APPENDIX C

1/f ALGORITHM

(Landini, 1992)

- QBASIC adaption to play fractal music
- Custom QBASIC algorithm to play white music
- Custom QBASIC algorithm to play brown music
- Autocorelation function vs time plot for 1/f algorithm
- Replication data for autocorrelation function computation of 1/f algorithm
- Fourier analysis of output plot of 1/f algorithm
- Spectral density plot of 1/f algorithm
- Example of algorithmic fractal music
- Example of algorithmic white music
- Example of algorithmic brown music
- Pitch occurrence table

QBASIC listing of fractal music algorithm

```
'*****1/f noise generator

DEFINT A-Z
SCREEN 12
RANDOMIZE TIMER

'*****parameters
d = 7            'maximum number of dice
v = 8            'maximum value of dice 1...v
m = (d * v + d) / 2      'theoretical mean value of the set
                        '2^d number of data in the set
DIM r(d)                'dimension dice number
' LINE (639, 200 - m)-(0, 200 - m), 4     'draw mean value line
' PSET (0, 200)

'*****initialize dice
FOR i = 0 TO d - 1
   r(i) = INT(RND(1) * v) + 1
NEXT i

'***generate 1/f noise
DIM P(150)
FOR i = 0 TO (2 ^ d) - 1
   f = 0
   k = (i + 1) XOR i
   FOR j = 0 TO d - 1
       IF k MOD 2 = 1 THEN r(j) = INT(RND(1) * v) + 1
       k = k / 2
       f = f + r(j)          'sum of dice gives 1/f
    NEXT j
       ' PRINT f             'for 1/f value delete REM
         SOUND INT(110 * EXP(LOG(2) * f / 12)), (EXP(LOG(2) * f / 16))
       ' LINE -(4 * i, 300 - 4 * f)    'plot 1/f
NEXT i
END
```

QBASIC listing of white music algorithm

```
'*****white noise generator

DEFINT A-Z
SCREEN 12
RANDOMIZE TIMER

'*****parameters
d = 7               'maximum number of dice
v = 6               'maximum value of dice 1...v
m = (d * v + d) / 2      'theoretical mean value of the set
                        '2^d number of data in the set
DIM r(d)                'dimension dice number
' LINE (639, 200 - m)-(0, 200 - m), 4     'draw mean value line
' PSET (0, 200)

'*****initialize dice
FOR i = 0 TO d - 1
    r(i) = INT(RND(1) * v) + 1
NEXT i

'***generate white noise
FOR i = 0 TO (2 ^ d) - 1
    f = 0
    k = (i + 1) XOR i
    FOR j = 0 TO d - 1
        IF k MOD 2 = 1 THEN r(j) = INT(RND(1) * v) + 1
        k = k / 2
        f = f + r(j)          'sum of dice gives 1/f
    NEXT j
    ' PRINT f                 'for 1/f value delete REM
      SOUND INT(110 * (RND(1) * v + 1) * f / 12), ((RND(1) * v + 1) * f / 20)
    ' LINE -(3 * i, 300 - 4 * f)         'plot 1/f
NEXT i
END
```

QBASIC listing of brown music algorithm

```
'*****brown noise generator

DEFINT A-Z
SCREEN 12
RANDOMIZE TIMER

'*****parameters
d = 7            'maximum number of dice
v = 3            'maximum value of dice 1...v
m = (d * v + d) / 2      'theoretical mean value of the set
                        '2^d number of data in the set
DIM r(d)                'dimension dice number
' REM LINE (639, 200 - m)-(0, 200 - m), 4     'draw mean value line
' PSET (0, 200)

'*****initialize dice
FOR i = 0 TO d - 1
   r(i) = INT(RND(1) * v) + 1
NEXT i

'***generate brown noise
FOR i = 0 TO (2 ^ d) - 1
    f = 0
    k = (i + 1) XOR i
    FOR j = 0 TO d - 1
        IF k MOD 2 = 1 THEN r(j) = INT(RND(1) * v) + 1
        k = k / 2
        f = f + r(j)          'sum of dice gives 1/f
    NEXT j
    ' PRINT f                 'for 1/f value delete REM
      SOUND INT(220 * f / 6), (INT(RND(1) * 8) + f / 12)
    ' LINE -(4 * i, 300 - 4 * f)'plot 1/f
NEXT i
END
```

Autocorrelation function of fractal music algorithm

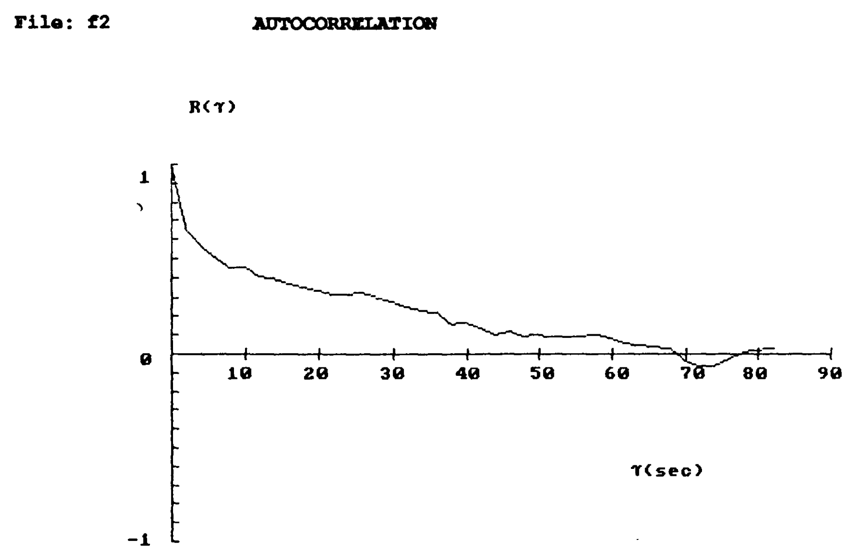


Figure 3. The autocorrelation function for the data generated with the 1/f algorithm, decays exponentially.

Autocorrelation function vs time

(Landini, 1992: 17)

```
2     3.00000
3     4.00000
4     4.00000
0     1.00000
1     6.00000
2     3.00000
3     4.00000
4     4.00000
0     2.00000
1     6.00000
2     6.00000
3     4.00000
4     4.00000
32     1.00000
analysis of last series above
mean,var, min, max    0.202  1.010  0.000  6.000
standard deviation    1.005
 lag, autocovar, autocorrel
   0     1.00969     1.00000
   1     0.73869     0.73160
   2     0.46770     0.46321
   3     0.23302     0.23079
   4    -0.00165    -0.00163
   5    -0.00206    -0.00204
   6    -0.00247    -0.00245
   7    -0.00289    -0.00286
   8    -0.00330    -0.00327
   9    -0.00371    -0.00367
```

Autocorrelation function for algorithm replication

using FORTRAN 77

Fourier analysis of 1/f algorithm outputs

using *Mathematica* ©

In[2]:=

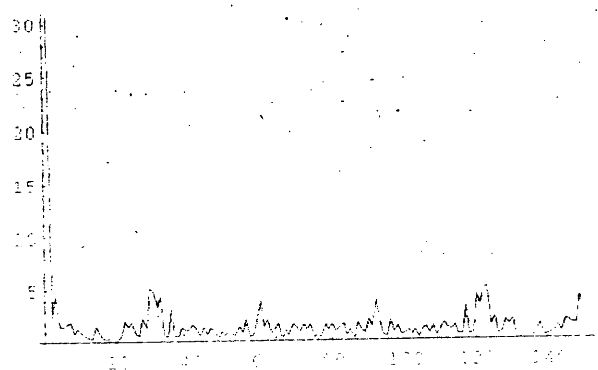
```
{1, 0, [illegible], 0, 0, 1, 1, 0, 0, 0, 5, 1, 0, 0, 0, 2, 6, 3, 0, 0, 4, 6, 3, 0, 0, 2, 4, 3, 0, 0,
6, 4, 3, 0, 0, 4, 5, 4, 3, 0, 1, 5, 4, 0, 0, 1, 5, 4, 3, 0, 6, 5, 4, 3, 0, 4, 3, 4, 3, 0,
1, 3, 4, 3, 0, 5, 1, 1, 3, 3, 2, 1, 1, 3, 3, 1, 1, 1, 3, 3, 2, 1, 1, 3, 3, 1, 3, 3, 3, 3,
2, 3, 3, 3, 3, 3, 4, 3, 3, 3, 4, 3, 3, 3, 4, 1, 2, 5, 3, 6, 1, 2, 5, 3, 6, 2, 2, 5, 3, 3, 2,
2, 5, 3, 3, 2, 2, 5, 3, 1, 2, 2, 5, 3, 2, 2, 2, 5, 2, 5, 3, 2, 2, 2, 5, 3, 4, 1, 4, 1, 4}
```

Out[2]=

```
{1, 1, 0, 0, 0, 1, 1, 0, 0, 0,
5, 1, 0, 0, 0, 0, 6, 3, 0, 0,
4, 6, 3, 0, 0, 2, 4, 3, 0, 0,
6, 4, 3, 0, 0, 4, 5, 4, 3, 0,
1, 5, 4, 0, 0, 1, 5, 4, 3, 0,
6, 5, 4, 3, 0, 4, 3, 4, 3, 0,
1, 3, 4, 3, 0, 5, 1, 1, 3, 3,
2, 1, 1, 3, 3, 1, 1, 1, 3, 3,
2, 1, 1, 3, 3, 1, 3, 3, 3, 3,
2, 3, 3, 3, 3, 3, 4, 3, 3, 3,
4, 3, 3, 3, 4, 1, 2, 5, 3, 6,
1, 2, 5, 3, 6, 2, 2, 5, 3, 3,
2, 2, 5, 3, 3, 2, 2, 5, 3, 1,
2, 2, 5, 3, 2, 2, 2, 5, 2, 5,
2, 2, 2, 5, 3, 4, 1, 4, 1, 4}
```

In[3]:=

```
ListPlot[ Abs[Fourier[%]], PlotJoined->True, PlotRange -> All]
```



Out[3]=

```
-Graphics-
```

Figure 1. The sequence is 512 data from the 1/f algorithm in List 1.

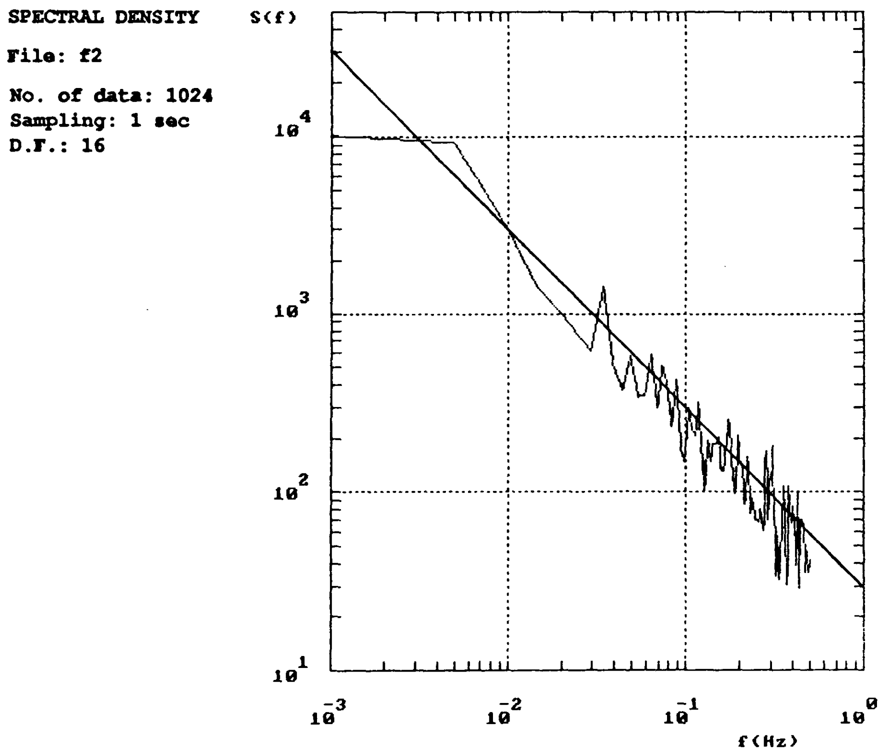
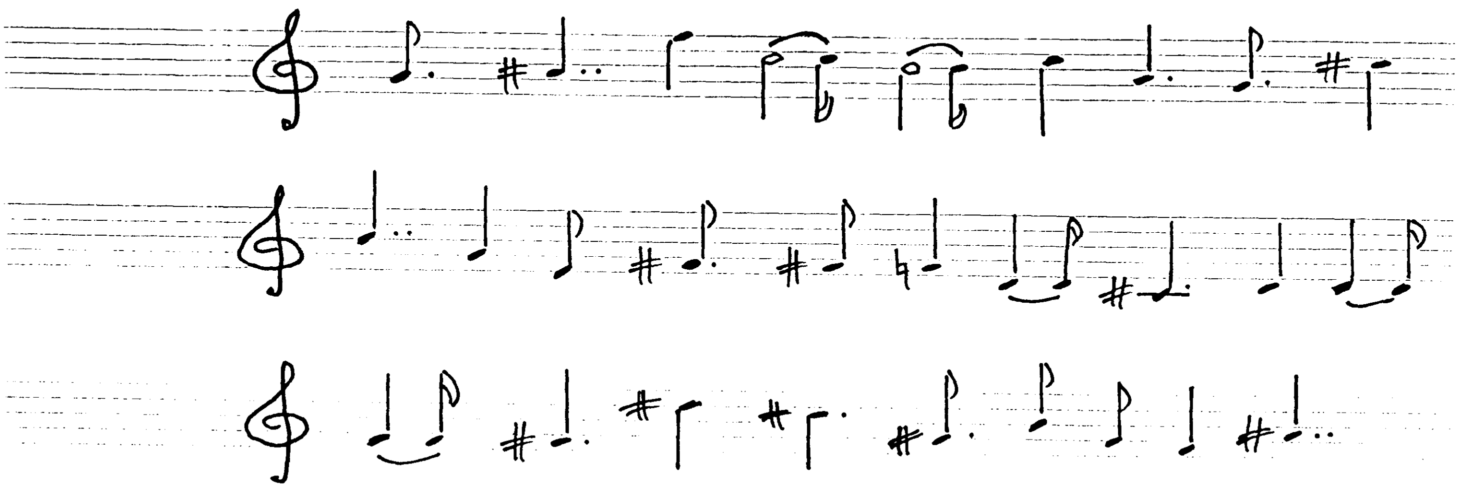


Figure 2. The spectral density of 1024 data points.
The stright line is the reference for the
'ideal 1/f noise' spectral density.

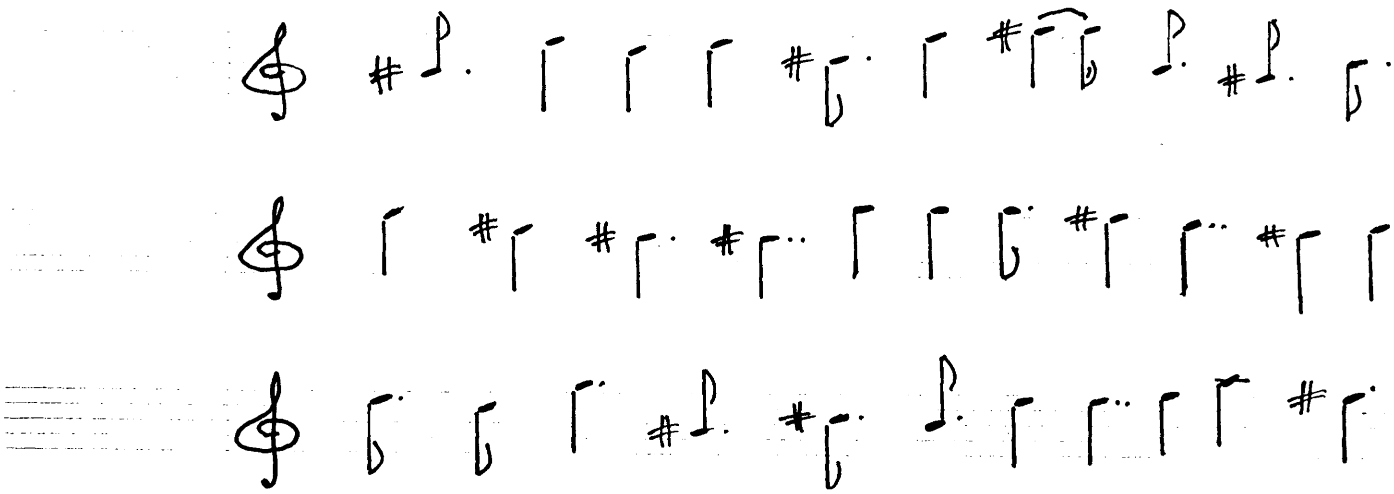
Spectral density plot of 1/f algorithm

for 1400 simulations, number of 'dice' = 9, values of 'dice' 3 -64

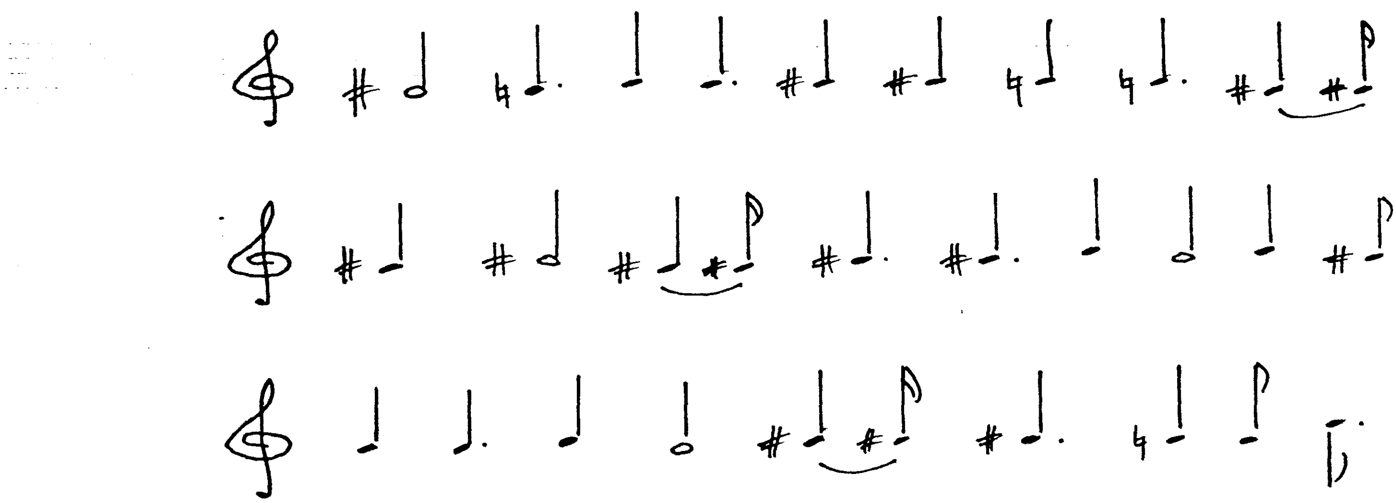
(Landini, 1992: 16)



Algorithmic fractal music



Algorithmic white music



Algorithmic brown music

percen	**white**	**brown**	**fractal**	**Bach 1**	**Bach 2**	**Bach 3**	**Debussy 1**	**Debussy 2**	**Debussy 3**	**Beatles**	**Pember**
unison	13.0	29.8	10.3	6.5	12.0	5.01	0.1	10.7	7.8	12.6	22.8
semi-tone	26.2	41.6	18.3	27.0	25.7	17.4	24.2	7.7	35.4	16.0	23.3
tone	19.2	22.5	18.2	33.5	35.3	34.4	60.5	41.1	28.8	25.0	6.4
third	17.9	4.6	27.9	16.5	12.3	30.1	15	18.7	14.8	35.0	8.7
fourth	12.4	1.4	16.2	7.0	4.8	9.6	0.1	9	6.2	11.0	12.3
fifth	6.5	0	6.5	1.5	3.1	2.2	0.1	4.7	2.3	1	10.0
sixth	2.5	0	2.5	8.0	3.1	0.02	0.1	1.7	3.1	1	5.5

Percentage occurrences of intervals in algorithmic and real music

Fourier analysis of 1/f algorithm outputs

using *Mathematica* ©

In[2]:=

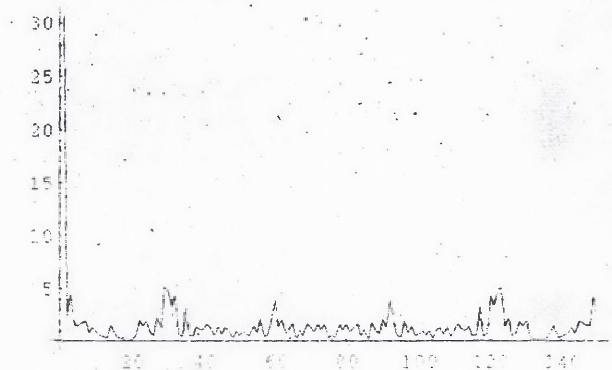
```
{1,0,0,0,0,1,1,0,0,0,5,1,0,0,0,3,6,3,0,0,4,6,3,0,0,2,4,3,0,0,
6,4,3,0,0,4,5,4,3,0,1,5,4,6,0,1,5,4,3,0,6,5,4,3,0,4,3,4,3,0,
1,3,4,3,0,5,1,1,3,3,2,1,1,3,3,1,1,1,3,3,2,1,1,3,3,1,3,3,3,3,
2,3,3,3,3,3,4,3,3,3,4,3,3,3,4,1,2,5,3,6,1,2,5,3,6,2,2,5,3,3,2,
2,5,3,3,2,2,5,3,1,2,2,5,3,2,2,2,5,2,3,2,2,2,5,3,4,1,4,1,4};
```

Out[2]=

```
{1, 0, 0, 0, 0, 1, 1, 0, 0, 0,
 5, 1, 0, 0, 0, 3, 6, 3, 0, 0,
 4, 6, 3, 0, 0, 2, 4, 3, 0, 0,
 6, 4, 3, 0, 0, 4, 5, 4, 3, 0,
 1, 5, 4, 6, 0, 1, 5, 4, 3, 0,
 6, 5, 4, 3, 0, 4, 3, 4, 3, 0,
 1, 3, 4, 3, 0, 5, 1, 1, 3, 3,
 2, 1, 1, 3, 3, 1, 1, 1, 3, 3,
 2, 1, 1, 3, 3, 1, 3, 3, 3, 3,
 2, 3, 3, 3, 3, 3, 4, 3, 3, 3,
 4, 3, 3, 3, 4, 1, 2, 5, 3, 6,
 1, 2, 5, 3, 6, 2, 2, 5, 3, 3,
 2, 2, 5, 3, 3, 2, 2, 5, 3, 1,
 2, 2, 5, 3, 2, 2, 2, 5, 2, 3,
 2, 2, 2, 5, 3, 4, 1, 4, 1, 4}
```

In[3]:=

```
ListPlot[ Abs[Fourier[%]], PlotJoined->True, PlotRange -> All]
```



Out[3]=

```
-Graphics-
```

Figure 1. The sequence is 512 data from the 1/f algorithm in List 1.

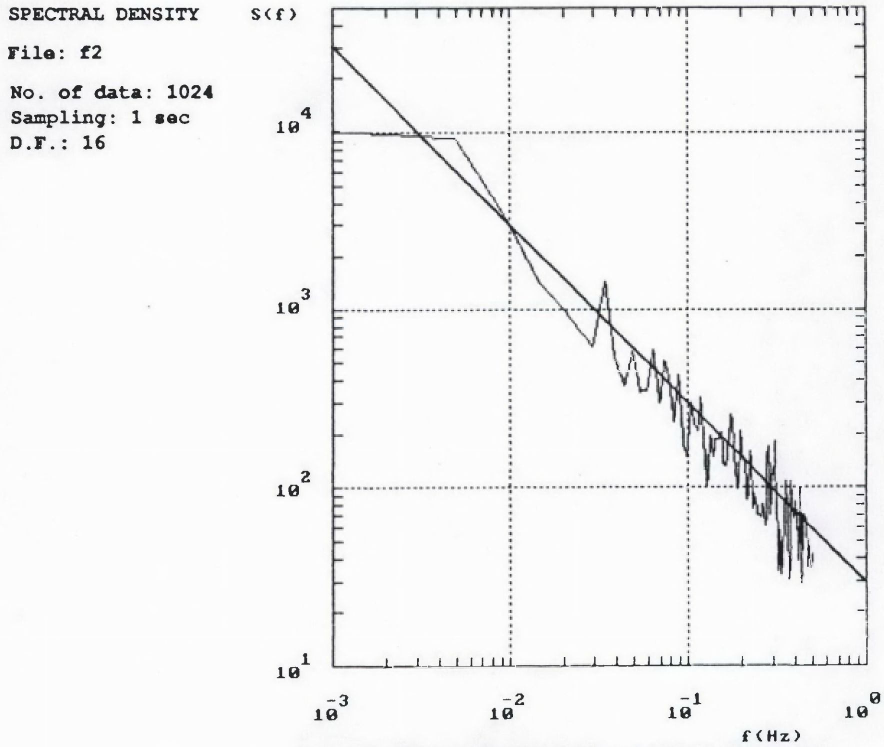


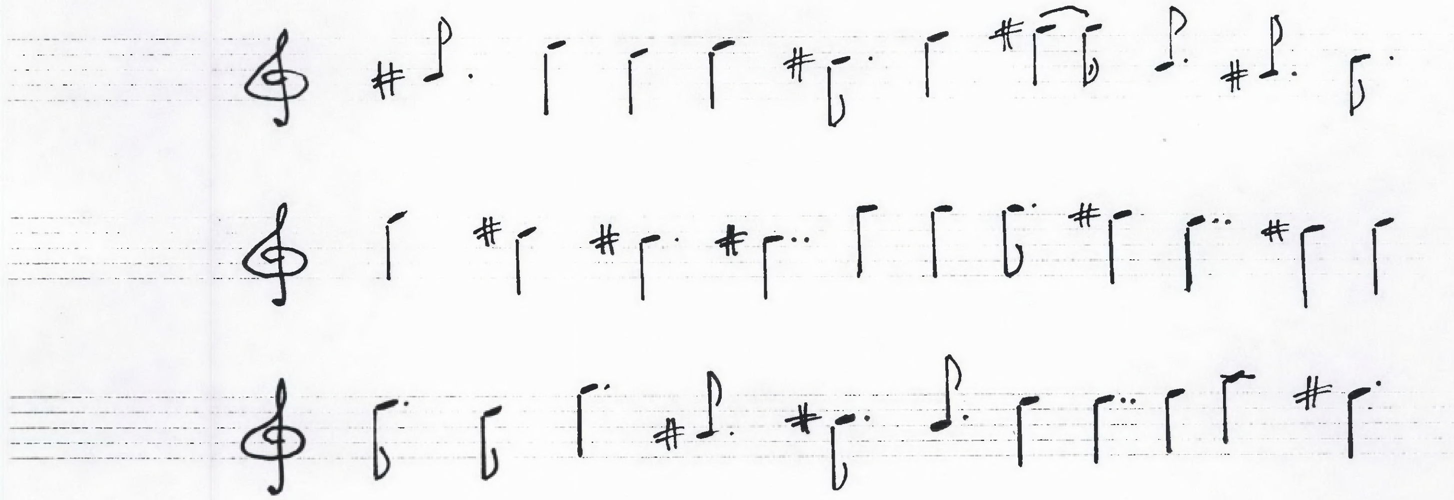
Figure 2. The spectral density of 1024 data points. The stright line is the reference for the 'ideal 1/f noise' spectral density.

Spectral density plot of 1/f algorithm

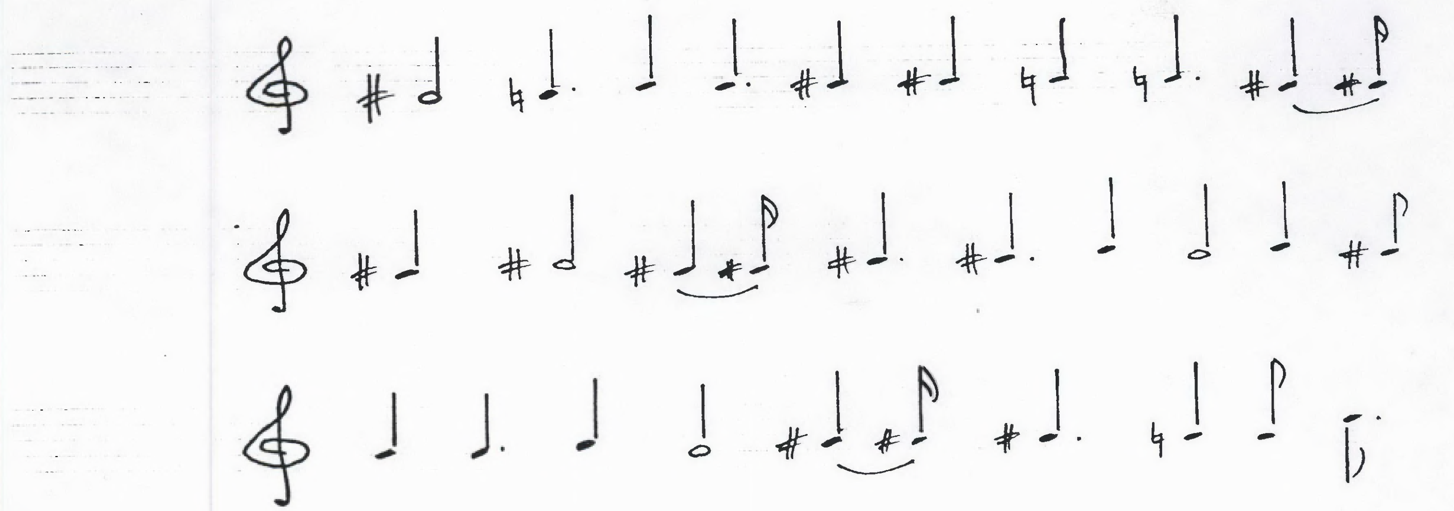
for 1400 simulations, number of 'dice' = 9, values of 'dice' 3 -64

(Landini, 1992: 16)

Algorithmic fractal music



Algorithmic white music



Algorithmic brown music

percen	**white**	**brown**	**fractal**	**Bach 1**	**Bach 2**	**Bach 3**	**Debussy 1**	**Debussy 2**	**Debussy 3**	**Beatles**	**Pember**
unison	13.0	29.8	10.3	6.5	12.0	5.01	0.1	10.7	7.8	12.6	22.8
semi-tone	26.2	41.6	18.3	27.0	25.7	17.4	24.2	7.7	35.4	16.0	23.3
tone	19.2	22.5	18.2	33.5	35.3	34.4	60.5	41.1	28.8	25.0	6.4
third	17.9	4.6	27.9	16.5	12.3	30.1	15	18.7	14.8	35.0	8.7
fourth	12.4	1.4	16.2	7.0	4.8	9.6	0.1	9	6.2	11.0	12.3
fifth	6.5	0	6.5	1.5	3.1	2.2	0.1	4.7	2.3	1	10.0
sixth	2.5	0	2.5	8.0	3.1	0.02	0.1	1.7	3.1	1	5.5

Percentage occurrences of intervals in algorithmic and real music

APPENDIX D

SEMANTIC EVALUATION OF SPECTRAL DENSITY TEST

• Subject answer booklet for *Semantic Evaluation of Spectral Density Test*

SEMANTIC EVALUATION OF FRACTAL MUSIC

In this activity you are asked to show your feelings about twelve short pieces of computer generated music, by marking each piece on the five scales.

fresh	**2**	**1**	**0**	**1**	**2**	**stale**
fair	**2**	**1**	**0**	**1**	**2**	**unfair**
kind	**2**	**1**	**0**	**1**	**2**	**cruel**
white	**2**	**1**	**0**	**1**	**2**	**black**
beautiful	**2**	**1**	**0**	**1**	**2**	**ugly**

For example, if you feel that a piece is very fresh, then you would circle the 2 like this:

fresh	**2**	**1**	**0**	**1**	**2**	**stale**

If you feel that a piece was a bit black, but not very black, then you would circle the 1 like this:

white	**2**	**1**	**0**	**1**	**2**	**black**

If you feel that a piece is neither fair nor unfair then you would circle the 0 like this:

fair	**2**	**1**	**0**	**1**	**2**	**unfair**

Here is a practice go.

PRACTICE MUSIC ITEM

fresh	**2**	**1**	**0**	**1**	**2**	**stale**
fair	**2**	**1**	**0**	**1**	**2**	**unfair**
kind	**2**	**1**	**0**	**1**	**2**	**cruel**
white	**2**	**1**	**0**	**1**	**2**	**black**
beautiful	**2**	**1**	**0**	**1**	**2**	**ugly**

For the twelve test items, the order of the scales has been jumbled up.

Each piece of computer music will be played only <u>once</u>. Work as quickly as you can. First impressions are best.

MUSIC ITEM 1

stale	2	1	0	1	2	fresh
fair	2	1	0	1	2	unfair
cruel	2	1	0	1	2	kind
white	2	1	0	1	2	black
ugly	2	1	0	1	2	beautiful

MUSIC ITEM 2

ugly	2	1	0	1	2	beautiful
white	2	1	0	1	2	black
kind	2	1	0	1	2	cruel
fresh	2	1	0	1	2	stale
unfair	2	1	0	1	2	fair

MUSIC ITEM 3

white	2	1	0	1	2	black
ugly	2	1	0	1	2	beautiful
fair	2	1	0	1	2	unfair
cruel	2	1	0	1	2	kind
fresh	2	1	0	1	2	stale

MUSIC ITEM 4

white	2	1	0	1	2	black
fair	2	1	0	1	2	unfair
kind	2	1	0	1	2	cruel
ugly	2	1	0	1	2	beautiful
fresh	2	1	0	1	2	stale

APPENDIX E

THREE-COMPONENT LURIA MODEL BATTERY

(Fitzgerald, 1978)

Instructions and subject answer sheets

Tests of Simultaneous Synthesis

Matrix Test A

Matrix Test B

Tests of Successive Synthesis

Word Span Test

Number Span Test

Tests of Executive Synthesis

Letter Search Test

Odd/Even Number Search Test

Number/Letter Attention Span Test

Instructions for Matrix Test A

If you look at your answer sheet you will see that there are a number of sets of nine dots. Within each group of dots it is possible to draw many shapes by joining up the dots with lines.

What I am going to do is to show you a number of slides. Each slide contains the photograph of a shape drawn by joining up some of the nine dots. Each slide will be shown for five seconds. Look at it carefully while it is on the screen. When it goes off the screen I want you to copy the same shape onto your set of nine dots. You will have ten seconds to do this before the next slide is shown.

Let us have a practice using the three sets of nine dots labelled 'A', 'B' and 'C' on your answer sheet. Copy the first practice example on to the set of dots labelled A. Copy the second practice example on to the set of dots labelled B. Copy the third practice example on to the set of dots labelled C.

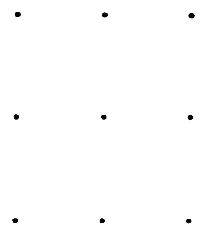
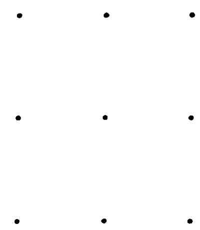
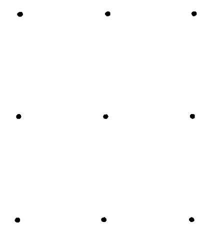
Remember:

1. Each shape will be shown for five seconds.
2. When the shape is taken away copy it on the set of dots. You have 10 seconds to do this.

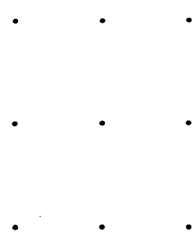
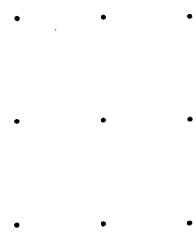
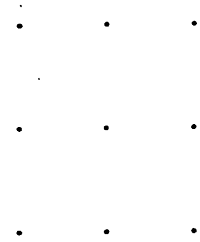
Complete and correct practice examples.

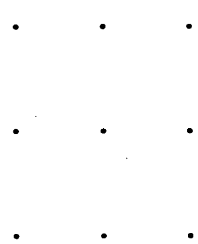
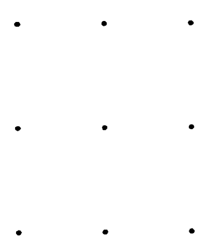
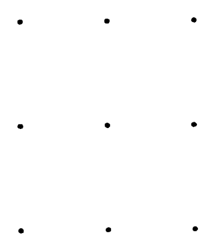
Start Matrix Test A.

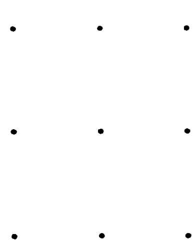
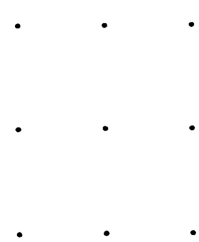
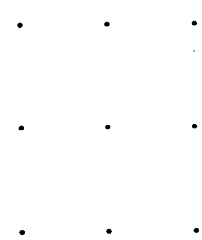
Practice examples

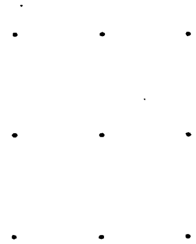
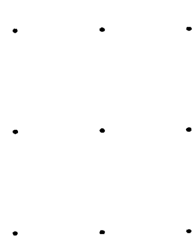
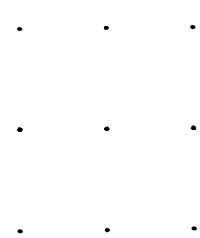
A

B

C


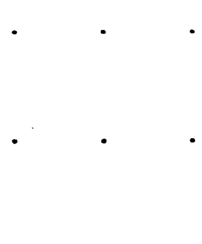
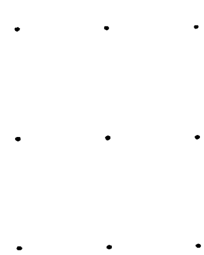
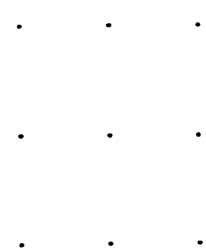
MATRIX TEST A

1

2

3


4

5

6


7

8

9


10

11

12


13

14

15


Instructions for Matrix Test B

This time you will be shown another set of shapes, some of them will be the same as the ones you have just seen and some will be different. However, this time, after a slide has been shown I want you to draw the shape as it would look like when you turned it upside down.

Let us have a practice using the three sets of nine dots labelled 'A', 'B' and 'C' on your answer sheet. Copy the first practice example on to the set of dots labelled A. Copy the second practice example on to the set of dots labelled B. Copy the third practice example on to the set of dots labelled C.

Remember:

1. Each shape will be shown for five seconds.
2. When the shape is taken away copy it on the set of dots as it would look when it was turned upside down. You have 10 seconds to do this.

Complete and correct practice examples.

Start Matrix Test B.

Practice examples

A . . . B . . . C . . .

. . . .

. . . .

MATRIX TEST B

1 . . . 2 . . . 3 . . .

. . . .

. . . .

4 . . . 5 . . . 6 . . .

. . . .

. . . .

7 . . . 8 . . . 9 . . .

. . . .

. . . .

10 . . . 11 . . . 12 . . .

. . . .

. . . .

13 . . . 14 . . . 15 . . .

. . . .

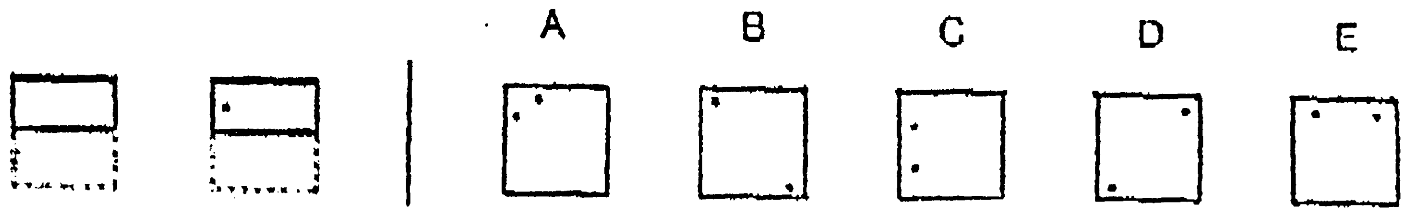
. . . .

In this test you are to imagine the folding and unfo pieces of paper.

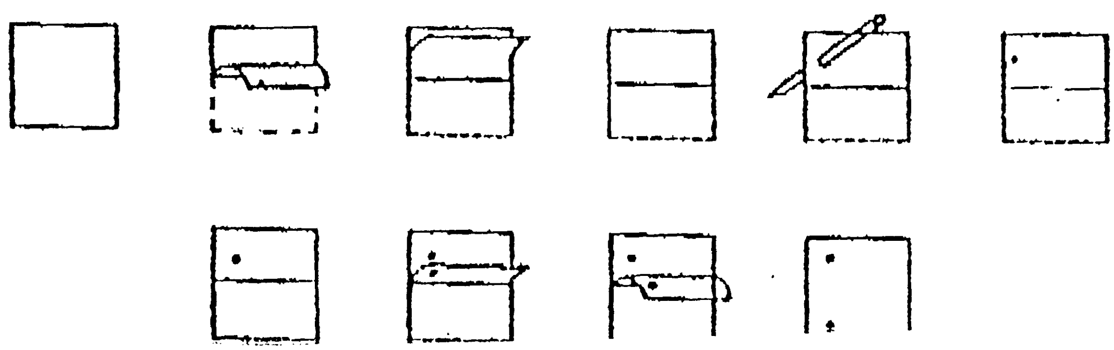
In each problem in the test there are some figures d: the left of a vertical line and there are other figu: drawn at the right of the line. The figures at the : represent a square piece of paper being folded, and ' of these figures has one or two small circles drawn (show where the paper has been punched. Each hole is through all the thicknesses of paper at that point.

One of the five figures at the right of the vertical shows where the holes will be when the paper is compl unfolded. You are to decide which one of these figu correct and draw an X through that figure.

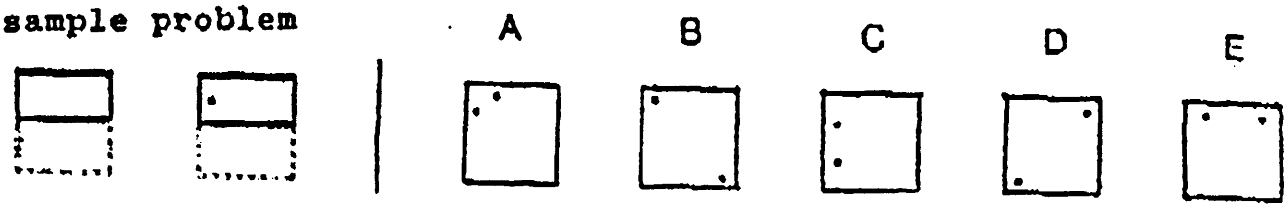
Now try the sample problem below (in this problem onl hole was punched in the folded paper).

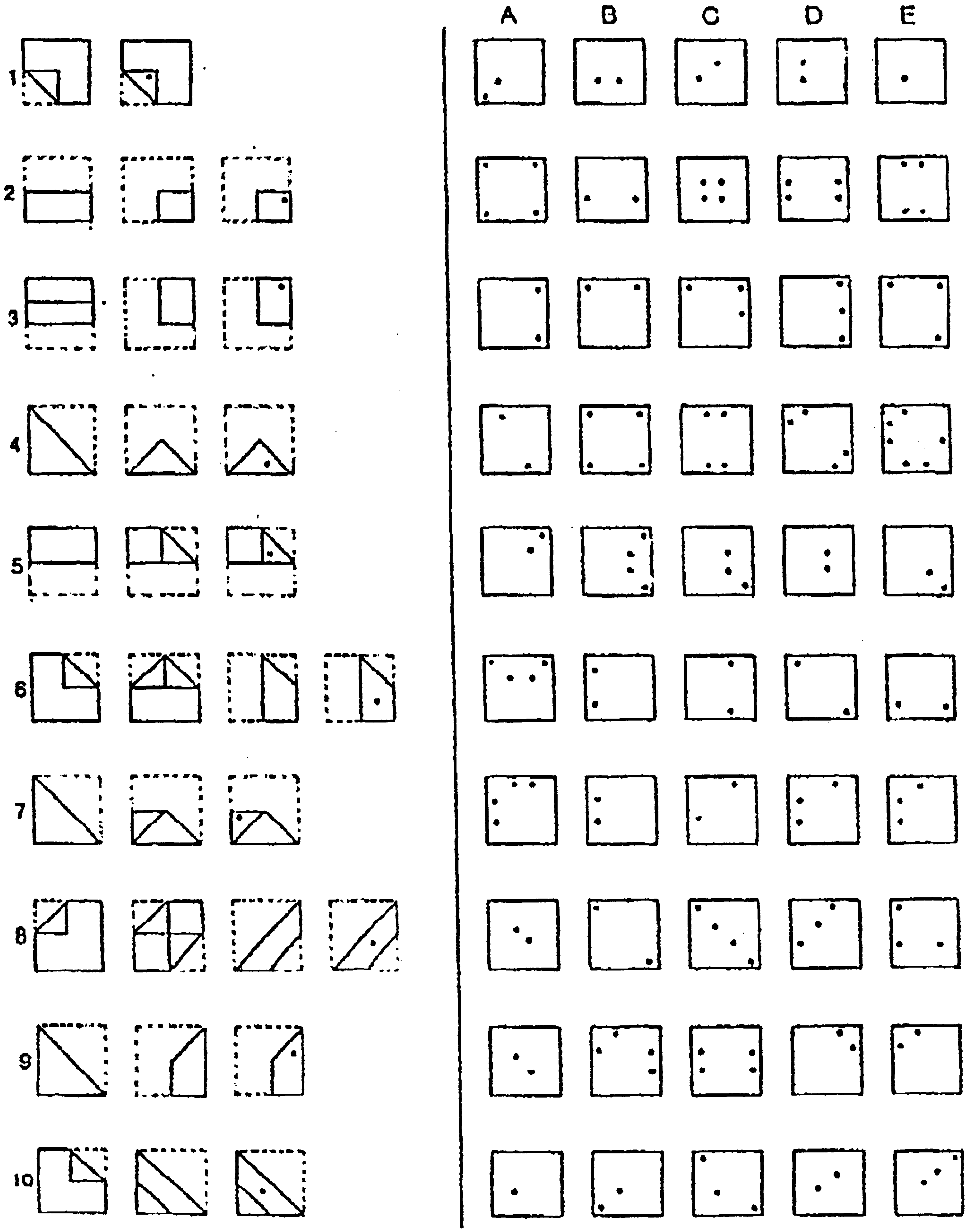


The correct answer to the sample problem above is C a it should have been marked with an X. The figures be show how the paper was folded and why C is the correc answer.



Paper Folding Test





Auditory Word Span Test

This is a test of your ability to remember sets of words. I will read out the words. After I have finished each set of words you are to write down the words in the exact order in which they were read out. Please do not write any words of a set until I have finished reading out the whole set. There will be 15 sets.
Some of the sets may be too long for you to remember all of the words. If you do not remember some of them, put a cross in the space and write down all the words that you remember. Try to remember all the words if possible, and be sure to write them down in the exact order they were read out.

For example, I might read out ,"Set one. Tree - card - bottle - letter - page. Begin."

A. ____________ ____________ ____________ ____________

____________ ____________ ____________ ____________

It is very important that you do not write words while a set is being read out, since this is a test of your memory for words.

Practice example.

0. ____________________

++

1. ____________________

2. ____________________

3. ____________________

4. ____________________

5. ____________________

6. ____________________

7. ____________________

8. ____________________

9. ____________________

10. ____________________

11. ____________________

12. ____________________

13. ____________________

14. ____________________

15. ____________________

Auditory Number Span Test

This is a test of your ability to remember sets of numbers. I will read out the numbers. After I have finished each set of numbers you are to write down the numbers in the exact order in which they were read out. Please do not write any numbers of a set until I have finished reading out the whole set. There will be 15 sets.

Some of the sets may be too long for you to remember all of the numbers. If you do not remember a number, put a cross in the space where you think it should go. Try to remember all the numbers if possible, and be sure to write them down in the exact order in which they were read out.

For example, I might read out. "Set one. 2 - 7 - 4 - 3 - 9. Begin."

Practice Example

A. ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

It is very important that you do not write numbers while a set is being read out, since this is a test of your memory for numbers.

Practice example.

0. ____

+++

1. ____

2. ____

3. ____

4. ____

5. ____

6. ____

7. ____

8. ____

9. ____

10. ____

11. ____

12. ____

13. ____

14. ____

15. ____

Letter Search Test

This is a test of how quickly and accurately you can place a ring around the VOWELS in the groups of letters shown on your sheet. The letters that are vowels are :

a, e, i, o, u

When you are told to begin you should place a ring around each vowel as quickly as you can. When I say "STOP" I want you to cross out the letter you are up to, and put your pencils down.

Let us have a practice: When I say "Begin" I want you to put a ring around each vowel.

Begin. (3 seconds) Stop.

A. a m p i e q t v g d

Correct practice example.

Start Letter Search Test (5 seconds).

practice example.

A. r d s a e c e p l s d n l a g d l f r p g o a z

---

1. a m x s i e r i y t b b f l o z b c p t c g l r
2. c l j k s q l a a p s t b u l o u c d j i m f q
3. o d a v w c u l w m e e e q m x f h y d k n o t
4. f g p s m a n o e g t u i q u s s t b m l g r x
5. h g l p h s m u n o q f x m p p x a d l t n v o
6. a a c e m d p d f x r b z w q b u o m d g l a f
7. u t p l l p q e e n f r z i r b j t x d t o n r
8. a j x a c o f o d u m l j d d l p i x k p p v s
9. r s a e c p s v i q v h m x r l v q w x w q o s
10. f e d s a c q e r l u o n m p e y t p m g n f q
11. d u r x o t e t b f b r z j d d t w m u e o z c
12. r q t x o f s s u r n a v r o f l g m k l g r z
13. m j k v m s m u o r s e m x s c m o r b d t p u
14. a b p t e u m n g e l l z b c r t u m m q x t p
15. s n o u b p y d f x b q l f r a s e l i i b n r

Odd/Even Number Search Test

This is a test of how quickly and accurately you can place a ring around the Odd or Even numbers in the groups of numbers shown on your sheet.

Practice Examples

(A)	Even	9 2 6 5 4 7 3 8 0
(B)	Odd	2 4 3 5 6 8 7 2 9

(1)	Even	3 4 5 4 6 8 7 9 3 5 7 9 6 9 4 5 7 9 5 5 4 0 0 1
(2)	Odd	2 4 1 3 7 6 5 4 2 3 9 7 8 3 4 5 5 1 3 2 8 0 2 3
(3)	Even	7 0 8 8 6 9 5 2 3 0 3 6 7 7 2 5 5 4 5 5 5 6 4 3
(4)	Even	5 2 9 1 2 3 4 5 9 5 6 2 3 5 7 1 4 2 4 4 9 9 9 1
(5)	Odd	2 3 1 5 7 5 4 8 5 9 2 1 8 3 7 2 5 9 9 7 6 2 4 9
(6)	Even	6 8 5 1 2 4 3 2 2 1 1 5 4 3 6 2 2 5 6 8 5 1 2 6
(7)	Even	1 7 1 8 9 9 7 5 5 3 8 8 7 9 4 2 5 1 2 5 8 4 1 5
(8)	Odd	8 2 6 3 6 7 6 8 7 2 6 3 3 3 7 9 4 8 2 1 5 6 4 1
(9)	Even	6 8 7 3 2 7 9 7 3 3 1 1 8 2 2 6 4 7 8 6 8 5 4 3
(10)	Odd	3 6 1 2 8 8 5 9 1 1 4 1 6 4 5 6 2 9 3 6 8 9 2 4
(11)	Odd	4 9 9 4 3 6 4 6 7 4 8 3 9 3 8 8 6 2 2 4 7 8 3 8
(12)	Even	8 4 4 9 5 5 7 5 1 1 8 9 3 2 5 8 4 7 5 5 2 5 7 4
(13)	Odd	2 1 3 4 1 4 8 7 1 6 8 3 5 2 3 2 4 4 4 3 6 2 2 5
(14)	Odd	1 4 1 7 3 9 2 2 6 9 5 9 5 7 6 4 3 2 4 5 2 2 4 3
(15)	Odd	9 5 4 0 1 3 1 8 1 8 8 4 2 9 8 4 1 8 6 9 5 3 8 2

ODD/EVEN NUMBER SEARCH

Practice Examples

(A)	Even	4 8 8 2 1 4 5 1 1 1 7 4 2 6 9 3 8 1 4 4 3 3 9 3
(B)	Odd	9 6 6 1 7 7 7 3 8 6 9 5 2 5 6 6 7 1 6 6 8 2 6 9

---

(1)	Even	3 4 5 4 6 8 7 9 3 5 7 9 6 9 4 5 7 9 5 5 4 0 0 1
(2)	Odd	2 4 1 3 7 6 5 4 2 3 9 7 8 3 4 5 5 1 3 2 8 0 2 3
(3)	Even	7 0 8 8 6 9 5 2 3 0 3 6 7 7 2 5 5 4 5 5 5 6 4 3
(4)	Even	5 2 9 1 2 3 4 5 9 5 6 2 3 5 7 1 4 2 4 4 9 9 9 1
(5)	Odd	2 3 1 5 7 5 4 8 5 9 2 1 8 3 7 2 5 9 9 7 6 2 4 9
(6)	Even	6 8 5 1 2 4 3 2 2 1 1 5 4 3 6 2 2 5 6 8 5 1 2 6
(7)	Even	1 7 1 8 9 9 7 5 5 3 8 8 7 9 4 2 5 1 2 5 8 4 1 5
(8)	Odd	8 2 6 3 6 7 6 8 7 2 6 3 3 3 7 9 4 8 2 1 5 6 4 1
(9)	Even	6 8 7 3 2 7 9 7 3 3 1 1 8 2 2 6 4 7 8 6 8 5 4 3
(10)	Odd	3 6 1 2 8 8 5 9 1 1 4 1 6 4 5 6 2 9 3 6 8 9 2 4
(11)	Odd	4 9 9 4 3 6 4 6 7 4 8 3 9 3 8 8 6 2 2 4 7 8 3 8
(12)	Even	8 4 4 9 5 5 7 5 1 1 8 9 3 2 5 8 4 7 5 5 2 5 7 4
(13)	Odd	2 1 3 4 1 4 8 7 1 6 8 3 5 2 3 2 4 4 4 3 6 2 2 5
(14)	Odd	1 4 1 7 3 9 2 2 6 9 5 9 5 7 6 4 3 2 4 5 2 2 4 3
(15)	Odd	9 5 4 0 1 3 1 8 1 8 8 4 2 9 8 4 1 8 6 9 5 3 8 2

Number/Letter Attention Span Test

This is a test of how well you can attend to either numbers or letters in a series of numbers and letters mixed together. I will read out either the word numbers or the word letters and then read out the series. After I have finished you are to write down either the numbers or the letters in the exact order in which they were read out. Please do not write any numbers or letters of a set until I have finished reading out the whole set. There will be 15 sets.

Practice Example A

For example, if I read out:

"Set one. Numbers. M - 2 - L - 8 - T - 5. Begin."

A ___ ___ ___ ___ ___ ___

Practice Example B

For example, if I read out:
"Set one. Letters. M - 2 - L - 8 - T - 5. Begin."

B ___ ___ ___ ___ ___ ___

If you do not remember a number or a letter, then put a cross where the number or letter should have been. Remember do not write a series until I have said "Begin".

It is very important that you do not write numbers or letters while a set is being read out, since this is a test of your attention for either numbers or letters.

NUMBER/LETTER ATTENTION SPAN

Practice Example A

A ___ ___ ___ ___ ___ ___

Practice Example B

B ___ ___ ___ ___ ___ ___

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________
15. ____________________

APPENDIX F

SPSS-PC© OUTPUTS FOR STUDY 1 DATA ANALYSIS

Preliminary analyses

Hypothesis 1.1

Hypothesis 1.2

Hypothesis 1.3

Hypothesis 1.4

Hypothesis 1.5

Hypothesis 1.6

Hypothesis 1.7

```
Page    5   Geake factor study April 93

        - - - -   F A C T O R   A N A L Y S I S   - - - -
```

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
MATRIXA	1.00000	*	1	2.52847	31.6	31.6
MATRIXB	1.00000	*	2	1.43707	18.0	49.6
PAPERF	1.00000	*	3	1.02000	12.7	62.3
NUMBSPAN	1.00000	*	4	.85622	10.7	73.0
WORDSPAN	1.00000	*	5	.80108	10.0	83.0
LETTSCH	1.00000	*	6	.55570	6.9	90.0
NUMBSCH	1.00000	*	7	.41785	5.2	95.2
LETTNUM	1.00000	*	8	.38361	4.8	100.0

PC Extracted 3 factors.

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
MATRIXA	.75437	*	1	2.52847	31.6	31.6
MATRIXB	.56677	*	2	1.43707	18.0	49.6
PAPERF	.49000	*	3	1.02000	12.7	62.3
NUMBSPAN	.73378	*				
WORDSPAN	.70482	*				
LETTSCH	.60462	*				
NUMBSCH	.73696	*				
LETTNUM	.39422	*				

Varimax Rotation 1, Extraction 1, Analysis 1 - Ka

Varimax converged in 4 iterations.

Rotated Factor Matrix:

	FACTOR 1	FACTOR 2	FACTOR 3
MATRIXA	.85504	.11638	.09869
MATRIXB	.70562	-.03838	.25960
PAPERF	.67592	.12481	-.13250
NUMBSPAN	.15078	.83190	.13782
WORDSPAN	.02268	.83462	.08777
LETTSCH	.03549	.17772	.75616
NUMBSCH	.09594	.12878	.84331
LETTNUM	.05850	.49236	.38520

Factor Transformation Matrix:

	FACTOR 1	FACTOR 2	FACTOR 3
FACTOR 1	.51232	.64096	.57158
FACTOR 2	.85803	-.41003	-.30928
FACTOR 3	-.03613	-.64889	.76003

Variable	MUSISCR		
Mean	3.381	Std Dev	2.376
Kurtosis	-.559	S.E. Kurt	.408
Skewness	.283	S.E. Skew	.206
Minimum	.00	Maximum	9.00

Variable	MEKI		
Mean	14.084	Std Dev	2.228
Kurtosis	-.036	S.E. Kurt	.463
Skewness	.231	S.E. Skew	.234
Minimum	9	Maximum	20

Variable	MEKV		
Mean	15.439	Std Dev	2.029
Kurtosis	1.174	S.E. Kurt	.463
Skewness	-.825	S.E. Skew	.234
Minimum	9	Maximum	20

Variable	WHITESCR		
Mean	36.933	Std Dev	14.564
Kurtosis	.727	S.E. Kurt	.469
Skewness	1.112	S.E. Skew	.237
Minimum	20.00	Maximum	80.00

Variable	BROWNSCR		
Mean	50.398	Std Dev	13.326
Kurtosis	-.080	S.E. Kurt	.472
Skewness	.298	S.E. Skew	.238
Minimum	20.00	Maximum	89.00

Variable	FRACSCR		
Mean	60.048	Std Dev	13.782
Kurtosis	-.404	S.E. Kurt	.469
Skewness	-.354	S.E. Skew	.237
Minimum	26.00	Maximum	87.00

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. SCHOOL
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 40)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.14311	1.52168	9.00	82.00	.154
Hotellings	.16701	1.52168	9.00	82.00	.154
Wilks	.85689	1.52168	9.00	82.00	.154
Roys	.14311				

Note.. F statistics are exact.

- -

EFFECT .. SCHOOL (Cont.)
Univariate F-tests with (1,90) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
SIM	.41586	91.08765	.41586	1.01209	.41089	.523
SUC	1.70169	80.89078	1.70169	.89879	1.89332	.172
EXEC	2.81563	86.48815	2.81563	.96098	2.92996	.090
MEKI	2.31614	468.90125	2.31614	5.21001	.44456	.507
MEKV	4.24806	300.48020	4.24806	3.33867	1.27238	.262
MUSISCR	.61145	506.29073	.61145	5.62545	.10869	.742
FRACSCR	.27338	17770.1614	.27338	197.44624	.00138	.970
BROWNSCR	294.89729	14854.9614	294.89729	165.05513	1.78666	.185
WHITESCR	1046.78719	18781.6802	1046.78719	208.68534	5.01610	.028

Hypothesis 1.1

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. MUSAPT
Multivariate Tests of Significance (S = 1, M = 1/2, N = 59 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02162	.89108	3.00	121.00	.448
Hotellings	.02209	.89108	3.00	121.00	.448
Wilks	.97838	.89108	3.00	121.00	.448
Roys	.02162				

Note.. F statistics are exact.

- -

Multivariate Effect Size

TEST NAME	Effect Size
(All)	.022

- -

EFFECT .. MUSAPT (Cont.)
Univariate F-tests with (1,123) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
SIM	2.47669	121.52331	2.47669	.98799	2.50679	.116
SUC	.20357	123.79643	.20357	1.00648	.20226	.654
EXEC	.00004	123.99996	.00004	1.00813	.00004	.995

- -

- - Correlation Coefficients - -

	MEKI	MEKV
MEKI	1.0000	.2985
	(107)	(107)
	P= .	P= .002

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

	MEKTOT	SIM	SUC	EXEC
MEKTOT	1.0000	.1645	.1096	.2165
	(107)	(99)	(99)	(99)
	P= .	P= .052	P= .140	P= .016

Hypothesis 1.2

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
MUS01	2.9640	4.9770	.1909	.5874
MUS02	3.2374	5.4722	.0286	.6079
MUS03	3.2590	5.3672	.1103	.5956
MUS04	3.2806	5.2613	.2099	.5824
MUS05	3.1367	5.0174	.2276	.5787
MUS06	3.2302	5.4104	.0621	.6036
MUS07	3.0791	4.6241	.4071	.5425
MUS08	3.1295	4.6643	.4195	.5419
MUS09	3.1367	4.8290	.3314	.5593
MUS10	3.2086	5.2388	.1502	.5911
MUS11	3.2086	5.2678	.1331	.5938
MUS12	3.0000	4.8406	.2635	.5720
MUS13	3.1655	4.9507	.2842	.5686
MUS14	3.2446	5.2586	.1682	.5878
MUS15	3.0576	4.6923	.3591	.5521

Reliability Coefficients

N of Cases =   139.0   N of Items = 15

Alpha =   .5954

==

- - Correlation Coefficients - -

	MUSISCR
SUC	-.1466
	(125)
	P= .103
SIM	.1821
	(125)
	P= .042
EXEC	-.3073
	(125)
	P= .000

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. SIM3 BY SUC3 BY EXEC3
Multivariate Tests of Significance (S = 8, M = 3 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	1.32338	1.20248	120.00	728.00	.083
Hotellings	1.82049	1.24779	120.00	658.00	.050
Wilks	.21470	1.22667	120.00	610.25	.066
Roys	.40882				

- -

EFFECT .. SUC3 BY EXEC3
Multivariate Tests of Significance (S = 4, M = 5 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.55958	.94337	60.00	348.00	.597
Hotellings	.68835	.94648	60.00	330.00	.591
Wilks	.53868	.94488	60.00	330.12	.594
Roys	.25842				

- -

EFFECT .. SIM3 BY EXEC3
Multivariate Tests of Significance (S = 4, M = 5 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.55551	.93539	60.00	348.00	.613
Hotellings	.66405	.91307	60.00	330.00	.658
Wilks	.54545	.92427	60.00	330.12	.636
Roys	.21843				

- -

EFFECT .. SIM3 BY SUC3
Multivariate Tests of Significance (S = 4, M = 5 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.73202	1.29919	60.00	348.00	.079
Hotellings	.96778	1.33070	60.00	330.00	.063
Wilks	.43286	1.31637	60.00	330.12	.070
Roys	.31390				

- -

EFFECT .. EXEC3
Multivariate Tests of Significance (S = 2, M = 6 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.47306	1.75559	30.00	170.00	.014
Hotellings	.65953	1.82469	30.00	166.00	.009
Wilks	.57414	1.79060	30.00	168.00	.011
Roys	.33005				

Note.. F statistic for WILKS' Lambda is exact.

- -

EFFECT .. SUC3
Multivariate Tests of Significance (S = 2, M = 6 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.34393	1.17683	30.00	170.00	.256
Hotellings	.43750	1.21041	30.00	166.00	.224
Wilks	.67942	1.19392	30.00	168.00	.239
Roys	.25089				

Note.. F statistic for WILKS' Lambda is exact.

- -

EFFECT .. SIM3
Multivariate Tests of Significance (S = 2, M = 6 , N = 41)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.33679	1.14745	30.00	170.00	.287
Hotellings	.41345	1.14388	30.00	166.00	.291
Wilks	.68914	1.14580	30.00	168.00	.289
Roys	.21765				

Note.. F statistic for WILKS' Lambda is exact.

- -

Variable .. MUS04

CELL	Obs. Mean	Adj. Mean	Est. Mean	Raw Resid.	Std. Resid.
1	.000	.000	.000	.000	.000
2	.250	.250	.250	.000	.000
3	.000	.000	.000	.000	.000
4	.000	.000	.000	.000	.000
5	.167	.167	.167	.000	.000
6	.667	.667	.667	.000	.000
7	.000	.000	.000	.000	.000
8	.000	.000	.000	.000	.000
9	.250	.250	.250	.000	.000
10	.000	.000	.000	.000	.000
11	.000	.000	.000	.000	.000
12	.600	.600	.600	.000	.000
13	.000	.000	.000	.000	.000
14	.000	.000	.000	.000	.000
15	.000	.000	.000	.000	.000
16	.333	.333	.333	.000	.000
17	.200	.200	.200	.000	.000
18	.250	.250	.250	.000	.000
19	.000	.000	.000	.000	.000
20	.000	.000	.000	.000	.000
21	.000	.000	.000	.000	.000
22	.000	.000	.000	.000	.000
23	.000	.000	.000	.000	.000
24	.250	.250	.250	.000	.000
25	.000	.000	.000	.000	.000
26	.000	.000	.000	.000	.000
27	.333	.333	.333	.000	.000

Variable .. MUS05

CELL	Obs. Mean	Adj. Mean	Est. Mean	Raw Resid.	Std. Resid.
1	.000	.000	.000	.000	.000
2	.750	.750	.750	.000	.000
3	.750	.750	.750	.000	.000
4	.000	.000	.000	.000	.000
5	.333	.333	.333	.000	.000
6	.000	.000	.000	.000	.000
7	.000	.000	.000	.000	.000
8	.200	.200	.200	.000	.000
9	.250	.250	.250	.000	.000
10	.200	.200	.200	.000	.000
11	.143	.143	.143	.000	.000
12	.000	.000	.000	.000	.000
13	.500	.500	.500	.000	.000
14	.000	.000	.000	.000	.000
15	.250	.250	.250	.000	.000
16	.333	.333	.333	.000	.000
17	.200	.200	.200	.000	.000
18	.250	.250	.250	.000	.000
19	.500	.500	.500	.000	.000
20	.000	.000	.000	.000	.000
21	.500	.500	.500	.000	.000
22	.200	.200	.200	.000	.000
23	.750	.750	.750	.000	.000
24	.375	.375	.375	.000	.000
25	.200	.200	.200	.000	.000
26	.143	.143	.143	.000	.000
27	.000	.000	.000	.000	.000

Variable .. MUS08

CELL	Obs. Mean	Adj. Mean	Est. Mean	Raw Resid.	Std. Resid.
1	.167	.167	.167	.000	.000
2	.500	.500	.500	.000	.000
3	.500	.500	.500	.000	.000
4	.000	.000	.000	.000	.000
5	.333	.333	.333	.000	.000
6	.667	.667	.667	.000	.000
7	.500	.500	.500	.000	.000
8	.000	.000	.000	.000	.000
9	.500	.500	.500	.000	.000
10	.000	.000	.000	.000	.000
11	.143	.143	.143	.000	.000
12	.400	.400	.400	.000	.000
13	.750	.750	.750	.000	.000
14	.000	.000	.000	.000	.000
15	.000	.000	.000	.000	.000
16	.333	.333	.333	.000	.000
17	.400	.400	.400	.000	.000
18	.250	.250	.250	.000	.000
19	.000	.000	.000	.000	.000
20	.000	.000	.000	.000	.000
21	.000	.000	.000	.000	.000
22	.000	.000	.000	.000	.000
23	.000	.000	.000	.000	.000
24	.500	.500	.500	.000	.000
25	.000	.000	.000	.000	.000
26	.286	.286	.286	.000	.000
27	.333	.333	.333	.000	.000

Variable .. MUS11

CELL	Obs. Mean	Adj. Mean	Est. Mean	Raw Resid.	Std. Resid.
1	.167	.167	.167	.000	.000
2	.250	.250	.250	.000	.000
3	.250	.250	.250	.000	.000
4	.000	.000	.000	.000	.000
5	.500	.500	.500	.000	.000
6	.000	.000	.000	.000	.000
7	.167	.167	.167	.000	.000
8	.200	.200	.200	.000	.000
9	.250	.250	.250	.000	.000
10	.200	.200	.200	.000	.000
11	.143	.143	.143	.000	.000
12	.200	.200	.200	.000	.000
13	.125	.125	.125	.000	.000
14	1.000	1.000	1.000	.000	.000
15	.000	.000	.000	.000	.000
16	.000	.000	.000	.000	.000
17	.000	.000	.000	.000	.000
18	.250	.250	.250	.000	.000
19	.000	.000	.000	.000	.000
20	.000	.000	.000	.000	.000
21	.333	.333	.333	.000	.000
22	.000	.000	.000	.000	.000
23	.500	.500	.500	.000	.000
24	.375	.375	.375	.000	.000
25	.400	.400	.400	.000	.000
26	.000	.000	.000	.000	.000
27	.000	.000	.000	.000	.000

\- -

Variable .. MUS12

CELL	Obs. Mean	Adj. Mean	Est. Mean	Raw Resid.	Std. Resid.
1	.333	.333	.333	.000	.000
2	.000	.000	.000	.000	.000
3	.750	.750	.750	.000	.000
4	.000	.000	.000	.000	.000
5	.667	.667	.667	.000	.000
6	.333	.333	.333	.000	.000
7	.667	.667	.667	.000	.000
8	.600	.600	.600	.000	.000
9	.500	.500	.500	.000	.000
10	.000	.000	.000	.000	.000
11	.286	.286	.286	.000	.000
12	1.000	1.000	1.000	.000	.000
13	.500	.500	.500	.000	.000
14	1.000	1.000	1.000	.000	.000
15	.250	.250	.250	.000	.000
16	.333	.333	.333	.000	.000
17	.600	.600	.600	.000	.000
18	.500	.500	.500	.000	.000
19	.000	.000	.000	.000	.000
20	.000	.000	.000	.000	.000
21	.333	.333	.333	.000	.000
22	.400	.400	.400	.000	.000
23	.250	.250	.250	.000	.000
24	.125	.125	.125	.000	.000
25	.400	.400	.400	.000	.000
26	.286	.286	.286	.000	.000
27	1.000	1.000	1.000	.000	.000

\- -

```
Variable .. MUS06
          SIM3
             1       UNWGT.       .07407
             2       UNWGT.       .29815
             3       UNWGT.       .21019

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. MUS10
          SIM3
             1       UNWGT.       .27222
             2       UNWGT.       .14762
             3       UNWGT.       .02976

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. MUS12
          SUC3
             1       UNWGT.       .30026
             2       UNWGT.       .39167
             3       UNWGT.       .54286

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. MUS01
         EXEC3
             1       UNWGT.       .30926
             2       UNWGT.       .34683
             3       UNWGT.       .64907

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. MUS04
         EXEC3
             1       UNWGT.       .03704
             2       UNWGT.       .06852
             3       UNWGT.       .26111

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. MUS12
         EXEC3
             1       UNWGT.       .29259
             2       UNWGT.       .40979
             3       UNWGT.       .53241

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

=======================================================================

 - - - - - - - - - - -   F A C T O R   A N A L Y S I S   - - - -

VARIMAX   rotation   1 for extraction   1 in analysis   1 - Kaiser Normalization.

VARIMAX converged in 5 iterations.

Rotated Factor Matrix:

              Factor  1     Factor  2     Factor  3

MUSISCR        -.72006        .32801       -.25879
SUC             .02617        .02591        .97693
SIM            -.02579        .96442        .03137
EXEC            .87693        .14687       -.12235

Factor Transformation Matrix:

               Factor  1     Factor  2     Factor  3

Factor  1       -.86494        .39401       -.31087
Factor  2        .50186        .67382       -.54232
Factor  3        .00421        .62508        .78055
```

Hypothesis 1.3

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. MUSAPT
Multivariate Tests of Significance (S = 1, M = 6 1/2, N = 60 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.25168	2.75782	15.00	123.00	.001
Hotellings	.33632	2.75782	15.00	123.00	.001
Wilks	.74832	2.75782	15.00	123.00	.001
Roys	.25168				

Note.. F statistics are exact.

- -

Multivariate Effect Size

TEST NAME	Effect Size
(All)	.252

- -

EFFECT .. MUSAPT (Cont.)
Univariate F-tests with (1,137) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
MUS01	.24483	33.55373	.24483	.24492	.99964	.319
MUS02	.01633	17.10597	.01633	.12486	.13080	.718
MUS03	.07758	14.84328	.07758	.10835	.71604	.399
MUS04	.05261	12.53731	.05261	.09151	.57494	.450
MUS05	.65510	25.02836	.65510	.18269	3.58585	.060
MUS06	.01241	17.81493	.01241	.13004	.09546	.758
MUS07	1.28547	28.02388	1.28547	.20455	6.28427	.013
MUS08	1.55869	24.62836	1.55869	.17977	8.67053	.004
MUS09	1.59987	24.08358	1.59987	.17579	9.10090	.003
MUS10	.94716	18.90896	.94716	.13802	6.86240	.010
MUS11	.15462	19.70149	.15462	.14381	1.07521	.302
MUS12	.90928	31.88209	.90928	.23272	3.90724	.050
MUS13	1.76996	21.75522	1.76996	.15880	11.14601	.001
MUS14	.02079	16.38209	.02079	.11958	.17385	.677
MUS15	.03016	30.40149	.03016	.22191	.13592	.713

Hypothesis 1.4

	fractal music	white music	brown music
stale-fresh	FSTAFR	WSTAFR	BSTAFR
unfair-fair	FUNFR	WUNFR	BUNFR
cruel-kind	FCRUKIN	WCRUKIN	BCRUKIN
black-white	FBLACWT	WBLACWT	BBLACWT
ugly-beautiful	FUGBEAT	WUGBEAT	BUGBEAT
combined scales	FRACSCR	WHITESCR	BROWNSCR

Variable labels for the Semantic *Evaluation of Spectral Density* instrument

Hypothesis 1.5 and Hypothesis 1.6

```
                  - -  Correlation Coefficients  - -

              SIM          SUC         EXEC

FRACSCR       .0243       -.0388      -.0491
            (   96)     (   96)     (   96)
            P= .814     P= .708     P= .634

BROWNSCR     -.0055      -.0316       .0144
            (   96)     (   96)     (   96)
            P= .957     P= .760     P= .889

WHITESCR      .1975       .0456      -.0943
            (   96)     (   96)     (   96)
            P= .054     P= .659     P= .361

(Coefficient / (Cases) / 2-tailed Significance)

============================================================================

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. SIM3 BY SUC3 BY EXEC3
 Multivariate Tests of Significance (S = 3, M = 2 , N = 30 1/2)

 Test Name         Value  Approx. F Hypoth. DF   Error DF  Sig. of F

 Pillais          .17721     .51006      24.00     195.00       .973
 Hotellings       .19383     .49804      24.00     185.00       .977
 Wilks            .83092     .50372      24.00     183.32       .975
 Roys             .11256

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. SUC3 BY EXEC3
 Multivariate Tests of Significance (S = 3, M = 0, N = 30 1/2)

 Test Name         Value  Approx. F Hypoth. DF   Error DF  Sig. of F

 Pillais          .16296     .93340      12.00     195.00       .515
 Hotellings       .18716     .96181      12.00     185.00       .487
 Wilks            .83992     .94835      12.00     166.97       .500
 Roys             .14324

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. SUC3 BY EXEC3 (Cont.)
 Univariate F-tests with (4,65) D. F.

 Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

 FRACSCR     275.46111 14138.8500   68.86528  217.52077     .31659       .866
 BROWNSCR   1452.09363 10904.4333  363.02341  167.76051    2.16394       .083
 WHITESCR    797.92294 15095.3167  199.48073  232.23564     .85896       .493

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. SIM3 BY EXEC3
 Multivariate Tests of Significance (S = 3, M = 0, N = 30 1/2)

 Test Name         Value  Approx. F Hypoth. DF   Error DF  Sig. of F

 Pillais          .10422     .58483      12.00     195.00       .853
 Hotellings       .11203     .57573      12.00     185.00       .860
 Wilks            .89761     .57984      12.00     166.97       .856
 Roys             .08234
```

EFFECT .. SIM3 BY SUC3
Multivariate Tests of Significance (S = 3, M = 0, N = 30 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.16384	.93871	12.00	195.00	.509
Hotellings	.17969	.92341	12.00	185.00	.525
Wilks	.84240	.93184	12.00	166.97	.517
Roys	.10421				

EFFECT .. EXEC3
Multivariate Tests of Significance (S = 2, M = 0, N = 30 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.05762	.63287	6.00	128.00	.704
Hotellings	.06021	.62219	6.00	124.00	.712
Wilks	.94280	.62761	6.00	126.00	.708
Roys	.04888				

Note.. F statistic for WILKS' Lambda is exact.

EFFECT .. SUC3
Multivariate Tests of Significance (S = 2, M = 0, N = 30 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.06120	.67336	6.00	128.00	.671
Hotellings	.06359	.65706	6.00	124.00	.684
Wilks	.93953	.66525	6.00	126.00	.678
Roys	.04505				

Note.. F statistic for WILKS' Lambda is exact.

EFFECT .. SIM3
Multivariate Tests of Significance (S = 2, M = 0, N = 30 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.16094	1.86698	6.00	128.00	.091
Hotellings	.17796	1.83892	6.00	124.00	.097
Wilks	.84439	1.85319	6.00	126.00	.094
Roys	.11420				

Note.. F statistic for WILKS' Lambda is exact.

EFFECT .. SIM3 (Cont.)
Univariate F-tests with (2,65) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
FRACSCR	587.11663	14138.8500	293.55831	217.52077	1.34956	.267
BROWNSCR	464.79650	10904.4333	232.39825	167.76051	1.38530	.258
WHITESCR	1495.22231	15095.3167	747.61116	232.23564	3.21919	.046

Combined Adjusted Means for SIM3
Variable .. WHITESCR

SIM3		
1	UNWGT.	42.71875
2	UNWGT.	35.21212
3	UNWGT.	34.06452

Hypothesis 1.7

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. MUSAPT
 Multivariate Tests of Significance (S = 1, M = 1/2, N = 46 1/2)

 Test Name         Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais          .05422    1.81524       3.00      95.00       .150
 Hotellings       .05732    1.81524       3.00      95.00       .150
 Wilks            .94578    1.81524       3.00      95.00       .150
 Roys             .05422
 Note.. F statistics are exact.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Multivariate Effect Size

 TEST NAME   Effect Size

  (All)            .054

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. MUSAPT (Cont.)
 Univariate F-tests with (1,97) D. F.

 Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

 FRACSCR     567.35534 18488.6043  567.35534  190.60417    2.97662       .088
 BROWNSCR     52.23471 16320.5128   52.23471  168.25271     .31045       .579
 WHITESCR     75.07331 20573.1085   75.07331  212.09390     .35396       .553


 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 Tests of Significance for WHITESCR using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN+RESIDUAL        18231.68      90    202.57
 SIM3                     600.49       2    300.24      1.48      .233
 GENDER                   962.37       1    962.37      4.75      .032
 SIM3 BY GENDER           438.53       2    219.26      1.08      .343

 (Model)                 2741.98       5    548.40      2.71      .025
 (Total)                20973.66      95    220.78

 R-Squared =           .131
 Adjusted R-Squared =  .082

 Combined Adjusted Means for GENDER
 Variable .. WHITESCR
        GENDER
            0      UNWGT.    33.42724
            1      UNWGT.    39.96537
```

MEKIHI EQ 1

Correlations	FSTAFR	FUNFR	FCRUKIN	FBLACWT	FUGBEAT
SIM	.3057	.3439	.3681	-.0480	.1349
SUC	.4084	.4029	.7305*	.5026	.7943*
EXEC	-.1674	.0560	-.3729	.1641	-.2042

Correlations	BSTAFR	BUNFR	BCRUKIN	BBLACWT	BUGBEAT
SIM	-.3320	-.1363	-.4504	-.2875	-.3451
SUC	.3564	.5052	.0059	.5776	.3638
EXEC	-.0925	.0825	.3147	-.0812	-.2466

Correlations	WSTAFR	WUNFR	WCRUKIN	WBLACWT	WUGBEAT
SIM	-.1492	-.2454	-.0703	-.1751	-.2766
SUC	-.0015	-.0883	-.1265	-.1889	-.0478
EXEC	-.0923	-.2625	-.2502	-.0482	-.2118

MEKIHI EQ 0

Correlations	FSTAFR	FUNFR	FCRUKIN	FBLACWT	FUGBEAT
SIM	.0441	-.0265	.0784	-.0618	-.0310
SUC	-.1435	-.0538	-.0033	-.0708	-.1505
EXEC	-.0252	-.0572	-.1360	.1257	-.0682

Correlations	BSTAFR	BUNFR	BCRUKIN	BBLACWT	BUGBEAT
SIM	.0625	.0323	.0575	-.0237	.0221
SUC	-.2116	-.0327	-.0194	.0057	-.0869
EXEC	-.0449	.0927	.0958	.0153	-.0273

Correlations	WSTAFR	WUNFR	WCRUKIN	WBLACWT	WUGBEAT
SIM	.1824	.1759	.1632	.2614*	.2846*
SUC	-.0512	.1036	.0132	.1320	.0492
EXEC	-.2112	-.0836	-.0107	-.0197	-.0703

MEKVHI EQ 1

Correlations	FSTAFR	FUNFR	FCRUKIN	FBLACWT	FUGBEAT
SIM	.1559	.2646	.4006	-.0228	.2616
SUC	-.1398	-.0817	.1916	-.0791	-.1400
EXEC	-.3466	.1997	-.2989	.2614	-.0564

Correlations	BSTAFR	BUNFR	BCRUKIN	BBLACWT	BUGBEAT
SIM	.1409	.1121	.0092	-.0196	.3648
SUC	-.8062**	-.7035*	-.7041*	-.2741	-.6578*
EXEC	-.2433	.0229	-.1480	-.2995	-.2931

Correlations	WSTAFR	WUNFR	WCRUKIN	WBLACWT	WUGBEAT
SIM	.2676	.2846	.2772	.1615	.4937
SUC	-.3745	-.2958	-.4233	-.1837	-.4446
EXEC	-.1628	-.0988	.1892	-.0398	-.1733

MEKVHI EQ 0

Correlations	FSTAFR	FUNFR	FCRUKIN	FBLACWT	FUGBEAT
SIM	.0495	-.0374	.0620	-.0805	-.0690
SUC	-.1324	-.0155	.0042	-.0329	-.1081
EXEC	-.0332	-.1279	-.1910	.0595	-.1133

Correlations	BSTAFR	BUNFR	BCRUKIN	BBLACWT	BUGBEAT
SIM	-.0146	-.0299	.0003	-.0796	-.0826
SUC	-.0882	.0755	.0963	.0725	.0260
EXEC	-.0552	.0522	.1428	.0008	-.0311

Correlations	WSTAFR	WUNFR	WCRUKIN	WBLACWT	WUGBEAT
SIM	.1292	.1151	.1133	.2338	.1954
SUC	.0135	.1417	.0666	.1312	.1132
EXEC	-.1953	-.1014	-.0929	-.0116	-.0568

1-tailed Signif: * - .01 ** - .001

APPENDIX G

SCALE ESTIMATION OF SMOOTHING TEST

- QBASIC listing of *Scale Estimation of Smoothing Test*

```
'                           Can You Describe It?
'
'
'                       QBASIC Program by John Geake
'                               July 1994
'
'
' As an auditory parallel to an instrument of Pentland (1984) which measures
' subjects' visual perceptions of surface roughness per fractal contours,
' this program tests subjects on their ability to judge, on a scale of 1-10,
' the smoothing coefficients of each of a set of Turner series with different
' smoothing coefficients played as notes from a four octave chromatic scale,
' A = 440 Hz.
'
' To run the program press Shift-F5.
'
'
' subroutines
DECLARE SUB Ready ()              ' SUB for inkey response
DECLARE SUB Delay (tm)             ' SUB for pause between pieces
DECLARE SUB Turner (tm, nt&, st#)     ' SUB for Turner series
'
' arrays
DIM SMC(M)                        ' smoothing coefficients
DIM L(M)                          ' subject scale scores

SCREEN 0, 1
COLOR 15, 3, 3
15 CLS

h$ = "c:\qbasic\settings.dat"
OPEN h$ FOR INPUT AS #4                  'default settings
  INPUT #4, f$, g$, tm, M, lf, fa$, pg$, df
CLOSE #4

g$ = "c:\qbasic\info.dat"
OPEN g$ FOR INPUT AS #2                   ' read subject data from file
        INPUT #2, c, sub$, meanw
CLOSE #2

PRINT : PRINT : PRINT
PRINT " Hello "; sub$; ". When you are ready to continue press any key."
Ready
'
PRINT : PRINT : PRINT : PRINT
PRINT "        *******************************************************"
PRINT "        **                                                   **"
PRINT "        **                                                   **"
PRINT "        **               CAN YOU DESCRIBE IT?                **"
PRINT "        **                                                   **"
PRINT "        **                                                   **"
PRINT "        *******************************************************"
PRINT : PRINT
PRINT " The computer has written many different pieces of music,"
PRINT " but it is not able to describe them."
PRINT : PRINT
PRINT " First the computer will play three pieces of music that it has written."
PRINT : PRINT : PRINT
PRINT " Press any key when you are ready to listen to the first piece."
Ready
Delay tm
' set variables for Turner series
LET nt = 50               ' intro pieces length of 50
LET st# = .5              ' first piece: intermediate value for smoothing
Turner tm, nt&, st#
Delay tm
LOCATE 20, 17: PRINT "Press any key when ready for the second example."
```

```
Ready
Delay tm
st# = .2                 ' second piece: low smoothing coefficient
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT : PRINT
PRINT " Press any key when ready for the third piece."
Ready
Delay tm
LET st# = .8                 ' third piece: large smoothing coefficient
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT
PRINT " Sometimes the computer uses notes which are close together, like this
piece."
PRINT : PRINT
PRINT " Press any key when ready. "
Ready
Delay tm
st# = .1                             ' very low smoothing
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT
PRINT " Other times the computer uses notes which are far apart, like this
piece."
PRINT : PRINT
PRINT " Press any key when ready. "
Ready
Delay tm
st# = .9                             ' very large smoothing
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT
PRINT " Can you think of two different labels which describe each of these two"
PRINT " kinds of computer music?"
PRINT : PRINT : PRINT
PRINT " Listen to the two pieces played again."
PRINT : PRINT : PRINT
PRINT " After listening to them type in your label for each piece."
PRINT : PRINT : PRINT
PRINT " Press any key when ready. "
Ready
25 CLS
PRINT : PRINT
PRINT " This piece needs a label."
Delay tm
st# = .1                             ' very low smoothing
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT
PRINT " Some other kids have labelled this piece with words such as"
PRINT : PRINT " smooth", "close", "kept-in", "flat", "long", " boring", "happy"
PRINT : PRINT
PRINT " You can use one of these labels or make up your own."
PRINT : PRINT
PRINT " Before chosing a label, would you like to listen to the piece again?"
INPUT " (type y or n and press ENTER)"; h$
IF h$ = "y" THEN 25
PRINT : PRINT
INPUT " What label best describes this piece (type and press ENTER)"; BR$
IF LEN(BR$) > 8 THEN BR$ = LEFT$(BR$, 8)    ' keep labels short to fit on scale
Delay tm
```

```
35 CLS
PRINT : PRINT : PRINT
PRINT " Now listen to the other piece. This also needs a label."
PRINT : PRINT
PRINT " Press any key when ready. "
Ready
Delay tm
st# = .9
Turner tm, nt&, st#
Delay tm
CLS
PRINT : PRINT
PRINT " Some other kids have labelled this piece with words such as"
PRINT : PRINT " bumpy", "apart", "free", "jumpy", "short", " interesting",
"angry", "wild"
PRINT : PRINT
PRINT " You can use one of these labels or make up your own."
PRINT : PRINT
INPUT " Would you like to listen to the piece again (type y or n and press
ENTER)"; h$
IF h$ = "y" THEN 35
PRINT : PRINT
INPUT " What label best describes this piece (type and press ENTER)"; WH$
IF LEN(WH$) > 8 THEN WH$ = LEFT$(WH$, 8)
Delay
COLOR 15, 4
CLS
PRINT : PRINT : PRINT : PRINT : PRINT
PRINT : PRINT "                              "; sub$; ", thank you very much."
PRINT : PRINT : PRINT
PRINT : PRINT
PRINT : PRINT "                       Press any key when ready for the next part."
COLOR 15, 2, 2
Ready
CLS
PRINT : PRINT : PRINT
PRINT " But what about all the other pieces which are in between "; BR$; " and
"; WH$; "?"
PRINT : PRINT
PRINT " Could you help the computer label each of these in-between pieces?"
PRINT : PRINT
PRINT " Here is a scale or number line with your labels at the ends."
PRINT : PRINT
PRINT BR$; " 0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10 ";
WH$
PRINT : PRINT
PRINT " The computer will next play an in-between piece."
PRINT : PRINT
PRINT " After listening to the piece give it a number on the scale from 0 to
10."
PRINT : PRINT
PRINT " Press any key when ready for a practice go."
Ready
45 CLS
PRINT : PRINT : PRINT " Here is a practice piece. Where does it fit on the
scale?"
PRINT : PRINT
PRINT BR$; " 0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10 ";
WH$
Delay tm
PRINT : PRINT
RANDOMIZE (c)
st# = (INT(RND(1) * 100)) / 100             ' random smoothing coefficient
Turner tm, nt&, st#
Delay tm
PRINT : PRINT
```

```
PRINT " Where on the scale from 0 "; BR$; " to 10 "; WH$; " would this piece
go?"
PRINT : PRINT " (You can use a decimal place such as 3.5 if you want to.)"
PRINT : PRINT
INPUT " (type and press ENTER) scale (0 - 10) = "; R
PRINT : PRINT
LET SMC = INT(100 * st#) / 10                ' one decimal place accuracy
PRINT " The computer scaled this as "; SMC
PRINT : PRINT
INPUT " Would you like another practice (type y or n and press ENTER)"; q$
IF q$ = "y" THEN GOTO 45
COLOR 15, 1, 1
CLS
PRINT : PRINT : PRINT
PRINT "                           Now for the test proper."
PRINT : PRINT : PRINT
PRINT " The computer will play "; M; " pieces. "
PRINT : PRINT : PRINT
PRINT "
*******************************************************************************"
PRINT "   Please give each piece a scale number 0 to 10 which you think best
shows   "
PRINT "      its position in between "; BR$; " and "; WH$; "
"
PRINT "
*******************************************************************************"
PRINT : PRINT : PRINT : PRINT
PRINT " Press any key when ready. "
Ready
Delay tm
FOR I = 1 TO M
PRINT : PRINT
PRINT BR$; " 0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 --- 8 --- 9 --- 10 ";
WH$
PRINT : PRINT
PRINT : PRINT : PRINT "                     Here is piece number"; I
RANDOMIZE (M)
st# = (INT(RND(1) * 100)) / 100
Turner tm, nt&, st#
PRINT : PRINT : INPUT " (type and press ENTER) scale (0 - 10) = "; L
L(I) = L                            ' store the scale scores
SMC = INT(100 * st#) / 10
SMC(I) = SMC                        ' store the smoothing coeffs
PRINT
PRINT " The computer scaled this as "; SMC      ' subject feedback
Delay tm
IF I = M THEN GOTO 55                ' jump out of loop on last time before
instructions
PRINT : PRINT
PRINT " Press any key when ready for next piece."
Ready
NEXT I
'
55 PRINT : PRINT : PRINT
PRINT "              ####                 THE END                ###"
PRINT : PRINT
PRINT "                Thank you "; sub$; " for doing this test."
PRINT : PRINT
PRINT "               Press any key for a summary of your scores."
Ready
PRINT " subject "; c, sub$
PRINT : PRINT BR$; " to "; WH$
PRINT : PRINT " your scale", "smoothing coefficients"
        FOR I = 1 TO M
                PRINT L(I), SMC(I)
        NEXT I
```

```
f$ = "a:\data\scale25.dat"
OPEN f$ FOR APPEND AS #1                     ' write test data to file
        WRITE #1, c, sub$, BR$, WH$, M
                FOR I = 1 TO M
                        WRITE #1, L(I), SMC(I)
                NEXT I
CLOSE #1

PRINT : PRINT "Press any key when ready for the next test."
Ready

RUN "c:\qbasic\CHANGE.BAS"

555 END

SUB Delay (tm)
FOR j = 1 TO INT(5000 / tm)
NEXT j
END SUB

SUB Ready
DO
LOOP UNTIL INKEY$ > ""
CLS
END SUB

SUB Turner (tm, nt&, st#)
x = 0: y = 2.38         'start with middle C
FOR w = 1 TO nt&
        x = RND(nt&) * 9
        y = y + st# * (x - y)
        pitch = INT(110 * (y * 1.0594363#))   'semitone ratio even temperament
        IF pitch < 110 THEN pitch = 110         'out of range protection
        IF pitch > 1100 THEN pitch = 1100
        SOUND pitch, 2.2 / tm
1005     IF INKEY$ > "" THEN 1005       'key press protection
NEXT w
END SUB
```

APPENDIX H

CHANGE OF SMOOTHING TEST

- QBASIC listing of *Base Latency Test*
- QBASIC listing of *Change of Smoothing Test*

```
'
'                        QBASIC Program by John Geake
'                                July 1994
'
'

' As a preliminary test to the test for response to change of smoothing
' coefficient, this test should be given first. It measures the mean latency
' response of a subject to pressing a key on hearing a change in pitch,
' A2 to A5.
'
' To run the program press Shift-F5.
'
'
' subroutines
DECLARE SUB Ready ()              ' SUB for inkey response
DECLARE SUB Delay (tm)             ' SUB for pause between pieces
DECLARE SUB lowtone (nt&, w%)      ' SUB for pitch = 110
DECLARE SUB hitone (nt&, w%, ref)     ' SUB for pitch = 880

h$ = "c:\qbasic\settings.dat"
OPEN h$ FOR INPUT AS #4
 INPUT #4, f$, g$, tm, M, lf, fa$, pg$, df
 CLOSE #4

SCREEN 0, 1
COLOR 15, 1, 1
CLS

PRINT : PRINT "  This program measures base latency to a change of tone."
PRINT : PRINT : PRINT

INPUT " Enter subject name "; sub$
PRINT : PRINT
INPUT " Enter subject identification number "; c                  'enter
unique subject code
PRINT : PRINT
PRINT " Press any key when ready."
Ready
SCREEN 0, 1
COLOR 15, 2, 2
CLS
PRINT : PRINT : PRINT
PRINT "        ******************************************************"
PRINT "        **                                                  **"
PRINT "        **                                                  **"
PRINT "        **              HOW ARE YOUR REFLEXES?              **"
PRINT "        **                                                  **"
PRINT "        **                                                  **"
PRINT "        ******************************************************"
PRINT : PRINT : PRINT : PRINT : PRINT
PRINT " How quickly can you respond when a low tone suddenly changes to a"
PRINT " high tone?"
PRINT : PRINT
PRINT " Press any key when you are ready to listen to the each of the two
tones."
Ready
PRINT : PRINT
PRINT " NOTE: These tones are examples. You do not have to respond."
'
CLS
PRINT : PRINT
PRINT " Here is the low tone."
Delay tm
nt& = 30                         ' 3 seconds length
lowtone nt&, w%
Delay tm
```

```
PRINT : PRINT : PRINT : PRINT : PRINT
PRINT : PRINT " Press any key when ready for the high tone."
Ready
Delay tm
PRINT : PRINT
PRINT " Here is the high tone."
hitone nt&, w%, ref
'
Delay tm
45 CLS : PRINT : PRINT
PRINT " When you are ready the computer will play the low tone and suddenly"
PRINT " change to the high tone."
PRINT : PRINT
PRINT "        ********************************************************"
PRINT "        * As soon as you hear the change press any key to stop.*"
PRINT "        ********************************************************"
PRINT : PRINT
PRINT " Press any key when ready. This will be a practice go."
Ready
Delay tm
nt& = 35               ' set length of low tone
lowtone nt&, w%
IF w% < nt& + 1 THEN PRINT : PRINT : PRINT " You pressed the key too soon. Lets
do that one again": GOTO 45
nt& = 10 * lf - nt&                     ' length of high tone = difference
hitone nt&, w%, ref
PRINT : PRINT
PRINT : PRINT "                          Your reflex score = "; ref
PRINT : PRINT
INPUT " Would you like another practice (type y or n and press ENTER)"; a$
IF a$ = "y" THEN 45
PRINT : PRINT
PRINT " Press any key when you are ready for the reflexes test."
'
COLOR 15, 1, 1
Ready
PRINT : PRINT
PRINT " When you are ready the computer will play the low tone and suddenly"
PRINT " change to the high tone."
PRINT : PRINT
PRINT "        ********************************************************"
PRINT "        * As soon as you hear the change press any key to stop.*"
PRINT "        ********************************************************"
PRINT : PRINT
PRINT " This will be repeated five times to get your average reflex."
FOR i = 1 TO 5
55 PRINT : PRINT : PRINT : PRINT
PRINT " Press any key when ready for the next tone."
Ready
Delay tm
nt& = INT(100 * RND(2))                ' randomise length of low tone
IF nt& > 45 THEN nt& = 45
IF nt& < 25 THEN nt& = 25
lowtone nt&, w%
IF w% < nt& + 1 THEN PRINT : PRINT : PRINT " You pressed the key too soon. Lets
do that one again": GOTO 55
nt& = 10 * lf - nt&                     ' length of high tone = difference
hitone nt&, w%, ref
IF w% > nt& - 1 THEN PRINT : PRINT : PRINT " Lets do that one again": GOTO 55
'
cumref = cumref + ref                  ' add reflex scores to get mean
PRINT : PRINT
PRINT "               Your reflex score on tone number "; i; " = "; ref
' subject feedback
NEXT i
PRINT : PRINT : PRINT
mean% = cumref / 5
```

```
PRINT "                    Your average reflex score = "; mean%
PRINT : PRINT
PRINT "                                              THE END"

OPEN g$ FOR OUTPUT AS #2                       ' write data to file
    WRITE #2, c, sub$, mean%
CLOSE #2

LOCATE 20, 10: INPUT " Would you like to do the change of music test (y/n press
ENTER) "; zq$
IF zq$ = "n" THEN 555

RUN "c:\qbasic\CHANGE.BAS"

555  END

SUB Delay (tm)
FOR j = 1 TO INT(5000 / tm)
NEXT j
END SUB

SUB hitone (nt&, w%, ref)
startTime = TIMER
FOR w% = 1 TO nt&
SOUND 880, 2                          ' A5 high pitch
IF INKEY$ > "" THEN 100
NEXT w%
100 ref = INT(((TIMER - startTime) * 100) / 10)
END SUB

SUB lowtone (nt&, w%)
FOR w% = 1 TO nt&
SOUND 220, 2                     ' A2 low pitch
IF INKEY$ > "" THEN 200
NEXT w%
200
END SUB

SUB Ready
DO
LOOP UNTIL INKEY$ > ""
CLS
END SUB
```

```
PRINT "   %%%%%%%%%%%%   WELCOME TO 'WHEN DOES IT CHANGE?'   %%%%%%%%%%%%%"

PRINT : PRINT : PRINT "                         QBASIC Program by John Geake"
PRINT : PRINT : PRINT "                                  July 1994"

' This program tests subjects' abilities to respond to the change of two
' concatenated Turner series

' subroutines
DECLARE SUB Ready ()              ' SUB for inkey response
DECLARE SUB Delay (tm)             ' SUB for pause between pieces
DECLARE SUB Turner (tm, nt&, st#)     ' SUB for Turner series
DECLARE SUB Interupt (tm, I, nat&, nbt&, sat#, sbt#, l, lsc) ' SUB for interupt
DECLARE SUB Number1 ()
DECLARE SUB Number2 ()

SCREEN 0, 1
COLOR 15, 1, 1
CLS
PRINT : PRINT

h$ = "c:\qbasic\settings.dat"
OPEN h$ FOR INPUT AS #4                    'default settings
  INPUT #4, f$, g$, tm, M, lf, fa$, pg$, df
CLOSE #4

OPEN g$ FOR INPUT AS #2                    'data from reflex test
  INPUT #2, c, sub$, mean%
CLOSE #2

DIM score(M): DIM A1(M): DIM A2(M)        'arrays for storing scores

l = mean%                                  'initialise scores
lsc = 0
PRINT : PRINT : PRINT "                         Press any key when ready."
Ready

LOCATE 4, 8: PRINT "This program writes pieces of computer music."
LOCATE 7, 8: PRINT "The different notes in each piece can be random, or much the
same,"
LOCATE 8, 8: PRINT "or a balance in between."
LOCATE 11, 8: PRINT "Here are three examples."
75 LOCATE 20, 17: PRINT "Press any key when ready for the first example."
Ready

LOCATE 4, 3: PRINT "In this first piece the tones are fairly random."
Delay tm
LOCATE 20, 17: PRINT "Press any key to hear the first example."
Ready
Delay tm

st# = .9: nt& = 40
Turner tm, nt&, st#
Delay tm
LOCATE 20, 17: PRINT "Press any key when ready for the second example."
Ready

LOCATE 4, 3: PRINT "In this second piece the tones are fairly much together."
Delay tm
LOCATE 20, 17: PRINT "Press any key to hear the second example."
Ready
Delay tm
st# = .2: nt& = 40
Turner tm, nt&, st#
Delay tm
LOCATE 20, 17: PRINT "Press any key when ready for the third example."
Ready
```

```
LOCATE 4, 3: PRINT "In this third piece the tones are in between random and
together."
Delay tm
LOCATE 20, 17: PRINT "Press any key to hear the third example."
Ready
Delay tm
st# = .4: nt& = 40
Turner tm, nt&, st#
Delay tm
LOCATE 10, 3: INPUT "Would you like to hear these examples again (y/n and press
ENTER)"; xq$
IF xq$ = "y" THEN 75
Delay tm

85 LOCATE 20, 17: PRINT "Press any key when ready for the next section of
examples."
Ready

LOCATE 4, 8: PRINT "Now the program will play two different pieces,"
LOCATE 5, 8: PRINT "the second immediately after the first without any gap."
LOCATE 8, 8: PRINT "The program shows the number 1 (blue) while the first piece
is playing"
LOCATE 9, 8: PRINT "and changes to number 2 (red) as soon as the second piece
begins."
LOCATE 12, 8: PRINT "That is, the numbers change when the pieces change."
Delay tm
LOCATE 20, 17: PRINT "Press any key when ready for an example."
Ready
Delay tm
Number1
st# = .8: nt& = 35
Turner tm, nt&, st#
Number2
st# = .1: nt& = 35
Turner tm, nt&, st#
Delay tm
LOCATE 20, 17: PRINT "Press any key when ready for another example."
Ready
Delay tm
Number1
st# = .2: nt& = 45
Turner tm, nt&, st#
Number2
st# = .7: nt& = 30
Turner tm, nt&, st#
Delay tm
LOCATE 17, 7: INPUT "Would you like to hear these two examples again (y/n press
ENTER)"; zq$
IF zq$ = "y" THEN 85
LOCATE 20, 17: PRINT "Press any key when ready for the next section."

300 SCREEN 0, 1
COLOR 15, 2, 2
CLS
LOCATE 4, 8: PRINT "Now the program will play two different pieces"
LOCATE 5, 8: PRINT "but will NOT display the 1 and 2 to show when they change."
LOCATE 8, 8: PRINT "You have to show when you think the pieces have changed."
LOCATE 11, 8: PRINT "Press any key as soon as you think the first piece has
changed to the second."
LOCATE 15, 8: PRINT "This will stop the piece being played."
LOCATE 18, 8: PRINT "Your score is how long the second piece played before you
stopped it."
LOCATE 20, 8: PRINT "Low scores are best. "
LOCATE 22, 8: PRINT "The change can happen any time after 3 seconds."
LOCATE 24, 8: PRINT "Press any key when ready for a practice go."
Delay tm
```

```
Ready
I = 0
Delay tm
sat# = .08: nat& = 38
sbt# = .95: nbt& = 10 * lf - nat&
Interupt tm, I, nat&, nbt&, sat#, sbt#, l, lsc
Delay tm
LOCATE 10, 10: INPUT "Would you like another practice (y/n press ENTER) "; zq$
IF zq$ = "y" THEN 300
LOCATE 20, 17: PRINT "Press any key when ready for the next section."
Ready

SCREEN 0, 1
COLOR 15, 1, 1
CLS
LOCATE 4, 8: PRINT "Now that you have practiced you are ready for the test."
LOCATE 7, 8: PRINT "The test consists of "; M; " items."
LOCATE 10, 8: PRINT "You have to respond to the change in each item as quickly
as you can"
LOCATE 11, 8: PRINT "by pressing any key, just as you did in the practice."
Delay tm
99 LOCATE 20, 17: PRINT "Press any key when ready for the test."
Ready
Delay tm
RANDOMIZE (M)
cha# = (10 - df) / 10                   'change set by degree of difficulty
mincha# = (10 - df) / 20
af = 1
asec = 0
FOR I = 1 TO M
        Delay tm
        IF RND(I) < .5 THEN sat# = af ELSE sat# = asec
        sbt# = 1 - sat#

        IF ABS(sat# - sbt#) < mincha# THEN sat# = 1 - mincha#: sbt# = mincha#
        nat& = INT(100 * RND(I))            ' randomise length of first series

        IF nat& < 35 THEN nat& = 35          'allow first series to be heard
        nbt& = 10 * lf - nat&

        IF fa$ = "n" THEN 400             ' insert false changes every 9th item
                IF I MOD 10 = 9 THEN nat& = 10 * lf: nbt& = 0: sbt# = 0

400     Interupt tm, I, nat&, nbt&, sat#, sbt#, l, lsc
        score(I) = lsc: A1(I) = (INT(100 * sat#)) / 100: A2(I) = (INT(100 *
sbt#)) / 100        'store scores
        lsc = 0                                     'reset lsc for next loop

        af = af - 1 / (5 * M / df)
        asec = asec + 1 / (5 * M / df)
        IF pg$ = "y" THEN cha# = cha# - 1 / M       'decrease difference

        LOCATE 20, 20: PRINT "Press any key when ready for next item."
        Ready
        IF I = M THEN 500                           'jump out of loop on last

NEXT I

500
OPEN f$ FOR APPEND AS #6                                        'write data
        WRITE #6, c, sub$
        FOR j = 1 TO M
                WRITE #6, j, score(j), A1(j), A2(j)
        NEXT j
CLOSE #6

Delay tm
```

```
LOCATE 12, 36: PRINT "THE END"
LOCATE 18, 20: PRINT "Thank you "; sub$; " for doing this test."
Delay tm
LOCATE 22, 10: PRINT "Press any key to continue"
Ready
LOCATE 12, 10: INPUT "Another test (y/n and ENTER)"; wq$
IF wq$ = "y" THEN RUN "c:\qbasic\reflexs.bas"

END

SUB Delay (tm)
FOR j = 1 TO INT(5000 / tm)
NEXT j
END SUB

SUB Interupt (tm, I, nat&, nbt&, sat#, sbt#, l, lsc)
x = 0: y = 2.38         'start at middle C
FOR p = 1 TO nat&
        x = RND(p) * 9
        y = y + sat# * (x - y)
        pitch = INT(110 * (y * 1.0594363#))   'semitone ratio even temperament
        IF pitch < 110 THEN pitch = 110         'out of range protection
        IF pitch > 1100 THEN pitch = 1100
        SOUND pitch, 2.2 / tm
   IF INKEY$ > "" THEN 2010
NEXT p
                        'keep y at same value for continuity
FOR q = 1 TO nbt&
        x = RND(q) * 9
        y = y + sbt# * (x - y)
        pitch = INT(110 * (y * 1.0594363#))   'semitone ratio even temperament
        IF pitch < 110 THEN pitch = 110         'out of range protection
        IF pitch > 1100 THEN pitch = 1100
        SOUND pitch, 2.2 / tm
   IF INKEY$ > "" THEN 2000
NEXT q

2000
IF q < 1 THEN 2010
IF q > nbt& THEN 2020
IF fa$ = "y" AND I MOD 10 = 9 AND p = nat& + 1 THEN 2030

lsc = q - 1
IF I = 0 THEN PRINT : PRINT "  Your practice score was "; lsc: GOTO 2500
PRINT : PRINT "  Your score on item "; I; "was "; lsc
GOTO 2500

2010  lsc = 100
PRINT : PRINT "Too early! You stopped the computer before the second piece had
begun"
GOTO 2500

2020  lsc = 200
PRINT : PRINT "Too late! You did not stop the computer before it had finished
the second piece"
GOTO 2500

2030  lsc = 300
PRINT : PRINT "Correct! You did not stop the computer when the piece did NOT
change"

2500
END SUB

SUB Number1
COLOR 0, 3, 3
CLS
```

```
LOCATE 7, 38: PRINT "*"
LOCATE 8, 37: PRINT "**"
LOCATE 9, 38: PRINT "*"
LOCATE 10, 38: PRINT "*"
LOCATE 11, 38: PRINT "*"
LOCATE 12, 38: PRINT "*"
LOCATE 13, 38: PRINT "*"
LOCATE 14, 38: PRINT "*"
LOCATE 15, 38: PRINT "*"
LOCATE 16, 37: PRINT "***"
END SUB

SUB Number2
COLOR 15, 4, 4
CLS
LOCATE 7, 38: PRINT "***"
LOCATE 8, 36: PRINT "*    *"
LOCATE 9, 34: PRINT "*       *"
LOCATE 10, 39: PRINT "*"
LOCATE 11, 37: PRINT "*"
LOCATE 12, 35: PRINT "*"
LOCATE 13, 33: PRINT "*"
LOCATE 14, 31: PRINT "*"
LOCATE 15, 31: PRINT "*************"
END SUB

SUB Ready
DO
LOOP UNTIL INKEY$ > ""
CLS
END SUB

SUB Turner (tm, nt&, st#)
x = 0: y = 2.38         'start with middle C
FOR w = 1 TO nt&
        x = RND(nt&) * 9
        y = y + st# * (x - y)
        pitch = INT(110 * (y * 1.0594363#))   'semitone ratio even temperament
        IF pitch < 110 THEN pitch = 110         'out of range protection
        IF pitch > 1100 THEN pitch = 1100
        SOUND pitch, 2.2 / tm
1005     IF INKEY$ > "" THEN 1005       'key press protection
NEXT w
END SUB
```

APPENDIX I

SPSS-Windows© ANALYSIS OF STUDY 2 DATA

- *Preliminary analysis*
- *Contrasts analysis*
- *Hypothesis 2.1*
- *Hypothesis 2.2*
- *Hypothesis 2.3*
- *Hypothesis 2.4*
- *Hypothesis 2.5*
- *Hypothesis 2.6*

Preliminary analysis

```
- - - - - - - - - - - -   F A C T O R   A N A L Y S I S   - - - - - - - - - - - -

VARIMAX   rotation   1 for extraction   1 in analysis  1 - Kaiser Normalization.

VARIMAX converged in 5 iterations.

Rotated Factor Matrix:

              Factor  1     Factor  2     Factor  3

INVERT          .06523        .76985        .38433
PAPERF          .25318        .87147        .05871
NUMBER          .86999        .13864        .11888
WORD            .78234        .15238        .26454
SIZE            .22263        .20744        .88250
NUMLET          .56019        .24698        .58256

  3 PC  EXACT  factor scores will be saved.

====================================================================

Variable  NCONT

Mean              .641              Std Dev          .795
Kurtosis          .225              S.E. Kurt        .420
Skewness         1.018              S.E. Skew        .212
Minimum             0               Maximum            3

Valid observations -      131        Missing observations -       4

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Variable  NEARLY

Mean             9.771              Std Dev         5.071
Kurtosis         1.410              S.E. Kurt        .420
Skewness         1.089              S.E. Skew        .212
Minimum             2               Maximum           28

Valid observations -      131        Missing observations -       4

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Variable  NGOOD

Mean            11.809              Std Dev         4.265
Kurtosis         -.027              S.E. Kurt        .420
Skewness         -.589              S.E. Skew        .212
Minimum             0               Maximum           21

Valid observations -      131        Missing observations -       4

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Variable  NGUESS

Mean             3.954              Std Dev         2.323
Kurtosis         -.103              S.E. Kurt        .420
Skewness          .479              S.E. Skew        .212
Minimum             0               Maximum           10

Valid observations -      131        Missing observations -       4
```

- -

Variable RMSD

Mean	3.052	Std Dev	.921
Kurtosis	-.141	S.E. Kurt	.419
Skewness	.381	S.E. Skew	.211
Minimum	1.20	Maximum	5.79

Valid observations - 132 Missing observations - 3

- -

Variable XLAT

Mean	11.190	Std Dev	2.334
Kurtosis	3.624	S.E. Kurt	.420
Skewness	-.657	S.E. Skew	.212
Minimum	.00	Maximum	17.63

Valid observations - 131 Missing observations - 4

- -

Variable XWTLAT

Mean	4.307	Std Dev	1.258
Kurtosis	1.259	S.E. Kurt	.420
Skewness	.222	S.E. Skew	.212
Minimum	.00	Maximum	8.19

Valid observations - 131 Missing observations - 4

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. FORM
Multivariate Tests of Significance (S = 1, M = 7 , N = 44)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.35845	3.14279	16.00	90.00	.000
Hotellings	.55872	3.14279	16.00	90.00	.000
Wilks	.64155	3.14279	16.00	90.00	.000
Roys	.35845				

Note.. F statistics are exact.

- -

Multivariate Effect Size

TEST NAME	Effect Size
(All)	.358

- -

EFFECT .. FORM (Cont.)
Univariate F-tests with (1,105) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
MEK1	154.05688	778.69078	154.05688	7.41610	20.77329	.000
MEK5	16.51032	467.67660	16.51032	4.45406	3.70680	.057
EXEC	.62162	107.15791	.62162	1.02055	.60910	.437
MUSICEXP	.18147	169.70638	.18147	1.61625	.11228	.738
NCONT	3.28765	65.21702	3.28765	.62111	5.29315	.023
NEARLY	5.18659	2893.31809	5.18659	27.55541	.18822	.665
NGOOD	.78924	1914.20142	.78924	18.23049	.04329	.836
NGUESS	11.92619	578.72801	11.92619	5.51170	2.16380	.144
RMSD	3.67967	82.81301	3.67967	.78870	4.66552	.033
SIM	.27822	113.25482	.27822	1.07862	.25795	.613
SUC	.38101	94.70838	.38101	.90198	.42241	.517
XLAT	28.70762	527.26698	28.70762	5.02159	5.71684	.019
XWTLAT	2.14768	176.04735	2.14768	1.67664	1.28094	.260

Variable	ETA Square
MEK1	.16516

Combined Adjusted Means for FORM
Variable .. MEK1

FORM		
5	UNWGT.	13.43333
6	UNWGT.	15.85106

- -

- - Correlation Coefficients - -

	AGE	MEK1
AGE	1.0000	.3444
	(122)	(121)
	P= .	P= .000

	AGE	MEK5
AGE	1.0000	.0414
	(122)	(119)
	P= .	P= .655

	AGE	MUSICEXP
AGE	1.0000	.0081
	(122)	(120)
	P= .	P= .930

	AGE	NGOOD
AGE	1.0000	-.1551
	(122)	(119)
	P= .	P= .092

	AGE	NGUESS
AGE	1.0000	-.0925
	(122)	(119)
	P= .	P= .317

	AGE	NEARLY
AGE	1.0000	.1037
	(122)	(119)
	P= .	P= .262

	AGE	NCONT
AGE	1.0000	-.1863
	(122)	(119)
	P= .	P= .042

	AGE	RMSD
AGE	1.0000	-.1202
	(122)	(120)
	P= .	P= .191

	AGE	SIM	SUC	EXEC
AGE	1.0000	.0242	-.0678	-.0704
	(122)	(117)	(117)	(117)
	P= .	P= .796	P= .468	P= .451

Analysis of contrasts

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design  1 * * * * * *

 EFFECT .. SUC3(1) BY EXEC3(1)
 Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

 Test Name         Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais          .26176    2.31839      13.00      85.00       .011
 Hotellings       .35458    2.31839      13.00      85.00       .011
 Wilks            .73824    2.31839      13.00      85.00       .011
 Roys             .26176
 Note.. F statistics are exact.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Multivariate Effect Size

 TEST NAME   Effect Size

  (All)           .262

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. SUC3(1) BY EXEC3(1) (Cont.)
 Univariate F-tests with (1,97) D. F.

 Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

 RMSD          1.13193   69.98043    1.13193     .72145    1.56897       .213
 NGOOD         7.35766 1532.35979    7.35766   15.79752     .46575       .497
 NEARLY       78.36962 2337.84707   78.36962   24.10152    3.25165       .074
 NGUESS        1.90817  527.14482    1.90817    5.43448     .35112       .555
 NCONT          .15473   62.32499     .15473     .64253     .24082       .625
 MEK1         34.25505  744.61921   34.25505    7.67649    4.46233       .037
 MEK5         28.66957  365.04689   28.66957    3.76337    7.61806       .007
 MATH          1.87440   38.80694    1.87440     .40007    4.68516       .033
 LANG           .18762   39.64297     .18762     .40869     .45908       .500
 MUSICEXP      1.03955  158.47229    1.03955    1.63373     .63631       .427

 Variable   ETA Square

 RMSD           .01592
 NGOOD          .00478
 NEARLY         .03243
 NGUESS         .00361
 NCONT          .00248
 MEK1           .04398
 MEK5           .07282
 MATH           .04608
 LANG           .00471
 MUSICEXP       .00652

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. SIM3(1) BY EXEC3(1)
 Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

 Test Name         Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais          .10447     .76274      13.00      85.00       .696
 Hotellings       .11665     .76274      13.00      85.00       .696
 Wilks            .89553     .76274      13.00      85.00       .696
 Roys             .10447
 Note.. F statistics are exact.

 Multivariate Effect Size
  (All)           .104
```

EFFECT .. SIM3(1) BY SUC3(1)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.10315	.75201	13.00	85.00	.707
Hotellings	.11501	.75201	13.00	85.00	.707
Wilks	.89685	.75201	13.00	85.00	.707
Roys	.10315				

Note.. F statistics are exact.

Multivariate Effect Size

(All) .103

EFFECT .. EXEC3(2)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.15470	1.19658	13.00	85.00	.296
Hotellings	.18301	1.19658	13.00	85.00	.296
Wilks	.84530	1.19658	13.00	85.00	.296
Roys	.15470				

Note.. F statistics are exact.

Multivariate Effect Size

(All) .155

EFFECT .. EXEC3(1)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.31210	2.96647	13.00	85.00	.001
Hotellings	.45370	2.96647	13.00	85.00	.001
Wilks	.68790	2.96647	13.00	85.00	.001
Roys	.31210				

Note.. F statistics are exact.

Multivariate Effect Size
(All) .312

EFFECT .. EXEC3(1) (Cont.)
Univariate F-tests with (1,97) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	2.61594	69.98043	2.61594	.72145	3.62596	.060
NGOOD	166.71848	1532.35979	166.71848	15.79752	10.55346	.002
NEARLY	198.73287	2337.84707	198.73287	24.10152	8.24566	.005
NGUESS	1.33950	527.14482	1.33950	5.43448	.24648	.621
NCONT	1.05157	62.32499	1.05157	.64253	1.63661	.204
MEK1	19.41791	744.61921	19.41791	7.67649	2.52953	.115
MEK5	27.83815	365.04689	27.83815	3.76337	7.39713	.008
MATH	8.00641	38.80694	8.00641	.40007	20.01244	.000
LANG	5.14620	39.64297	5.14620	.40869	12.59193	.001
MUSICEXP	.01965	158.47229	.01965	1.63373	.01203	.913

Variable	ETA Square
RMSD	.03603
NGOOD	.09812
NEARLY	.07835
NGUESS	.00253
NCONT	.01659
MEK1	.02541
MEK5	.07086
MATH	.17103
LANG	.11490
MUSICEXP	.00012

- -

EFFECT .. SUC3(2)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.10189	.74176	13.00	85.00	.717
Hotellings	.11345	.74176	13.00	85.00	.717
Wilks	.89811	.74176	13.00	85.00	.717
Roys	.10189				

Note.. F statistics are exact.

- -

Multivariate Effect Size

(All) .102

- -

EFFECT .. SUC3(1)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.32427	3.13767	13.00	85.00	.001
Hotellings	.47988	3.13767	13.00	85.00	.001
Wilks	.67573	3.13767	13.00	85.00	.001
Roys	.32427				

Note.. F statistics are exact.

Multivariate Effect Size

(All) .324

- -

EFFECT .. SUC3(1) (Cont.)
Univariate F-tests with (1,97) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	4.40399	69.98043	4.40399	.72145	6.10438	.015
NGOOD	128.12451	1532.35979	128.12451	15.79752	8.11042	.005
NEARLY	130.67819	2337.84707	130.67819	24.10152	5.42199	.022
NGUESS	.13491	527.14482	.13491	5.43448	.02482	.875
NCONT	.15459	62.32499	.15459	.64253	.24060	.625
MEK1	104.47104	744.61921	104.47104	7.67649	13.60923	.000
MEK5	16.83849	365.04689	16.83849	3.76337	4.47431	.037
MATH	5.73490	38.80694	5.73490	.40007	14.33468	.000
LANG	11.14037	39.64297	11.14037	.40869	27.25870	.000
MUSICEXP	.89061	158.47229	.89061	1.63373	.54514	.462

Variable	ETA Square
RMSD	.05921
NGOOD	.07716
NEARLY	.05294
NGUESS	.00026
NCONT	.00247
MEK1	.12304
MEK5	.04409
MATH	.12875
LANG	.21937
MUSICEXP	.00559

- -

EFFECT .. SIM3(2)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.20181	1.65312	13.00	85.00	.087
Hotellings	.25283	1.65312	13.00	85.00	.087
Wilks	.79819	1.65312	13.00	85.00	.087
Roys	.20181				

Note.. F statistics are exact.

- -

Multivariate Effect Size

(All) .202

EFFECT .. SIM3(1)
Multivariate Tests of Significance (S = 1, M = 5 1/2, N = 41 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.17856	1.42132	13.00	85.00	.167
Hotellings	.21738	1.42132	13.00	85.00	.167
Wilks	.82144	1.42132	13.00	85.00	.167
Roys	.17856				

Note.. F statistics are exact.

- -

Multivariate Effect Size

(All) .179

- -

EFFECT .. SIM3(1) (Cont.)
Univariate F-tests with (1,97) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	5.95837	69.98043	5.95837	.72145	8.25891	.005
NGOOD	44.98978	1532.35979	44.98978	15.79752	2.84790	.095
NEARLY	43.43748	2337.84707	43.43748	24.10152	1.80227	.183
NGUESS	.01907	527.14482	.01907	5.43448	.00351	.953
NCONT	.76629	62.32499	.76629	.64253	1.19262	.278
MEK1	13.51911	744.61921	13.51911	7.67649	1.76111	.188
MEK5	16.73206	365.04689	16.73206	3.76337	4.44603	.038
MATH	1.20256	38.80694	1.20256	.40007	3.00585	.086
LANG	1.67393	39.64297	1.67393	.40869	4.09583	.046
MUSICEXP	2.53852	158.47229	2.53852	1.63373	1.55381	.216

Variable	ETA Square
RMSD	.07846
NGOOD	.02852
NEARLY	.01824
NGUESS	.00004
NCONT	.01215
MEK1	.01783
MEK5	.04383
MATH	.03006
LANG	.04051
MUSICEXP	.01577

- -

Estimates for RMSD
--- Individual univariate .9500 confidence intervals

SIM3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
2	.588451248	.20476	2.87383	.00498	.18206	.99485

SUC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
4	.511837278	.20716	2.47070	.01523	.10068	.92300

Estimates for NGOOD
--- Individual univariate .9500 confidence intervals

SUC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
4	-2.7607367	.96940	-2.84788	.00537	-4.68473	-.83674

EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
6	-3.1964759	.98395	-3.24861	.00159	-5.14935	-1.24360

- -

Estimates for NEARLY
--- Individual univariate .9500 confidence intervals

EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
6	3.48991156	1.21535	2.87153	.00502	1.07778	5.90205

- -

Estimates for MEK1
--- Individual univariate .9500 confidence intervals

SUC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
4	-2.4929114	.67576	-3.68907	.00037	-3.83410	-1.15172

- -

Estimates for MEK5
--- Individual univariate .9500 confidence intervals

EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
6	-1.3061700	.48025	-2.71977	.00774	-2.25933	-.35301

SUC3(1) BY EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
10	-3.3116813	1.19985	-2.76008	.00691	-5.69305	-.93031

- -

Estimates for MATH
--- Individual univariate .9500 confidence intervals

SUC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
4	-.58407913	.15427	-3.78612	.00027	-.89026	-.27790

EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
6	-.70048430	.15658	-4.47353	.00002	-1.01126	-.38971

- -

Estimates for LANG
--- Individual univariate .9500 confidence intervals

SUC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
4	-.81406426	.15592	-5.22099	.00000	-1.12353	-.50460

EXEC3(1)

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
6	-.56159461	.15826	-3.54851	.00060	-.87570	-.24749

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Significance for MEKTOT using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	1473.96	103	14.31		
SIM3(1)	46.07	1	46.07	3.22	.076
SIM3(2)	3.90	1	3.90	.27	.603
SUC3(1)	209.50	1	209.50	14.64	.000
SUC3(2)	1.35	1	1.35	.09	.760
EXEC3(1)	84.67	1	84.67	5.92	.017
EXEC3(2)	10.30	1	10.30	.72	.398
SIM3(1) BY SUC3(1)	19.25	1	19.25	1.35	.249
SIM3(1) BY EXEC3(1)	11.27	1	11.27	.79	.377
SUC3(1) BY EXEC3(1)	93.28	1	93.28	6.52	.012
(Model)	523.17	9	58.13	4.06	.000
(Total)	1997.13	112	17.83		

R-Squared = .262
Adjusted R-Squared = .197

- -

Effect Size Measures

Source of Variation	Partial ETA Sqd
SIM3(1)	.030
SIM3(2)	.003
SUC3(1)	.124
SUC3(2)	.001
EXEC3(1)	.054
EXEC3(2)	.007
SIM3(1) BY SUC3(1)	.013
SIM3(1) BY EXEC3(1)	.008
SUC3(1) BY EXEC3(1)	.060

- -

Estimates for MEKTOT
--- Individual univariate .9500 confidence intervals

Parameter	Coeff.	Std. Err.	t-Value	Sig. t	Lower -95%	CL- Upper
SUC3(1)						
4	-3.4233585	.89472	-3.82619	.00022	-5.19782	-1.64890
EXEC3(1)						
6	-2.1792417	.89591	-2.43245	.01672	-3.95606	-.40242
SUC3(1) BY EXEC3(1)						
10	-5.6735190	2.22219	-2.55312	.01214	-10.08071	-1.26633

Hypothesis 2.1

One Sample t-tests

Variable	Number of Cases	Mean	SD	SE of Mean
RMSD	132	3.0517	.921	.080

Test Value = 4.04

Mean Difference	95% CI Lower	Upper	t-value	df	2-Tail Sig
-.99	-1.147	-.830	-12.32	131	.000

- - Correlation Coefficients - -

	SIM	EXEC	SUC
RMSD	-.3375	-.1602	-.2161
	(123)	(123)	(123)
	P= .000	P= .077	P= .016

Combined Adjusted Means for SIM3
Variable .. RMSD

SIM3		
1	UNWGT.	2.67740
2	UNWGT.	3.07867
3	UNWGT.	3.40467

Combined Adjusted Means for SUC3
Variable .. RMSD

SUC3		
1	UNWGT.	2.83943
2	UNWGT.	2.91709
3	UNWGT.	3.40423

- - - - - - - - - - - F A C T O R A N A L Y S I S - - - - - - - - - - -

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.
VARIMAX converged in 5 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
SIM	.89368	-.14517	-.11360
SUC	.01644	.96029	-.04515
EXEC	.02252	-.03471	.97767
RMSD	-.71364	-.37585	-.27147

Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	.85449	.42345	.30090
Factor 2	.13160	-.73681	.66317
Factor 3	-.50252	.52707	.68532

Hypothesis 2.2

- - Correlation Coefficients - -

	SUC	EXEC	NGOOD	NCONT	NEARLY	NGUESS
SUC	1.0000	.0000	.2790	-.0888	-.1642	-.0585
	(126)	(126)	(122)	(122)	(122)	(122)
	P= .	P=1.000	P= .002	P= .330	P= .071	P= .522
EXEC	.0000	1.0000	.2991	.1315	-.2402	.0056
	(126)	(126)	(122)	(122)	(122)	(122)
	P=1.000	P= .	P= .001	P= .149	P= .008	P= .951

	XLAT	XWTLAT
SUC	.1100	.0890
	(122)	(122)
	P= .228	P= .330
EXEC	-.0693	-.1032
	(122)	(122)
	P= .448	P= .258

==

Combined Adjusted Means for SUC3
Variable .. NGOOD

SUC3		
1	UNWGT.	13.60556
2	UNWGT.	11.62504
3	UNWGT.	10.82619

- -

Combined Adjusted Means for EXEC3
Variable .. NGOOD

EXEC3		
1	UNWGT.	13.56949
2	UNWGT.	12.59074
3	UNWGT.	9.89656

==

t-tests for Paired Samples

Variable	Number of pairs	Corr	2-tail Sig	Mean	SD	SE of Mean
ACONT0				.5259	.199	.035
	33	-.217	.225			
ACONT1				.3897	.312	.054

Paired Differences Mean	SD	SE of Mean	t-value	df	2-tail Sig
.1362	.405	.070	1.93	32	.062
95% CI (-.007, .280)					

Hypothesis 2.3 *and* ***Hypothesis 2.4***

- - Correlation Coefficients - -

	MEK1	MEK5
MEK1	1.0000	.3836
	(121)	(118)
	P= .	P= .000

- - Correlation Coefficients - -

	MEK1	MEK5	MEKTOT
NCONT	-.0607	-.1249	-.1120
	(118)	(116)	(115)
	P= .514	P= .182	P= .234
NEARLY	-.1833	-.2145	-.2504
	(118)	(116)	(115)
	P= .047	P= .021	P= .007
NGOOD	.1178	.2934	.2529
	(118)	(116)	(115)
	P= .204	P= .001	P= .006
NGUESS	.1545	.0679	.1238
	(118)	(116)	(115)
	P= .095	P= .469	P= .187
RMSD	-.2498	-.2075	-.3228
	(119)	(117)	(116)
	P= .006	P= .025	P= .000

- - Correlation Coefficients - -

	EXEC	SUC	SIM	MEK1	MEK5	MEKTOT
MEK1	.1420	.2663	.1643	1.0000	.3836	.8876
	(116)	(116)	(116)	(121)	(118)	(118)
	P= .128	P= .004	P= .078	P= .	P= .000	P= .000
MEK5	.2315	.2590	.2544	.3836	1.0000	.7658
	(114)	(114)	(114)	(118)	(119)	(118)
	P= .013	P= .005	P= .006	P= .000	P= .	P= .000
MEKTOT	.2195	.3525	.2610	.8876	.7658	1.0000
	(113)	(113)	(113)	(118)	(118)	(118)
	P= .020	P= .000	P= .005	P= .000	P= .000	P= .

```
================================================================================
Combined Adjusted Means for SUC3
Variable .. MEKTOT
         SUC3
            1      UNWGT.    31.64444
            2      UNWGT.    29.80291
            3      UNWGT.    28.49127
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Combined Adjusted Means for EXEC3
Variable .. MEKTOT
        EXEC3
            1      UNWGT.    31.01587
            2      UNWGT.    30.31667
            3      UNWGT.    28.60608


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Combined Adjusted Means for EXEC3
Variable .. MEK1
        EXEC3
            1      UNWGT.    14.91098
            2      UNWGT.    14.15556
            3      UNWGT.    13.74444

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. MEK5
        EXEC3
            1      UNWGT.    16.10489
            2      UNWGT.    16.16111
            3      UNWGT.    14.86164

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Combined Adjusted Means for SUC3
Variable .. MEK1
         SUC3
            1      UNWGT.    15.47593
            2      UNWGT.    14.21098
            3      UNWGT.    13.12407

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. MEK5
         SUC3
            1      UNWGT.    16.16852
            2      UNWGT.    15.59193
            3      UNWGT.    15.36720
```

Hypothesis 2.5

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. MUSICEXP
Multivariate Tests of Significance (S = 4, M = 0, N = 52)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.19508	1.11771	20.00	436.00	.327
Hotellings	.21725	1.13511	20.00	418.00	.310
Wilks	.81409	1.12769	20.00	352.51	.318
Roys	.13094				

Multivariate Effect Size

TEST NAME	Effect Size
Pillais	.049
Hotellings	.052
Wilks	.050

EFFECT .. MUSICEXP (Cont.)
Univariate F-tests with (4,110) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	2.10751	91.68715	.52688	.83352	.63211	.641
NGOOD	26.29383	2022.28008	6.57346	18.38436	.35756	.838
NCONT	2.80372	72.63976	.70093	.66036	1.06143	.379
NEARLY	126.14111	2958.51976	31.53528	26.89563	1.17251	.327
NGUESS	16.25222	595.60865	4.06305	5.41462	.75039	.560

Hypothesis 2.6

- - Correlation Coefficients - -

	MATH	LANG	RMSD	NGOOD	NCONT	NEARLY
MATH	1.0000	.8464	-.5049	.4170	-.0772	-.1925
	(122)	(122)	(120)	(119)	(119)	(119)
	P= .	P= .000	P= .000	P= .000	P= .202	P= .018
LANG	.8464	1.0000	-.4475	.4005	.0389	-.2599
	(122)	(122)	(120)	(119)	(119)	(119)
	P= .000	P= .	P= .000	P= .000	P= .337	P= .002

	NGUESS
MATH	-.0580
	(119)
	P= .265
LANG	-.0115
	(119)
	P= .451

==

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. MATH
Multivariate Tests of Significance (S = 3, M = 1/2, N = 54)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.43035	3.75143	15.00	336.00	.000
Hotellings	.62473	4.52579	15.00	326.00	.000
Wilks	.59810	4.14857	15.00	304.06	.000
Roys	.35012				

- -

Multivariate Effect Size

Pillais	.143
Hotellings	.172
Wilks	.157

- -

EFFECT .. MATH (Cont.)
Univariate F-tests with (3,114) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	26.94116	71.66892	8.98039	.62867	14.28463	.000
NGOOD	393.19794	1681.79359	131.06598	14.75258	8.88428	.000
NCONT	.80663	75.63405	.26888	.66346	.40527	.749
NEARLY	236.58307	2850.74744	78.86102	25.00656	3.15361	.028
NGUESS	15.79567	609.12806	5.26522	5.34323	.98540	.402

Variable	ETA Square
RMSD	.27321
NGOOD	.18949
NCONT	.01055
NEARLY	.07663
NGUESS	.02528

Combined Adjusted Means for MATH
Variable .. RMSD

MATH		
1	UNWGT.	4.50800
2	UNWGT.	3.45600
3	UNWGT.	3.13370
4	UNWGT.	2.47974

Variable .. NGOOD

MATH		
1	UNWGT.	8.80000
2	UNWGT.	8.75000
3	UNWGT.	12.16667
4	UNWGT.	13.82051

Variable .. NEARLY

MATH		
1	UNWGT.	10.80000
2	UNWGT.	12.65000
3	UNWGT.	8.83333
4	UNWGT.	9.05128

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. LANG
Multivariate Tests of Significance (S = 3, M = 1/2, N = 54)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.49775	4.45579	15.00	336.00	.000
Hotellings	.66385	4.80922	15.00	326.00	.000
Wilks	.56452	4.66505	15.00	304.06	.000
Roys	.30527				

Multivariate Effect Size

TEST NAME	Effect Size
Pillais	.166
Hotellings	.181
Wilks	.174

EFFECT .. LANG (Cont.)
Univariate F-tests with (3,114) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RMSD	22.23002	76.38006	7.41001	.67000	11.05970	.000
NGOOD	347.93786	1727.05367	115.97929	15.14959	7.65560	.000
NCONT	1.97791	74.46277	.65930	.65318	1.00937	.391
NEARLY	469.66024	2617.67027	156.55341	22.96202	6.81793	.000
NGUESS	51.91687	573.00686	17.30562	5.02638	3.44296	.019

Variable	ETA Square
RMSD	.22543
NGOOD	.16768
NCONT	.02588
NEARLY	.15213
NGUESS	.08308

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Combined Adjusted Means for LANG
Variable .. RMSD
         LANG
            1      UNWGT.     4.50800
            2      UNWGT.     3.36000
            3      UNWGT.     3.19468
            4      UNWGT.     2.62280

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. NGOOD
         LANG
            1      UNWGT.     8.80000
            2      UNWGT.     9.43750
            3      UNWGT.    11.25532
            4      UNWGT.    13.82000

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. NEARLY
         LANG
            1      UNWGT.    10.80000
            2      UNWGT.    14.56250
            3      UNWGT.     8.68085
            4      UNWGT.     8.84000

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. NGUESS
         LANG
            1      UNWGT.     5.00000
            2      UNWGT.     2.68750
            3      UNWGT.     4.57447
            4      UNWGT.     3.72000
```

APPENDIX J

SPSS-Windows© ANALYSIS OF STUDY 3 DATA

- *Preliminary analysis*
- *Hypothesis 3.1*
- *Hypothesis 3.2*
- *Hypothesis 3.3*
- *Hypothesis 3.4*

Preliminary analysis

\- - - - - - - - - - - - F A C T O R   A N A L Y S I S - - - - - - - - - - - -

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 6 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
INVERT	.53281	-.00189	.71651
PAPERF	.11179	.33631	.87290
NUMLET	.67418	.51187	.24182
SIZE	.82543	.28728	.22832
NUMBER	.19101	.88393	.17762
WORD	.49811	.67060	.17073

3 PC EXACT factor scores will be saved.

==

Number of valid observations (listwise) = 29.00

Variable RMSD

Mean	2.442	Std Dev	.726
Kurtosis	-.496	S.E. Kurt	.845
Skewness	.456	S.E. Skew	.434
Minimum	1.29	Maximum	4.20

Valid observations - 29 Missing observations - 0

\- -

Variable NGOOD

Mean	13.966	Std Dev	2.884
Kurtosis	-.238	S.E. Kurt	.845
Skewness	.056	S.E. Skew	.434
Minimum	8	Maximum	20

Valid observations - 29 Missing observations - 0

==

\- - Correlation Coefficients - -

	AGE	RMSD
AGE	1.0000	-.1002
	(29)	(29)
	P= .	P= .605

	AGE	NGOOD
AGE	1.0000	-.2343
	(29)	(29)
	P= .	P= .221

	AGE	PSTUDY	INSTUDY	MUEDYEAR
AGE	1.0000	.1139	.2286	.1599
	(29)	(22)	(26)	(29)
	P= .	P= .614	P= .261	P= .407

One Sample t-tests

Variable	Number of Cases	Mean	SD	SE of Mean
INSTAMEB	22	1.5801	1.098	.234

Test Value = 0.8

Mean Difference	95% CI Lower	Upper	t-value	df	2-Tail Sig
.78	.293	1.267	3.33	21	.003

Variable	Number of Cases	Mean	SD	SE of Mean
PSTUDY	22	4.5000	2.345	.500

Test Value = 0.6

Mean Difference	95% CI Lower	Upper	t-value	df	2-Tail Sig
3.90	2.860	4.940	7.80	21	.000

Hypothesis 3.1

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design  1 * * * * * *

 EFFECT .. MOZART
 Multivariate Tests of Significance (S = 1, M = 0, N = 77 )

 Test Name          Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais           .08213    6.97972       2.00     156.00       .001
 Hotellings        .08948    6.97972       2.00     156.00       .001
 Wilks             .91787    6.97972       2.00     156.00       .001
 Roys              .08213
 Note.. F statistics are exact.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Multivariate Effect Size

 TEST NAME   Effect Size

  (All)            .082

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 EFFECT .. MOZART (Cont.)
 Univariate F-tests with (1,157) D. F.

 Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

 RMSD          8.99848  125.42087    8.99848     .79886   11.26417       .001
 NGOOD       109.61620 2596.53475  109.61620   16.53844    6.62797       .011

 Variable   ETA Square

 RMSD          .06694
 NGOOD         .04051

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 Combined Adjusted Means for MOZART
 Variable .. RMSD
        MOZART
             0      UNWGT.     3.05777
             1      UNWGT.     2.44172

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 Variable .. NGOOD
        MOZART
             0      UNWGT.    11.81538
             1      UNWGT.    13.96552

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

--- PARTIAL CORRELATION COEFFICIENTS ---

Controlling for.. AGE

	MUEDYEAR	RMSD	NGOOD
MUEDYEAR	1.0000	.0094	.1293
	(0)	(26)	(26)
	P= .	P= .962	P= .512
RMSD	.0094	1.0000	.0428
	(26)	(0)	(26)
	P= .962	P= .	P= .829
NGOOD	.1293	.0428	1.0000
	(26)	(26)	(0)
	P= .512	P= .829	P= .

(Coefficient / (D.F.) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

-- Correlation Coefficients --

	INSTUDY	PSTUDY	INSTAMEB	PAMEB	RMSD	NGOOD
INSTUDY	1.0000	.1159	-.6279	-.3278	.1355	-.0279
	(26)	(19)	(22)	(15)	(26)	(26)
	P= .	P= .637	P= .002	P= .233	P= .509	P= .893
PSTUDY	.1159	1.0000	.1907	-.2831	-.6046	-.2685
	(19)	(22)	(16)	(18)	(22)	(22)
	P= .637	P= .	P= .479	P= .255	P= .003	P= .227
INSTAMEB	-.6279	.1907	1.0000	.3586	-.3299	-.1218
	(22)	(16)	(22)	(13)	(22)	(22)
	P= .002	P= .479	P= .	P= .229	P= .134	P= .589
PAMEB	-.3278	-.2831	.3586	1.0000	-.2871	.0031
	(15)	(18)	(13)	(18)	(18)	(18)
	P= .233	P= .255	P= .229	P= .	P= .248	P= .990
RMSD	.1355	-.6046	-.3299	-.2871	1.0000	.0649
	(26)	(22)	(22)	(18)	(29)	(29)
	P= .509	P= .003	P= .134	P= .248	P= .	P= .738
NGOOD	-.0279	-.2685	-.1218	.0031	.0649	1.0000
	(26)	(22)	(22)	(18)	(29)	(29)
	P= .893	P= .227	P= .589	P= .990	P= .738	P= .

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

Hypothesis 3.2

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design  1 * * * * * *

EFFECT .. MOZART
Multivariate Tests of Significance (S = 1, M = 1/2, N = 73 1/2)

Test Name         Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais          .37289   29.53324       3.00     149.00       .000
Hotellings       .59463   29.53324       3.00     149.00       .000
Wilks            .62711   29.53324       3.00     149.00       .000
Roys             .37289
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Multivariate Effect Size

TEST NAME   Effect Size

 (All)           .373

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
EFFECT .. MOZART (Cont.)
Univariate F-tests with (1,151) D. F.

Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

SIM          3.51372  148.48628    3.51372     .98335    3.57321       .061
SUC         17.61269  134.38731   17.61269     .88998   19.78994       .000
EXEC        35.55361  116.44639   35.55361     .77117   46.10358       .000

Variable   ETA Square

SIM          .02312
SUC          .11587
EXEC         .23391

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Combined Adjusted Means for MOZART
Variable .. SIM
       MOZART
            0      UNWGT.     -.07329
            1      UNWGT.      .31336

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. SUC
       MOZART
            0      UNWGT.     -.16408
            1      UNWGT.      .70158

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. EXEC
       MOZART
            0      UNWGT.     -.23312
            1      UNWGT.      .99680

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

- - Correlation Coefficients - -

(combined samples)

	SIM	SUC	EXEC
RMSD	-.3318	-.2547	-.2463
	(150)	(150)	(150)
	P= .000	P= .002	P= .002
NGOOD	.1909	.2234	.2785
	(149)	(149)	(149)
	P= .020	P= .006	P= .001

(Coefficient / (Cases) / 2-tailed Significance)

==

- - Correlation Coefficients - -

(matched Study 2 sub-sample)

	EXEC	SUC	SIM
RMSD	-.0863	-.0085	-.2489
	(75)	(75)	(75)
	P= .462	P= .942	P= .031
NGOOD	.1396	.2016	.0506
	(75)	(75)	(75)
	P= .232	P= .083	P= .666

(Coefficient / (Cases) / 2-tailed Significance)

==

- - Correlation Coefficients - -

(Study 3)

	EXEC	SUC	SIM
RMSD	-.1923	-.0896	-.0464
	(29)	(29)	(29)
	P= .318	P= .644	P= .811
NGOOD	-.0157	-.2493	.1220
	(29)	(29)	(29)
	P= .935	P= .192	P= .528

(Coefficient / (Cases) / 2-tailed Significance)

==

- - Description of Subpopulations - -

Summaries of ID2 (= sim3:suc3:exec3)
(1 = high, 2 = medium, 3 = low)

Variable	Value	Cases	MOZART = 0	MOZART = 1
For Entire Population		104	75	29
ID2	111.00	6	2	4
ID2	112.00	7	2	5
ID2	113.00	6	6	0
ID2	121.00	3	2	1
ID2	122.00	10	10	0
ID2	123.00	5	5	0
ID2	131.00	4	3	1
ID2	132.00	6	6	0
ID2	133.00	4	4	0
ID2	211.00	10	1	9
ID2	212.00	3	2	1
ID2	213.00	5	5	0
ID2	221.00	6	2	4
ID2	231.00	6	3	3
ID2	311.00	5	4	1
ID2	312.00	4	4	0
ID2	313.00	5	5	0
ID2	321.00	4	4	0
ID2	331.00	5	5	0

==

Hypothesis 3.3

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. MOZART
Multivariate Tests of Significance (S = 1, M = 1 1/2, N = 65)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.10455	3.08229	5.00	132.00	.012
Hotellings	.11675	3.08229	5.00	132.00	.012
Wilks	.89545	3.08229	5.00	132.00	.012
Roys	.10455				

Note.. F statistics are exact.

\- -

Multivariate Effect Size

TEST NAME	Effect Size
(All)	.105

\- -

EFFECT .. MOZART (Cont.)
Univariate F-tests with (1,136) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
ADD1	94.77022	2344.23705	94.77022	17.23704	5.49806	.020
ADD2	217.15821	2956.77031	217.15821	21.74096	9.98844	.002
ADD3	144.50736	2581.06133	144.50736	18.97839	7.61431	.007
ADD4	112.79382	3701.24289	112.79382	27.21502	4.14454	.044
ADD5	164.19317	2755.70380	164.19317	20.26253	8.10329	.005

Variable	ETA Square
ADD1	.03886
ADD2	.06842
ADD3	.05302
ADD4	.02957
ADD5	.05623

\- -

Roy-Bargman Stepdown F - tests

Variable	Hypoth. MS	Error MS	StepDown F	Hypoth. DF	Error DF	Sig. of F
ADD1	94.77022	17.23704	5.49806	1	136	.020
ADD2	148.76091	20.93656	7.10532	1	135	.009
ADD3	26.69171	15.51820	1.72003	1	134	.192
ADD4	2.76780	21.05066	.13148	1	133	.717
ADD5	10.98009	14.40360	.76232	1	132	.384

```
Combined Adjusted Means for MOZART
Variable .. ADD1
       MOZART
            0      UNWGT.    10.46181
            1      UNWGT.     8.42775
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. ADD2
       MOZART
            0      UNWGT.     9.91932
            1      UNWGT.     6.84028

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. ADD3
       MOZART
            0      UNWGT.    10.52942
            1      UNWGT.     8.01769

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. ADD4
       MOZART
            0      UNWGT.     9.93834
            1      UNWGT.     7.71927

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. ADD5
       MOZART
            0      UNWGT.     9.60535
            1      UNWGT.     6.92800

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. MOZART
Multivariate Tests of Significance (S = 1, M = 2 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.06995	1.60452	6.00	128.00	.151
Hotellings	.07521	1.60452	6.00	128.00	.151
Wilks	.93005	1.60452	6.00	128.00	.151
Roys	.06995				

Note.. F statistics are exact.

- -

Multivariate Effect Size

TEST NAME	Effect Size
(All)	.070

- -

EFFECT .. MOZART (Cont.)
Univariate F-tests with (1,133) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
GG1	8.63502	172.29831	8.63502	1.29548	6.66552	.011
GG2	7.47276	264.26057	7.47276	1.98692	3.76097	.055
GG3	4.81794	238.39688	4.81794	1.79246	2.68789	.103
GG4	2.24397	219.01529	2.24397	1.64673	1.36268	.245
GG5	.59044	157.40956	.59044	1.18353	.49888	.481
GG6	.01181	145.91412	.01181	1.09710	.01076	.918

Variable	ETA Square
GG1	.04772
GG2	.02750
GG3	.01981
GG4	.01014
GG5	.00374
GG6	.00008

- -

Roy-Bargman Stepdown F - tests

Variable	Hypoth. MS	Error MS	StepDown F	Hypoth. DF	Error DF	Sig. of F
GG1	8.63502	1.29548	6.66552	1	133	.011
GG2	2.63044	1.82838	1.43867	1	132	.233
GG3	.89351	1.60348	.55723	1	131	.457
GG4	1.23402	1.59997	.77128	1	130	.381
GG5	.09761	1.03100	.09468	1	129	.759
GG6	.26215	1.08670	.24123	1	128	.624

- -

```
Combined Adjusted Means for MOZART
Variable .. GG1
       MOZART
            0      UNWGT.     2.55660
            1      UNWGT.     3.17241

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. GG2
       MOZART
            0      UNWGT.     2.25472
            1      UNWGT.     2.82759

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. GG3
       MOZART
            0      UNWGT.     2.26415
            1      UNWGT.     2.72414

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. GG4
       MOZART
            0      UNWGT.     1.85849
            1      UNWGT.     2.17241

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. GG5
       MOZART
            0      UNWGT.     1.63208
            1      UNWGT.     1.79310

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Variable .. GG6
       MOZART
            0      UNWGT.     1.26415
            1      UNWGT.     1.24138

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

Hypothesis 3.4

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design  1 * * * * * *

EFFECT .. V_OR_G
Multivariate Tests of Significance (S = 2, M = 0, N = 11 )

Test Name         Value  Approx. F Hypoth. DF   Error DF  Sig. of F

Pillais          .22231    1.04215       6.00      50.00       .410
Hotellings       .28314    1.08537       6.00      46.00       .385
Wilks            .77861    1.06627       6.00      48.00       .396
Roys             .21806
Note.. F statistic for WILKS' Lambda is exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Multivariate Effect Size

TEST NAME   Effect Size

Pillais            .111
Hotellings         .124
Wilks              .118

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
EFFECT .. V_OR_G (Cont.)
Univariate F-tests with (2,26) D. F.

Variable   Hypoth. SS   Error SS Hypoth. MS   Error MS          F  Sig. of F

EXEC           .79838   15.35373     .39919     .59053     .67599       .517
SIM           1.80918    8.28030     .90459     .31847    2.84040       .077
SUC            .85590   28.66244     .42795    1.10240     .38820       .682

Variable   ETA Square

EXEC           .04943
SIM            .17931
SUC            .02900

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Combined Adjusted Means for V_OR_G
Variable .. SIM
       V_OR_G
           1       UNWGT.       .56424
           2       UNWGT.       .33564
           3       UNWGT.      -.05944

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```