Pre-post, 2 groups Repeated Measures Anova

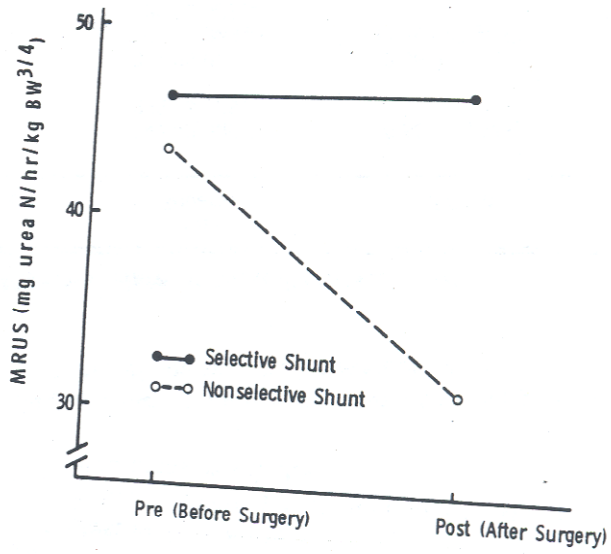
Brogan-Kutner example

Stat 209 week 9 [redacted]

© The American Statistician, November 1980, Vol. 34, No. 4

1. Pre and Post Maximal Rate of Urea Synthesis Level (mg urea N/hr/kg $BW^{3/4}$) and Sample Cell Means, by Group

Group	Subject	Pre	Post
Selective Shunt (new operation)	1	51	48
	2	35	55
	3	66	60
	4	40	35
	5	39	36
	6	46	43
	7	52	46
	8	42	54
Mean		$\hat{\mu}_{11} = 46.375$	$\hat{\mu}_{12} = 47.125$
Nonselective Shunt (standard operation)	9	34	16
	10	40	36
	11	34	16
	12	36	18
	13	38	32
	14	32	14
	15	44	20
	16	50	43
	17	60	45
	18	63	67
	19	50	36
	20	42	34
	21	43	32
Mean		$\hat{\mu}_{21} = 43.538$	$\hat{\mu}_{22} = 31.462$



analysis on back

Growth Curves (Group) T=4

Bock, DR MSMBR text

EXAMPLE 7.1-1 (*Mixed-model analysis of vocabulary growth*) Data for this example are drawn from test results on file in the Records Office of the Laboratory School of the University of Chicago. They consist of scores, obtained from a cohort of pupils at the eighth through eleventh grade level, on alternative forms of the vocabulary section of the Cooperative Reading Tests [Davis, 1950]. Since these data cover an age range in which physical growth is beginning to decelerate, it is of interest to inquire whether a similar deceleration can be observed in the acquisition of new vocabulary.

Table 7.2-5 MIXED-MODEL ANALYSIS OF VARIANCE OF SEX EFFECTS IN THE VOCABULARY-SCALED SCORES

Source	df	ss	F	p
Constant	1	ssm = 1,644.90		
Sex	1	ssb = .85	.06	> .5
Occasions	3	ssc = 194.18		
Sex × occasions	3	ssbc = 2.79	1.12	> .1
Subjects within groups	62	ssa = 873.00		
Occasions × subjects within groups	186	sse = 152.17		
Total	256	sst = 2,867.90		

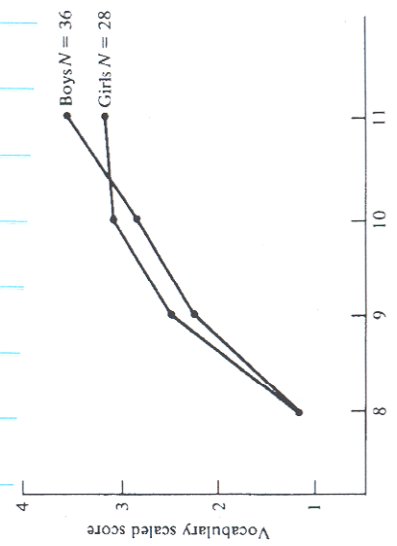


FIGURE 7.2-1
Average vocabulary scores of boys and girls in a cohort from the University of Chicago Laboratory School (longitudinal data).

Stat299 week 9 p. 2

Repeated Measures Brogan-Kutner ix p. 2

D. Rogosa

model

$$X_{ijk} = \mu + \alpha_i + \Pi_{k(i)} + \beta_j + \alpha\beta_{ij} + \beta\Pi_{jk(i)} + \epsilon_{m(ijk)} \quad (3.1)$$

$j = 1, 2$ (pretest = 1, posttest = 2),

$i = 1, 2$ (group 1 = 1, group 2 = 2),

$k = 1, 2, \ldots, n_i$, $m = 1$,

where X_{ijk} is the observed value of subject k within group i at time j,

μ is the overall mean,
α_i is the effect of group i,
$\Pi_{k(i)}$ is the effect of subject k nested within group i,
β_j is the effect of the repeated-measures variable j (*i.e.*, pretest and posttest),
$\alpha\beta_{ij}$ is the interaction of group i with level j of the repeated measures factor,

$\beta\Pi_{jk(i)}$ is the interaction of subject k within group i with level j of the repeated-measures factor.

2. Repeated-Measures Analysis of Variance for Maximal Rate of Urea Synthesis Level

Source of Variation	df	Sum of Squares	Mean Squares	F Ratio
Between Subjects	20 (n − 1)			
Groups	1	847.48	847.48 (MS_G)	3.63 (MS_G/MS_E)
Subjects Within Groups	19 (n − 2)	4440.00	233.68 (MS_E)	
Within Groups	21 (n)			
Pre/Post	1	317.69	317.69 (MS_P)	8.86 (MS_P/MS_{PE})
Groups x Pre/Post	1	407.41	407.4 (MS_{GP})	11.36 (MS_{GP}/MS_{PE})
(Pre/Post) x Subjects Within Groups	19 (n − 2)	681.21	35.85 (MS_{PE})	

Did the groups change differentially?

SAS or minitab does it

(R has problem w/ imbalance anova TBD /error

```
proc glm data=brogk;
class grp;
model m1--m2 = grp /nouni;
repeated Time 2 (1 2) / summary printe;
run;
```

OUTPUT (selected)

```
        The SAS System                    16:13 Tuesday, May 16, 2000   35

                              The GLM Procedure
                        Repeated Measures Analysis of Variance
                     Tests of Hypotheses for Between Subjects Effects

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

grp            1       847.476190       847.476190        3.63     0.0721
Error         19      4440.000000       233.684211

                              The GLM Procedure
                        Repeated Measures Analysis of Variance
                  Univariate Tests of Hypotheses for Within Subject Effects

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

Time             1      317.6932234      317.6932234        8.86     0.0078
Time*grp         1      407.4075092      407.4075092       11.36     0.0032
Error(Time)     19      681.2115385       35.8532389
```