

# Within-Cases: Multivariate approach part one

```

/* sleep2.sas */
options linesize=79 noovp formdlim=' ';
title "Student's Sleep data: Matched t-tests with proc reg";

data bedtime;
  infile 'studentsleep.data' firstobs=2; /* Skip the header */
  input patient xsleep1 xsleep2;
  sleepdif = xsleep2-xsleep1; /* Create a new variable */

proc means n mean stddev t probt;
  var sleepdif;

proc reg;
  model sleepdif = ; /* Just the intercept: beta0 = mu */
  Unnecessary: test intercept = 0;

```

Student's Sleep data: Matched t-tests with proc reg 1

The MEANS Procedure

Analysis Variable : sleepdif

N	Mean	Std Dev	t Value	Pr >  t
10	1.5800000	1.2299955	4.06	0.0028

Student's Sleep data: Matched t-tests with proc reg 2

The REG Procedure

Model: MODEL1

Dependent Variable: sleepdif

Number of Observations Read 10  
 Number of Observations Used 10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	0	0	.	.	.
Error	9	13.61600	1.51289		
Corrected Total	9	13.61600			

Root MSE 1.23000 R-Square 0.0000  
 Dependent Mean 1.58000 Adj R-Sq 0.0000  
 Coeff Var 77.84782

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	1.58000	0.38896	4.06	0.0028

Student's Sleep data: Matched t-tests with proc reg

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The REG Procedure

Model: MODEL1

Test Unnecessary Results for Dependent Variable sleepdif

Source	DF	Mean Square	F Value	Pr > F
Numerator	1	24.96400	16.50	0.0028
Denominator	9	1.51289		

Compare

Analysis Variable : sleepdif

N	Mean	Std Dev	t Value	Pr >  t
10	1.5800000	1.2299955	4.06	0.0028

```

/* grapefruit1.sas */
options linesize=79 pagesize=100 noovp formdlim='_' nodate;
title "Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach";
title2 'Grapefruit data (Kutner et al. 5th ed. Prob 27.6)';

data grape1;
  infile 'grapefruit1.data' firstobs=2; /* Skip the labels */
  input store sales1-sales3;
  label sales1 = 'Sales at Price 1'
        sales2 = 'Sales at Price 2'
        sales3 = 'Sales at Price 3';
  d12 = sales1-sales2; d13 = sales1-sales3; d23=sales2-sales3;

proc means n mean stddev;
  var sales1-sales3;

proc reg;
  title3 'Test H0: mu1=mu2=mu3';
  model d12 d13 = ;
  Price: mtest intercept=0;

proc means mean t probt;
  title3 'Pairwise matched t-tests';
  var d12 d13 d23;

```

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Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach 1

The MEANS Procedure

Variable	Label	N	Mean	Std Dev
sales1	Sales at Price 1	8	55.4375000	5.4413595
sales2	Sales at Price 2	8	53.6000000	6.1309519
sales3	Sales at Price 3	8	51.3375000	6.3738164

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Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach 2

Test H0: mu1=mu2=mu3

The REG Procedure

Model: MODEL1

Dependent Variable: d12

Number of Observations Read	8
Number of Observations Used	8

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	0	0	.	.	.
Error	7	8.21875	1.17411		
Corrected Total	7	8.21875			

Root MSE	1.08356	R-Square	0.0000
Dependent Mean	1.83750	Adj R-Sq	0.0000
Coeff Var	58.96937		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	1.83750	0.38310	4.80	0.0020

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Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach 3  
 Test H0:  $\mu_1 = \mu_2 = \mu_3$

The REG Procedure  
 Model: MODEL1  
 Dependent Variable: d13

Number of Observations Read 8  
 Number of Observations Used 8

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	0	0	.	.	.
Error	7	14.80000	2.11429		
Corrected Total	7	14.80000			

Root MSE	1.45406	R-Square	0.0000
Dependent Mean	4.10000	Adj R-Sq	0.0000
Coeff Var	35.46484		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	4.10000	0.51409	7.98	<.0001

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Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach 4  
Test H0:  $\mu_1 = \mu_2 = \mu_3$

The REG Procedure  
Model: MODEL1  
Multivariate Test: Price

Multivariate Statistics and Exact F Statistics

	S=1	M=0	N=2			
Statistic	Value	F Value	Num DF	Den DF	Pr > F	
Wilks' Lambda	0.09185282	29.66	2	6	0.0008	
Pillai's Trace	0.90814718	29.66	2	6	0.0008	
Hotelling-Lawley Trace	9.88698145	29.66	2	6	0.0008	
Roy's Greatest Root	9.88698145	29.66	2	6	0.0008	

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Oneway ANOVA with repeated measures: Hotelling's T-Squared Approach 5  
Pairwise matched t-tests

The MEANS Procedure

Variable	Mean	t Value	Pr >  t
d12	1.8375000	4.80	0.0020
d13	4.1000000	7.98	<.0001
d23	2.2625000	7.09	0.0002

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