:pair
¦  {to be logged for later analysis} 5:state    6:trufal   7:         8:
¦        TRIAL DEPENDENT VARIABLES   1:resp    2:         3:         4:
¦  {logs as ACcuracy,SElection, RT}  5:         6:         7:         8:
¦EVENT   TYPE  FORM ID       COMMENT                MISC. INSERT FIELD
¦  1  frame    1       Instructions
¦  2  frame    3       Blank screen
¦  3  trial    1       Present the trials
```

```
+---------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\gram---------
¦COMMENT
¦TRIAL INSERTS 10            SEQUENCE random   NUMBER OF TRIALS 32
¦VALUES OF TRIAL INDEPENDENT VARS  1:{T2}     2:{T3}     3:{T4}     4:{T5}
¦TO BE LOGGED FOR LATER ANALYSIS   5:{T6}     6:{T9}     7:         8:
¦RERUN ERROR TRIALS no
¦EVENT  TYPE   FORM ID       COMMENT                  MISC. INSERT FIELD
¦  1  frame    2       Present test stimuli
```

```
+---------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\gram---------
¦COMMENT Instruction for Gram Reasoning
¦FRAME INSERT         SEQUENCE none       START LINE 1       ERASE yes
¦FOREGROUND COLOR white     BACKGROUND blue   CENTER no      DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response
¦RESPONSE ' '                             ANSWER none
¦FEEDBACK none                            LOG DEPENDENT VARIABLE none
¦TEXT begins on next line and is continued on page 2
¦
¦
```

This task will present a series of statements about the sequential order of two letters. Each statement will then be followed by the two letters AB or BA. The first letter (left letter) is said to 'precede' the second letter (right letter), while the second letter is said to 'follow' the first. You are to decide whether each statement correctly describes the order of the two letters or not. If it does, press the 'T' keyboard key for True. If it does not, press the 'F' key for False.

For this task it is important that you make your decisions as quickly and as accurately as you can.

Press the SPACE BAR to begin

```
+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\gram---------+
|COMMENT Present test stimuli                                                 |
|FRAME INSERT          SEQUENCE none        START LINE 11       ERASE yes     |
|FOREGROUND COLOR white      BACKGROUND blue   CENTER yes      DURATION 15000 |
|DISPLAY TYPE waittop+flashup                                                 |
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response |
|RESPONSE TF                               ANSWER {T1}                        |
|FEEDBACK none                             LOG DEPENDENT VARIABLE resp        |
|TEXT begins on next line and is continued on page 2                          |
|{T7}                                                                         |
|                                                                             |
|{T8}                                                                         |
```

```
+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\gram---------+
|COMMENT Brief screen blanking at start of task                               |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes     |
|FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION 800   |
|DISPLAY TYPE normal                                                          |
|INPUT MODE none   LENGTH/PORT #           INDEX ANSWER no TERMINATE timeout  |
|RESPONSE none                             ANSWER none                        |
|FEEDBACK none                             LOG DEPENDENT VARIABLE none        |
```

```
+--------------------------  INSERT SPECIFICATIONS   #10 -c:\mel\gram---------
¦COMMENT
¦ Enter inserts, use a "\" to delimit each slot of the insert.
¦! Answer: T-true response key,F-false response key\1-positive, 2-negative\
¦! 1-active,2-passive\1-follows, 2-precedes\letter pair: (1-AB, 2-BA)\
¦! order within statement: (1-AB, 2-BA)\Statement itself\Letter pair\
¦! 1-match,2-nonmatch
¦T\1\1\2\1\1\A PRECEDES B\AB\1
¦F\1\1\1\1\1\A FOLLOWS B\AB\2
¦F\1\2\2\1\1\A IS PRECEDED BY B\AB\2
¦T\1\2\1\1\1\A IS FOLLOWED BY B\AB\1
¦F\2\1\2\1\1\A DOES NOT PRECEDE B\AB\2
¦T\2\1\1\1\1\A DOES NOT FOLLOW B\AB\1
¦T\2\2\2\1\1\A IS NOT PRECEDED BY B\AB\1
¦F\2\2\1\1\1\A IS NOT FOLLOWED BY B\AB\2
¦F\1\1\2\2\1\A PRECEDES B\BA\2
¦T\1\1\1\2\1\A FOLLOWS B\BA\1
¦T\1\2\2\2\1\A IS PRECEDED BY B\BA\1
¦F\1\2\1\2\1\A IS FOLLOWED BY B\BA\2
¦T\2\1\2\2\1\A DOES NOT PRECEDE B\BA\1
¦F\2\1\1\2\1\A DOES NOT FOLLOW B\BA\2
¦F\2\2\2\2\1\A IS NOT PRECEDED BY B\BA\2
¦T\2\2\1\2\1\A IS NOT FOLLOWED BY B\BA\1
¦F\1\1\2\1\2\B PRECEDES A\AB\2
¦T\1\1\1\1\2\B FOLLOWS A\AB\1
¦T\1\2\2\1\2\B IS PRECEDED BY A\AB\1
¦F\1\2\1\1\2\B IS FOLLOWED BY A\AB\2
¦T\2\1\2\1\2\B DOES NOT PRECEDE A\AB\1
¦F\2\1\1\1\2\B DOES NOT FOLLOW A\AB\2
¦F\2\2\2\1\2\B IS NOT PRECEDED BY A\AB\2
¦T\2\2\1\1\2\B IS NOT FOLLOWED BY A\AB\1
¦T\1\1\2\2\2\B PRECEDES A\BA\1
¦F\1\1\1\2\2\B FOLLOWS A\BA\2
¦F\1\2\2\2\2\B IS PRECEDED BY A\BA\2
¦T\1\2\1\2\2\B IS FOLLOWED BY A\BA\1
¦F\2\1\2\2\2\B DOES NOT PRECEDE A\BA\2
¦T\2\1\1\2\2\B DOES NOT FOLLOW A\BA\1
¦T\2\2\2\2\2\B IS NOT PRECEDED BY A\BA\1
¦F\2\2\1\2\2\B IS NOT FOLLOWED BY A\BA\2


+--------------------------          NOTE PAD          #1  -c:\mel\gram---------
¦Grammatical Reasoning Task
¦
¦     On each trial a statement is presented about the relationship between
¦two letters, A and B.  Each statement is followed by the letters AB or BA.
```

```
¦The subject must decide whether each statement correctly describes the order ¦
¦of the two letters or not.  The 'T' keyboard key is pressed for correct      ¦
¦(statement is true) and the 'F' key is pressed for incorrect (statement is   ¦
¦not true).                                                                   ¦
¦                                                                             ¦
¦     Statements can be positive/negative, active/passive, and a given letter ¦
¦may preced/follow the other letter.  A session lasts for 32 trials made up   ¦
¦of the above combination of statements.  A response must be made within      ¦
¦15 seconds.  Capslock switch is on so that all key presses are recorded as   ¦
¦upper case letters.                                                          ¦


+--------------------------  DEFAULT SPECIFICATIONS  #1  -c:\mel\gram---------+
¦Collect subject information for data logging yes                             ¦
¦Path to Setup,Run,Makedat,Analyze                                            ¦
¦Does your screen flicker on displays (IBM CGA video adaptor) no              ¦
¦Independent variables Minimum 0      Maximum 31                              ¦
¦Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10   ¦
¦ Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc   ¦
¦# elements    5            10             10        10        5        5     ¦
¦# characters  800          80             80        80        15       15    ¦
¦Length of tone for incorrect responses 300   Length of feedback display 800  ¦
¦Generate as an INCLUDE file no             Run file name run.exe             ¦
¦Clear on feedback yes    At frame execution set CapsLock up  and NumLock cur ¦
¦Time resolution 1        Run limit inserts no                                ¦
¦Counter balance none     Balance form number 255                             ¦
¦Graphics mode            Warn on duration not multiple of refresh time yes   ¦
¦Auto answer no           Subject init options ns                             ¦
¦Overlay FORM with RUN yes  Max questions allowed per questionnaire 100       ¦
¦Minimum value for QANSWER 0       Respbox port        Sound device speaker   ¦
¦End report no   Wait type exclude Subject messages     Max subject number    ¦
```

Repeated Acquisition:

```
+--------------------------EXPERIMENT SPECIFICATIONS #1  -c:\mel\ra----------
¦AUTHOR JR Thomas & J SchrotCREATION DATE 8-10-94  LAST UPDATE 02-08-95
¦FILES:   EXP ra       DATA ra        INSERT ra        INCLUDE
¦BACKUP DISK VOLUME                   DEBUG fast          SPARE
¦ABSTRACT Repeated Acquisition
¦   The task requires the subject to learn a sequence of 12 key presses
¦implemented on the four arrow keys.  The sequence must be learned by trial
¦and error.  The session lasts for 15 correct sequence completions.
¦NAMES OF: BLOCK INDEPENDENT VARS   1:seqnum   2:          3:          4:
¦ {to be logged for later analysis} 5:         6:          7:          8:
¦         BLOCK DEPENDENT VARIABLES 1:         2:          3:          4:
¦ {logs as ACcuracy,SElection, RT}  5:         6:          7:          8:
¦       TRIAL INDEPENDENT VARIABLES 1:cor      2:incor     3:          4:
¦ {to be logged for later analysis} 5:         6:          7:          8:
¦       TRIAL DEPENDENT VARIABLES   1:resp     2:          3:          4:
¦ {logs as ACcuracy,SElection, RT}  5:         6:          7:          8:
¦EVENT   TYPE  FORM ID       COMMENT                MISC. INSERT FIELD
¦  1  frame    1       Instructions
¦  2  block    1       Choose sequence and then
¦  3                      start session


+---------------------------  BLOCKS SPECIFICATIONS   #1  -c:\mel\ra----------
¦COMMENT Block is used to randomly choose a response sequence for session
¦BLOCK INSERTS 1             SEQUENCE random   NUMBER OF BLOCKS 1
¦VALUES OF BLOCK INDEPENDENT VARS  1:{B13}    2:          3:          4:
¦ {to be logged for later analysis}5:         6:          7:          8:
¦EVENT  TYPE   FORM ID       COMMENT                  MISC. INSERT FIELD
¦  1  trial    1       Session of 15 trials


+---------------------------  TRIALS SPECIFICATIONS   #1  -c:\mel\ra----------
¦COMMENT Each trial consists of 12 correct response sequence
¦TRIAL INSERTS               SEQUENCE none     NUMBER OF TRIALS 15
¦VALUES OF TRIAL INDEPENDENT VARS  1:1        2:2         3:          4:
¦TO BE LOGGED FOR LATER ANALYSIS   5:         6:          7:          8:
¦RERUN ERROR TRIALS no
¦EVENT  TYPE   FORM ID       COMMENT                MISC. INSERT FIELD
¦  1  frame    2       Turn graphics on
¦  2  frame    3       Resp 1
¦  3  code     1
¦  4  frame    4       Resp 2
¦  5  code     2
```

```
  6  frame    5       Resp 3
  7  code     3
  8  frame    6       Resp 4
  9  code     4
 10  frame    7       Resp 5
 11  code     5
 12  frame    8       Resp 6
 13  code     6
 14  frame    9       Resp 7
 15  code     7
 16  frame    10      Resp 8
 17  code     8
 18  frame    11      Resp 9
 19  code     9
 20  frame    12      Resp 10
 21  code     10
 22  frame    13      Resp 11
 23  code     11
 24  frame    14      Resp 12
 25  code     12
 26  frame    16      Brief delay
 27  frame    17      ITI + Turn graphics off
+--------------------------  FRAME SPECIFICATIONS    #1  -c:\mel\ra-----------+
|COMMENT Instructions
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE yes
|FOREGROUND COLOR white      BACKGROUND blue   CENTER no       DURATION response
|DISPLAY TYPE normal
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response
|RESPONSE ' '                              ANSWER none
|FEEDBACK none                             LOG DEPENDENT VARIABLE none
|TEXT begins on next line and is continued on page 2
|
|
|    In this task you must learn (or decode) a sequence of 12 key presses that
| are implemented on the Up (U), Down (D), Left (L), and Right (R) arrow keys.
| At the start of a session an outline of a empty rectangle appears on the
| center of the screen.  Each correct response fills in a portion of the
| rectangle with a solid square.  Each incorrect response makes the screen
| blank briefly.  (When the screen returns you will be at the same point in
| the sequence as before the incorrect response).  You must learn the correct
| sequence by trial and error.  When you correctly complete a sequence, the
| rectangle with be completely filled, the screen will blank, and the
| empty rectangle will reappear ready for the next trial.  The session
| will end when you complete the same correct sequence 15 times (15 trials).
|    Each time you start a new session the correct sequence will differ
| from the previous session.  For instance, during one session the correct
| sequence might be UDULRDRLURDL while the next session it might be
| LRULDLDRUDRU.  Your job each session is to learn the correct sequence of
```

```
¦ responses.  Remember, each session consists of 15 times through the
¦ SAME sequence of key presses, and each new session begins with an entirely
¦ DIFFERENT sequence of key presses.
¦
¦
¦                          Press the SPACE BAR to begin


+--------------------------  FRAME SPECIFICATIONS    #2  -c:\mel\ra-----------
¦COMMENT Turn graphics on
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION 200
¦DISPLAY TYPE flashup++waittop
¦INPUT MODE none    LENGTH/PORT #           INDEX ANSWER no TERMINATE timeout
¦RESPONSE none                              ANSWER none
¦FEEDBACK none                              LOG DEPENDENT VARIABLE none
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦  The text above is a continuation of the first page and will allow you to
¦display 25 lines of text (a full screen) in a single display
¦
¦Turn Graphics On Before Frame yes
¦Turn Graphics Off After Frame
¦Graphics Commands:
¦+10


+--------------------------  FRAME SPECIFICATIONS    #3  -c:\mel\ra-----------
¦COMMENT First Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE flashup++waittop
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE £,ù,ö,Ö                           ANSWER {B1}
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp
¦
¦
¦
```

```
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|  The text above is a continuation of the first page and will allow you to |
|display 25 lines of text (a full screen) in a single display              |
|                                                                          |
|Turn Graphics On Before Frame                                             |
|Turn Graphics Off After Frame                                             |
|Graphics Commands:                                                        |
|                                                                          |
|h m85,190 s p(d40 r470 u40 1470)                                          |
```

```
+--------------------------  FRAME SPECIFICATIONS    #4  -c:\mel\ra----------+
|COMMENT Second Response                                                   |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no   |
|FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION response |
|DISPLAY TYPE normal                                                       |
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response |
|RESPONSE £,ù,ö,Ö                          ANSWER {B2}                     |
|FEEDBACK none                             LOG DEPENDENT VARIABLE resp     |
```

```
+--------------------------  FRAME SPECIFICATIONS    #5  -c:\mel\ra----------+
|COMMENT Third Response                                                    |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no   |
|FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION response |
|DISPLAY TYPE normal                                                       |
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response |
|RESPONSE £,ù,ö,Ö                          ANSWER {B3}                     |
|FEEDBACK none                             LOG DEPENDENT VARIABLE resp     |
```

```
+--------------------------  FRAME SPECIFICATIONS    #6  -c:\mel\ra----------+
|COMMENT Fourth Response                                                   |
|FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no   |
|FOREGROUND COLOR white     BACKGROUND black  CENTER no       DURATION response |
|DISPLAY TYPE normal                                                       |
|INPUT MODE key    LENGTH/PORT #           INDEX ANSWER no TERMINATE response |
|RESPONSE £,ù,ö,Ö                          ANSWER {B4}                     |
|FEEDBACK none                             LOG DEPENDENT VARIABLE resp     |
```

```
+--------------------------  FRAME SPECIFICATIONS    #7  -c:\mel\ra----------
¦COMMENT Fifth Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE £,ù,ö,Ö                           ANSWER {B5}
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp


+--------------------------  FRAME SPECIFICATIONS    #8  -c:\mel\ra----------
¦COMMENT Sixth Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE £,ù,ö,Ö                           ANSWER {B6}
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp


+--------------------------  FRAME SPECIFICATIONS    #9  -c:\mel\ra----------
¦COMMENT Seventh Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE £,ù,ö,Ö                           ANSWER {B7}
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp


+--------------------------  FRAME SPECIFICATIONS    #10 -c:\mel\ra----------
¦COMMENT Eighth Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE normal
¦INPUT MODE key     LENGTH/PORT #           INDEX ANSWER no TERMINATE response
¦RESPONSE £,ù,ö,Ö                           ANSWER {B8}
¦FEEDBACK none                              LOG DEPENDENT VARIABLE resp


+--------------------------  FRAME SPECIFICATIONS    #11 -c:\mel\ra----------
¦COMMENT Nineth Response
¦FRAME INSERT          SEQUENCE none        START LINE 1        ERASE no
¦FOREGROUND COLOR white      BACKGROUND black  CENTER no       DURATION response
¦DISPLAY TYPE normal
```

```
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response   ¦
¦RESPONSE £,ù,ö,Ö                         ANSWER {B9}                          ¦
¦FEEDBACK none                            LOG DEPENDENT VARIABLE resp          ¦


+-------------------------- FRAME SPECIFICATIONS    #12 -c:\mel\ra-----------+
¦COMMENT Tenth Response                                                       ¦
¦FRAME INSERT          SEQUENCE none       START LINE 1       ERASE no       ¦
¦FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION response ¦
¦DISPLAY TYPE normal                                                         ¦
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response   ¦
¦RESPONSE £,ù,ö,Ö                         ANSWER {B10}                         ¦
¦FEEDBACK none                            LOG DEPENDENT VARIABLE resp          ¦


+-------------------------- FRAME SPECIFICATIONS    #13 -c:\mel\ra-----------+
¦COMMENT Eleventh Response                                                    ¦
¦FRAME INSERT          SEQUENCE none       START LINE 1       ERASE no       ¦
¦FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION response ¦
¦DISPLAY TYPE normal                                                         ¦
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response   ¦
¦RESPONSE £,ù,ö,Ö                         ANSWER {B11}                         ¦
¦FEEDBACK none                            LOG DEPENDENT VARIABLE resp          ¦


+-------------------------- FRAME SPECIFICATIONS    #14 -c:\mel\ra-----------+
¦COMMENT Twelveth Response                                                    ¦
¦FRAME INSERT          SEQUENCE none       START LINE 1       ERASE no       ¦
¦FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION response ¦
¦DISPLAY TYPE normal                                                         ¦
¦INPUT MODE key    LENGTH/PORT #          INDEX ANSWER no TERMINATE response   ¦
¦RESPONSE £,ù,ö,Ö                         ANSWER {B12}                         ¦
¦FEEDBACK none                            LOG DEPENDENT VARIABLE resp          ¦


+-------------------------- FRAME SPECIFICATIONS    #16 -c:\mel\ra-----------+
¦COMMENT Delay before clearing screen at end of trial                         ¦
¦FRAME INSERT          SEQUENCE none       START LINE 1       ERASE no       ¦
¦FOREGROUND COLOR green     BACKGROUND black  CENTER no      DURATION 1000    ¦
¦DISPLAY TYPE normal                                                         ¦
¦INPUT MODE none   LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout    ¦
¦RESPONSE none                            ANSWER none                          ¦
¦FEEDBACK none                            LOG DEPENDENT VARIABLE none          ¦
```

```
+--------------------------  FRAME SPECIFICATIONS    #17 -c:\mel\ra----------
¦COMMENT Turn graphics off and time inter-trial interval
¦FRAME INSERT         SEQUENCE none       START LINE 1       ERASE yes
¦FOREGROUND COLOR white     BACKGROUND black  CENTER no      DURATION 500
¦DISPLAY TYPE flashup++waittop
¦INPUT MODE none   LENGTH/PORT #          INDEX ANSWER no TERMINATE timeout
¦RESPONSE none                            ANSWER none
¦FEEDBACK none                            LOG DEPENDENT VARIABLE none
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦
¦  The text above is a continuation of the first page and will allow you to
¦display 25 lines of text (a full screen) in a single display
¦
¦Turn Graphics On Before Frame
¦Turn Graphics Off After Frame yes


+--------------------------   CODE SPECIFICATIONS    #1  -c:\mel\ra----------
¦COMMENT Response 1  Fill block or blank screen (error)
¦Enter MEL code exactly as you want it written to the experiment file.
¦trial_var(timesec(0,32000))
¦integer(time2)
¦incor=0
¦cor=0
¦time2=elapsed_time
¦label(1)
¦if (respac=1) then
¦   begin
¦     draw ('+14 h m85,190 s f p(d40 r40 u40 l40)')
¦     cor=cor+1
¦   end
¦else begin
¦     incor=incor+1
¦     display_off
¦     wait(500)
¦     display_on
¦     perform('255-50-3')
¦     goto(1)
```

```
|     end                                                                 |


+--------------------------- CODE SPECIFICATIONS    #2  -c:\mel\ra-----------+
|COMMENT Response 2  Fill block or blank screen                              |
|Enter MEL code exactly as you want it written to the experiment file.       |
|label(2)                                                                    |
|if (respac=1) then                                                          |
|   begin                                                                    |
|     draw ('h m125,190 s f p(d40 r40 u40 140)')                             |
|     cor=cor+1                                                              |
|   end                                                                      |
|else begin                                                                  |
|     incor=incor+1                                                          |
|     display_off                                                            |
|     wait(500)                                                              |
|     display_on                                                             |
|     perform('255-50-4')                                                    |
|     goto(2)                                                                |
|     end                                                                    |


+--------------------------- CODE SPECIFICATIONS    #3  -c:\mel\ra-----------+
|COMMENT Response 3  Fill block or blank screen                              |
|Enter MEL code exactly as you want it written to the experiment file.       |
|label(3)                                                                    |
|if (respac=1) then                                                          |
|   begin                                                                    |
|     draw ('h m165,190 s f p(d40 r40 u40 140)')                             |
|     cor=cor+1                                                              |
|   end                                                                      |
|else begin                                                                  |
|     incor=incor+1                                                          |
|     display_off                                                            |
|     wait(500)                                                              |
|     display_on                                                             |
|     perform('255-50-5')                                                    |
|     goto(3)                                                                |
|     end                                                                    |


+--------------------------- CODE SPECIFICATIONS    #4  -c:\mel\ra-----------+
|COMMENT Response 4  Fill block or blank screen                              |
|Enter MEL code exactly as you want it written to the experiment file.       |
|label(4)                                                                    |
|if (respac=1) then                                                          |
```

```
|   begin
|     draw ('h m195,190 s f p(d40 r40 u40 l40)')
|     cor=cor+1
|   end
|else begin
|     incor=incor+1
|     display_off
|     wait(500)
|     display_on
|     perform('255-50-6')
|     goto(4)
|     end
```

```
+---------------------------   CODE SPECIFICATIONS    #5  -c:\mel\ra----------
|COMMENT Response 5  Fill block or blank screen
|Enter MEL code exactly as you want it written to the experiment file.
|label(5)
|if (respac=1) then
|   begin
|     draw ('h m235,190 s f p(d40 r40 u40 l40)')
|     cor=cor+1
|   end
|else begin
|     incor=incor+1
|     display_off
|     wait(500)
|     display_on
|     perform('255-50-7')
|     goto(5)
|     end
```

```
+---------------------------   CODE SPECIFICATIONS    #6  -c:\mel\ra----------
|COMMENT Response 6  Fill block or blank screen
|Enter MEL code exactly as you want it written to the experiment file.
|label(6)
|if (respac=1) then
|   begin
|     draw ('h m275,190 s f p(d40 r40 u40 l40)')
|     cor=cor+1
|   end
|else begin
|     incor=incor+1
|     display_off
|     wait(500)
```

```
|     display_on
|     perform('255-50-8')
|     goto(6)
|     end
```

```
+---------------------------   CODE SPECIFICATIONS    #7  -c:\mel\ra-----------+
|COMMENT Response 7  Fill block or blank screen
|Enter MEL code exactly as you want it written to the experiment file.
|label(7)
|if (respac=1) then
|   begin
|     draw ('h m315,190 s f p(d40 r40 u40 140)')
|     cor=cor+1
|   end
|else begin
|     incor=incor+1
|     display_off
|     wait(500)
|     display_on
|     perform('255-50-9')
|     goto(7)
|     end
```

```
+---------------------------   CODE SPECIFICATIONS    #8  -c:\mel\ra-----------+
|COMMENT Response 8  Fill block or blank screen
|Enter MEL code exactly as you want it written to the experiment file.
|label(8)
|if (respac=1) then
|   begin
|     draw ('h m355,190 s f p(d40 r40 u40 140)')
|     cor=cor+1
|   end
|else begin
|     incor=incor+1
|     display_off
|     wait(500)
|     display_on
|     perform('255-50-10')
|     goto(8)
|     end
```

```
+---------------------------   CODE SPECIFICATIONS    #9  -c:\mel\ra-----------+
|COMMENT Response 9  Fill block or blank screen
```

```
¦Enter MEL code exactly as you want it written to the experiment file.
¦label(9)
¦if (respac=1) then
¦   begin
¦     draw ('h m395,190 s f p(d40 r40 u40 l40)')
¦     cor=cor+1
¦   end
¦else begin
¦     incor=incor+1
¦     display_off
¦     wait(500)
¦     display_on
¦     perform('255-50-11')
¦     goto(9)
¦     end
```

```
+---------------------------   CODE SPECIFICATIONS    #10 -c:\mel\ra----------
¦COMMENT Response 10  Fill block or blank screen
¦Enter MEL code exactly as you want it written to the experiment file.
¦label(10)
¦if (respac=1) then
¦   begin
¦     draw ('h m435,190 s f p(d40 r40 u40 l40)')
¦     cor=cor+1
¦   end
¦else begin
¦     incor=incor+1
¦     display_off
¦     wait(500)
¦     display_on
¦     perform('255-50-12')
¦     goto(10)
¦     end
```

```
+---------------------------   CODE SPECIFICATIONS    #11 -c:\mel\ra----------
¦COMMENT Response 11  Fill block or blank screen
¦Enter MEL code exactly as you want it written to the experiment file.
¦label(11)
¦if (respac=1) then
¦   begin
¦     draw ('h m475,190 s f p(d40 r40 u40 l40)')
¦     cor=cor+1
¦   end
¦else begin
```

```
¦      incor=incor+1
¦      display_off
¦      wait(500)
¦      display_on
¦      perform('255-50-13')
¦      goto(11)
¦      end


+---------------------------   CODE SPECIFICATIONS    #12 -c:\mel\ra-----------
¦COMMENT Response 12  Fill block or blank screen
¦Enter MEL code exactly as you want it written to the experiment file.
¦label(12)
¦if (respac=1) then
¦   begin
¦      draw ('h m515,190 s f p(d40 r40 u40 l40)')
¦      timesec=elapsed_time
¦      timesec=timesec-time2
¦      cor=cor+1
¦   end
¦else begin
¦      incor=incor+1
¦      display_off
¦      wait(500)
¦      display_on
¦      perform('255-50-14')
¦      goto(12)
¦      end


+---------------------------  INSERT SPECIFICATIONS   #1  -c:\mel\ra-----------
¦COMMENT Response sequences for each session
¦ Enter inserts, use a "\" to delimit each slot of the insert.
¦ ù\ö\Ö\ù\ö\Ö\ù\£\ö\£\Ö\£\1
¦ £\Ö\£\ö\Ö\ù\ö\£\Ö\£\ö\ù\2
¦ ù\ö\Ö\ö\£\Ö\ù\Ö\£\ù\£\ö\3
¦ Ö\ù\£\ù\Ö\ö\ù\ö\Ö\£\ö\£\4
¦ ö\£\Ö\ö\Ö\ù\£\Ö\ù\£\ö\ù\5
¦ ù\Ö\ö\£\Ö\ù\£\ù\ö\£\ö\Ö\6
¦ Ö\ù\£\ö\ù\£\ù\Ö\£\ö\Ö\ö\7
¦ ö\ù\Ö\£\ù\Ö\£\Ö\ù\ö\£\ö\8
¦ Ö\ù\Ö\ö\ù\£\ö\£\ö\ù\£\Ö\9
¦ ö\Ö\ö\ù\£\ö\Ö\£\ù\Ö\£\ù\10
¦ £\ö\ù\Ö\ù\ö\ù\Ö\ö\£\Ö\£\11
¦ Ö\ö\£\ù\Ö\ù\ö\ù\£\ö\£\Ö\12
¦ ö\£\Ö\ù\Ö\£\Ö\ù\ö\ù\ö\£\13
```

```
| ù\£\ö\Ö\ö\£\Ö\ù\Ö\ö\£\ù\14
| Ö\ù\£\Ö\£\ö\ù\ö\ù\£\ö\Ö\15
| £\ö\£\Ö\ö\ù\£\ù\Ö\ö\ù\Ö\16
| ù\Ö\£\Ö\ö\Ö\ù\ö\ù\£\ö\£\17
| ö\ù\Ö\£\ù\ö\£\Ö\£\ö\ù\Ö\18
| Ö\ö\£\ù\Ö\£\ö\Ö\ö\ù\£\ù\19
| £\Ö\ù\ö\ù\Ö\ö\£\Ö\£\ù\ö\20
| ö\Ö\ö\£\ù\£\Ö\ö\£\ù\Ö\ù\21
| £\ù\Ö\ù\ö\Ö\ö\ù\£\Ö\£\ö\22
| ù\£\ù\ö\Ö\£\ö\Ö\ù\Ö\ö\£\23
| £\Ö\ù\Ö\ö\£\ù\£\Ö\ö\ù\ö\24
| ù\ö\Ö\ù\ö\Ö\ù\£\ö\£\Ö\£\25
| £\Ö\£\ö\Ö\ù\ö\£\Ö\ù\ö\ù\26
| ù\ö\Ö\ö\£\Ö\£\Ö\£\ù\£\ö\27
| Ö\ù\£\ù\Ö\ö\ù\ö\Ö\£\ö\£\28
| ö\£\Ö\ö\Ö\ù\£\Ö\ù\£\ö\ù\29
| ù\Ö\ö\£\Ö\ù\£\ù\ö\£\ö\Ö\30
| Ö\ù\£\ö\ù\£\ù\Ö\£\ö\Ö\ö\31
| ö\ù\Ö\£\£\Ö\£\Ö\ù\ö\£\ö\32
```

```
+--------------------------          NOTE PAD          #1   -c:\mel\ra-----------
```

Repeated Acquisition Task

The subject must learn a sequence of twelve key presses implemented on the four arrow keys. The outline of a rectangle is presented on the screen at the beginning of a trial. Each correct response fills in a portion (1/12th) of the rectangle from left to right with solid yellow color. Each incorrect response blanks the screen for 0.5 sec. When the screen returns, the subject is at the same point in the sequence as before the incorrect response. The subject basically must learn the correct sequence by trial and error. When a sequence is correctly completed, the rectangle will be filled, then the screen will blank, and the empty rectangle will reappear for the next trial. A session will end when the subject completes 15 sequences (15 trials).

Each session consists of a sequence randomly selected from a list of 32 different sequences. Each time a NEW session is started, a NEW sequence will be selected for that session.

```
+--------------------------  DEFAULT SPECIFICATIONS  #1   -c:\mel\ra-----------
|Collect subject information for data logging yes
|Path to Setup,Run,Makedat,Analyze \mel
|Does your screen flicker on displays (IBM CGA video adaptor) no
|Independent variables Minimum 0      Maximum 33
```

```
Maximum value for dependent variable RT 32767 Maximum value for QANSWER 10
 Insert       Block  Trial/Question/Text  Frame     User     Subject   Misc
# elements    16           14             5         10        5        5
# characters  240          240            80        80        40       15
Length of tone for incorrect responses 300   Length of feedback display 800
Generate as an INCLUDE file no             Run file name run.exe
Clear on feedback no     At frame execution set CapsLock off and NumLock cur
Time resolution 1        Run limit inserts no
Counter balance none     Balance form number 255
Graphics mode            Warn on duration not multiple of refresh time yes
Auto answer no           Subject init options ns
Overlay FORM with RUN yes  Max questions allowed per questionnaire 100
Minimum value for QANSWER 0       Respbox port        Sound device speaker
End report no   Wait type include Subject messages 0   Max subject number 100
```