E. MONKEY MEMORY EXAMPLE

SHORT- and LONG-TERM MEMORY SCORES

LONG-TERM MEMORY SCORE

SHORT-TERM MEMORY SCORE

CONTROL

BLOCKED
“cbind” means combine into a matrix. This command fits regressions of short and long on TREAT (separately).
Calculator work for computing the pooled estimate of correlation between short term and long term scores

```r
pooled.var.short <- sum(residuals.short^2)/16
pooled.var.long <- sum(residuals.long^2)/16
pooled.cov <- sum(residuals.short*residuals.long)
pooled.var.short
[1] 48.06209
pooled.var.long
[1] 44.39484
pooled.cov
[1] -3.534226
R <- pooled.cov/sqrt(pooled.var.short*pooled.var.long)
R
[1] -0.0765115
```
"MANOVA" = multivariate ANOVA
Response has 2 or more columns. Use regression formulas as usual.

Wilk’s Lambda for 2 groups is the same as Hotelling’s $T^2$. 
Calculator work for computing confidence intervals for short- and long-term effects

S-PLUS - [Commands]

> # Note from regression output above, short-term
> # effect = -17.1753 with SE 3.3519; and long-term
> # effect = .7143 with SE 3.2215
> n1 <- 7
> n2 <- 11
> multiplier <- sqrt(2*(n1+n2-2)*qf(.95,2,n1+n2-3)/(n1+n2-3))
> half.width.short <- multiplier*3.3519
> half.width.long <- multiplier*3.2215
> -17.1753-half.width.short
> -17.1753+half.width.short
[1] -7.780637
> .7143 - half.width.long
[1] -8.314879
> .7143 + half.width.long
[1] 9.743479
F. One-sample analysis with bivariate responses

1. Oat bran study, bivariate response for each subject:
   a. Component 1: cholesterol after high fiber diet minus baseline cholesterol
   b. Component 2: cholesterol after low fiber diet minus baseline cholesterol

2. Hypothesis: means of both components are zero

3. Hotelling’s $T^2_{stat} = \frac{t_1^2 + t_2^2 - 2rt_1t_2}{1 - r^2}$
   where $t_1$ and $t_2$ are the univariate t-statistics for testing, individually, the means of component 1 and 2 are zero; and $r$ is the sample correlation of components 1 and 2.
G. Main Points of Ch. 16

1. Definition of multivariate response and repeated measure

2. Strategies for repeated measures

3. Hotelling’s $T^2$ test for comparing 2 samples with multivariate responses (and confidence intervals)

4. Hotelling’s $T^2$ test for testing the mean of a single sample of multivariate responses (and confidence intervals)
IX. Review

Ch. 8: (1) Interpretation after log transformation of y, x, or both, (2) ANOVA F-tests for (a) lack-of-fit, overall significance of regression

Ch. 9: Multiple regression models; indicator variables, quadratic terms, interaction
Ch. 10: (1) Tests and CI’s for individual coefficients, (2) prediction intervals, (3) extra SS F-tests for hierarchical models (full and reduced models)

Ch. 11: A strategy for dealing with influential observations, case-influence statistics (Cook’s D, leverage, studentized residual)
Ch. 12: (1) Dealing with a large set of x’s when purpose is: prediction, adjustment, fishing for important variables (2) Sequential selection (stepwise) (3) Comparing all possible subsets (Cp, BIC, AIC)

Ch. 13: (1) Two-way tables, (2) randomized block design
Ch. 14: (1) Two-way tables with one observation per cell; (2) Higher-way tables

Ch. 15: Serial correlation: (1) partial autocorrelation function, (2) AR(1) model, (3) filtering transformation

Ch. 16: Multivariate responses, repeated measures, two-sample Hotelling’s $T^2$ test