Eysenck’s Experiment Data

Taken from Howell, 2010, p. 319

SAS Program:

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\* Analyze ANOVA data from Howell, p. 319

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* Import data from Excel

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

**proc** **print**;

**proc** **glm**;

class label;

model words = label;

**proc** **glm**;

class iv;

model words = iv;

**proc** **sort**; by label;

**proc** **means**;

var words; by label;

**proc** **univariate** plot;

var words; by label;

**run**;

SAS Output:

The SAS System 10:33 Monday, August 29, 2011 18

Obs Words IV label

1 11 3 adject

2 13 3 adject

3 8 3 adject

4 6 3 adject

5 14 3 adject

6 11 3 adject

7 13 3 adject

8 13 3 adject

9 10 3 adject

10 11 3 adject

11 9 1 count

12 8 1 count

13 6 1 count

14 8 1 count

15 10 1 count

16 4 1 count

17 6 1 count

18 5 1 count

19 7 1 count

20 7 1 count

21 12 4 image

22 11 4 image

23 16 4 image

24 11 4 image

25 9 4 image

26 23 4 image

27 12 4 image

28 10 4 image

29 19 4 image

30 11 4 image

31 10 5 intent

32 19 5 intent

33 14 5 intent

34 5 5 intent

35 10 5 intent

36 11 5 intent

37 14 5 intent

38 15 5 intent

39 11 5 intent

40 11 5 intent

41 7 2 rhyme

42 9 2 rhyme

43 6 2 rhyme

44 6 2 rhyme

45 6 2 rhyme

46 11 2 rhyme

47 6 2 rhyme

48 3 2 rhyme

49 8 2 rhyme

50 7 2 rhyme

The SAS System 10:33 Monday, August 29, 2011 19

The GLM Procedure

Class Level Information

Class Levels Values

label 5 adject count image intent rhyme

Number of Observations Read 50

Number of Observations Used 50

The SAS System 10:33 Monday, August 29, 2011 20

The GLM Procedure

Dependent Variable: Words Words

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 4 351.5200000 87.8800000 9.08 <.0001

Error 45 435.3000000 9.6733333

Corrected Total 49 786.8200000

R-Square Coeff Var Root MSE Words Mean

0.446760 30.91648 3.110198 10.06000

Source DF Type I SS Mean Square F Value Pr > F

label 4 351.5200000 87.8800000 9.08 <.0001

Source DF Type III SS Mean Square F Value Pr > F

label 4 351.5200000 87.8800000 9.08 <.0001

The SAS System 10:33 Monday, August 29, 2011 21

The GLM Procedure

Class Level Information

Class Levels Values

IV 5 1 2 3 4 5

Number of Observations Read 50

Number of Observations Used 50

The SAS System 10:33 Monday, August 29, 2011 22

The GLM Procedure

Dependent Variable: Words Words

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 4 351.5200000 87.8800000 9.08 <.0001

Error 45 435.3000000 9.6733333

Corrected Total 49 786.8200000

R-Square Coeff Var Root MSE Words Mean

0.446760 30.91648 3.110198 10.06000

Source DF Type I SS Mean Square F Value Pr > F

IV 4 351.5200000 87.8800000 9.08 <.0001

Source DF Type III SS Mean Square F Value Pr > F

IV 4 351.5200000 87.8800000 9.08 <.0001

The SAS System 10:33 Monday, August 29, 2011 23

------------------------------------------ label=adject ------------------------------------------

The MEANS Procedure

Analysis Variable : Words Words

N Mean Std Dev Minimum Maximum

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10 11.0000000 2.4944383 6.0000000 14.0000000

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

------------------------------------------ label=count -------------------------------------------

Analysis Variable : Words Words

N Mean Std Dev Minimum Maximum

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

10 7.0000000 1.8257419 4.0000000 10.0000000

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

------------------------------------------ label=image -------------------------------------------

Analysis Variable : Words Words

N Mean Std Dev Minimum Maximum

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

10 13.4000000 4.5018515 9.0000000 23.0000000

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

------------------------------------------ label=intent ------------------------------------------

Analysis Variable : Words Words

N Mean Std Dev Minimum Maximum

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10 12.0000000 3.7416574 5.0000000 19.0000000

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

The SAS System 10:33 Monday, August 29, 2011 24

------------------------------------------ label=rhyme -------------------------------------------

The MEANS Procedure

Analysis Variable : Words Words

N Mean Std Dev Minimum Maximum

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

10 6.9000000 2.1317703 3.0000000 11.0000000

ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

The SAS System 10:33 Monday, August 29, 2011 25

------------------------------------------ label=adject ------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Moments

N 10 Sum Weights 10

Mean 11 Sum Observations 110

Std Deviation 2.49443826 Variance 6.22222222

Skewness -0.9127449 Kurtosis 0.37349672

Uncorrected SS 1266 Corrected SS 56

Coeff Variation 22.6767114 Std Error Mean 0.78881064

Basic Statistical Measures

Location Variability

Mean 11.00000 Std Deviation 2.49444

Median 11.00000 Variance 6.22222

Mode 11.00000 Range 8.00000

Interquartile Range 3.00000

Note: The mode displayed is the smallest of 2 modes with a count of 3.

Tests for Location: Mu0=0

Test -Statistic- -----p Value------

Student's t t 13.94505 Pr > |t| <.0001

Sign M 5 Pr >= |M| 0.0020

Signed Rank S 27.5 Pr >= |S| 0.0020

Quantiles (Definition 5)

Quantile Estimate

100% Max 14.0

99% 14.0

95% 14.0

90% 13.5

75% Q3 13.0

50% Median 11.0

25% Q1 10.0

10% 7.0

5% 6.0

1% 6.0

0% Min 6.0

The SAS System 10:33 Monday, August 29, 2011 26

------------------------------------------ label=adject ------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Extreme Observations

----Lowest---- ----Highest---

Value Obs Value Obs

6 4 11 10

8 3 13 2

10 9 13 7

11 10 13 8

11 6 14 5

Stem Leaf # Boxplot

14 0 1 |

13 000 3 +-----+

12 | |

11 000 3 \*--+--\*

10 0 1 +-----+

9 |

8 0 1 |

7 |

6 0 1 |

----+----+----+----+

Normal Probability Plot

14.5+ ++\*+

| \* \* +\*++

| ++++

| \* \*+\*+++

10.5+ \* ++++

| ++++

| ++\*+

| ++++

6.5+ ++++ \*

+----+----+----+----+----+----+----+----+----+----+

-2 -1 0 +1 +2

The SAS System 10:33 Monday, August 29, 2011 27

------------------------------------------ label=count -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Moments

N 10 Sum Weights 10

Mean 7 Sum Observations 70

Std Deviation 1.82574186 Variance 3.33333333

Skewness 0 Kurtosis -0.45

Uncorrected SS 520 Corrected SS 30

Coeff Variation 26.0820265 Std Error Mean 0.57735027

Basic Statistical Measures

Location Variability

Mean 7.000000 Std Deviation 1.82574

Median 7.000000 Variance 3.33333

Mode 6.000000 Range 6.00000

Interquartile Range 2.00000

Note: The mode displayed is the smallest of 3 modes with a count of 2.

Tests for Location: Mu0=0

Test -Statistic- -----p Value------

Student's t t 12.12436 Pr > |t| <.0001

Sign M 5 Pr >= |M| 0.0020

Signed Rank S 27.5 Pr >= |S| 0.0020

Quantiles (Definition 5)

Quantile Estimate

100% Max 10.0

99% 10.0

95% 10.0

90% 9.5

75% Q3 8.0

50% Median 7.0

25% Q1 6.0

10% 4.5

5% 4.0

1% 4.0

0% Min 4.0

The SAS System 10:33 Monday, August 29, 2011 28

------------------------------------------ label=count -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Extreme Observations

----Lowest---- ----Highest---

Value Obs Value Obs

4 16 7 20

5 18 8 12

6 17 8 14

6 13 9 11

7 20 10 15

Stem Leaf # Boxplot

10 0 1 |

9 0 1 |

8 00 2 +-----+

7 00 2 \*--+--\*

6 00 2 +-----+

5 0 1 |

4 0 1 |

----+----+----+----+

Normal Probability Plot

10.5+ \* +++++

| \*++++++

| \* +\*+++

7.5+ \*+\*++++

| \* +\*+++

| \*++++

4.5+ +\*++++

+----+----+----+----+----+----+----+----+----+----+

-2 -1 0 +1 +2

The SAS System 10:33 Monday, August 29, 2011 29

------------------------------------------ label=image -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Moments

N 10 Sum Weights 10

Mean 13.4 Sum Observations 134

Std Deviation 4.50185147 Variance 20.2666667

Skewness 1.37991471 Kurtosis 1.04789369

Uncorrected SS 1978 Corrected SS 182.4

Coeff Variation 33.5959065 Std Error Mean 1.42361043

Basic Statistical Measures

Location Variability

Mean 13.40000 Std Deviation 4.50185

Median 11.50000 Variance 20.26667

Mode 11.00000 Range 14.00000

Interquartile Range 5.00000

Tests for Location: Mu0=0

Test -Statistic- -----p Value------

Student's t t 9.412687 Pr > |t| <.0001

Sign M 5 Pr >= |M| 0.0020

Signed Rank S 27.5 Pr >= |S| 0.0020

Quantiles (Definition 5)

Quantile Estimate

100% Max 23.0

99% 23.0

95% 23.0

90% 21.0

75% Q3 16.0

50% Median 11.5

25% Q1 11.0

10% 9.5

5% 9.0

1% 9.0

0% Min 9.0

The SAS System 10:33 Monday, August 29, 2011 30

------------------------------------------ label=image -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Extreme Observations

----Lowest---- ----Highest---

Value Obs Value Obs

9 25 12 21

10 28 12 27

11 30 16 23

11 24 19 29

11 22 23 26

Stem Leaf # Boxplot

22 0 1 |

20 |

18 0 1 |

16 0 1 +-----+

14 | |

12 00 2 | + |

10 0000 4 \*-----\*

8 0 1 |

----+----+----+----+

Normal Probability Plot

23+ \* ++++

| +++++

| \*++++

| +\*+++

| ++++

| ++++\* \*

| \* \*++\* \*

9+ \* ++++

+----+----+----+----+----+----+----+----+----+----+

-2 -1 0 +1 +2

The SAS System 10:33 Monday, August 29, 2011 31

------------------------------------------ label=intent ------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Moments

N 10 Sum Weights 10

Mean 12 Sum Observations 120

Std Deviation 3.74165739 Variance 14

Skewness 0.06363363 Kurtosis 1.17274052

Uncorrected SS 1566 Corrected SS 126

Coeff Variation 31.1804782 Std Error Mean 1.18321596

Basic Statistical Measures

Location Variability

Mean 12.00000 Std Deviation 3.74166

Median 11.00000 Variance 14.00000

Mode 11.00000 Range 14.00000

Interquartile Range 4.00000

Tests for Location: Mu0=0

Test -Statistic- -----p Value------

Student's t t 10.14185 Pr > |t| <.0001

Sign M 5 Pr >= |M| 0.0020

Signed Rank S 27.5 Pr >= |S| 0.0020

Quantiles (Definition 5)

Quantile Estimate

100% Max 19.0

99% 19.0

95% 19.0

90% 17.0

75% Q3 14.0

50% Median 11.0

25% Q1 10.0

10% 7.5

5% 5.0

1% 5.0

0% Min 5.0

The SAS System 10:33 Monday, August 29, 2011 32

------------------------------------------ label=intent ------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Extreme Observations

----Lowest---- ----Highest---

Value Obs Value Obs

5 34 11 40

10 35 14 33

10 31 14 37

11 40 15 38

11 39 19 32

Stem Leaf # Boxplot

18 0 1 |

16 |

14 000 3 +-----+

12 | + |

10 00000 5 \*-----\*

8 |

6 |

4 0 1 |

----+----+----+----+

Normal Probability Plot

19+ \* +++++

| ++++++

| \* +\*++\*

| ++++++

| \* \* +\*++\* \*

| +++++

| ++++++

5+ +++++ \*

+----+----+----+----+----+----+----+----+----+----+

-2 -1 0 +1 +2

The SAS System 10:33 Monday, August 29, 2011 33

------------------------------------------ label=rhyme -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Moments

N 10 Sum Weights 10

Mean 6.9 Sum Observations 69

Std Deviation 2.13177026 Variance 4.54444444

Skewness 0.24773653 Kurtosis 1.34066118

Uncorrected SS 517 Corrected SS 40.9

Coeff Variation 30.8952212 Std Error Mean 0.67412495

Basic Statistical Measures

Location Variability

Mean 6.900000 Std Deviation 2.13177

Median 6.500000 Variance 4.54444

Mode 6.000000 Range 8.00000

Interquartile Range 2.00000

Tests for Location: Mu0=0

Test -Statistic- -----p Value------

Student's t t 10.23549 Pr > |t| <.0001

Sign M 5 Pr >= |M| 0.0020

Signed Rank S 27.5 Pr >= |S| 0.0020

Quantiles (Definition 5)

Quantile Estimate

100% Max 11.0

99% 11.0

95% 11.0

90% 10.0

75% Q3 8.0

50% Median 6.5

25% Q1 6.0

10% 4.5

5% 3.0

1% 3.0

0% Min 3.0

The SAS System 10:33 Monday, August 29, 2011 34

------------------------------------------ label=rhyme -------------------------------------------

The UNIVARIATE Procedure

Variable: Words (Words)

Extreme Observations

----Lowest---- ----Highest---

Value Obs Value Obs

3 48 7 41

6 47 7 50

6 45 8 49

6 44 9 42

6 43 11 46

Stem Leaf # Boxplot

11 0 1 |

10 |

9 0 1 |

8 0 1 +-----+

7 00 2 | |

6 0000 4 \*--+--\*

5 |

4 |

3 0 1 |

----+----+----+----+

Normal Probability Plot

11.5+ \* ++++

| +++++

| \*++++

| +\*++

7.5+ \*++\*+

| \* \* \*++\*+

| ++++

| +++++

3.5+ +++\*+

+----+----+----+----+----+----+----+----+----+----+

-2 -1 0 +1 +2

The SAS System 10:33 Monday, August 29, 2011 35

The UNIVARIATE Procedure

Variable: Words (Words)

Schematic Plots

|

24 +

|

| |

| |

22 + |

| |

| |

| |

20 + |

| |

| | |

| | |

18 + | |

| | |

| | |

| | |

16 + +-----+ |

| | | |

| | | |

| | | |

14 + | | | +-----+

| | | + | | |

| +-----+ | | | |

| | | | | | |

12 + | | | | | + |

| | | \*-----\* | |

| \*--+--\* +-----+ \*-----\* |

| | | | | | |

10 + +-----+ | | +-----+ |

| | | | | |

| | | | | |

| | | | |

8 + | +-----+ | +-----+

| | | | | | |

| | \*--+--\* | | + |

| | | | | \*-----\*

6 + | +-----+ | +-----+

| | | |

| | | |

| | |

4 + | |

| |

| |

|

2 +

------------+-----------+-----------+-----------+-----------+-----------

label adject count image intent rhyme