

Two-Way ANOVA - Randomized Block Experiment

Prosthetic Device Example

Data represents number of days to learn device

<i>Learning Method (Treatment)</i>	<i>Age Category (Block)</i>		
Level	Young	Middle	Old
Method 1	$Y_{11}=19$	$Y_{12}=21$	$Y_{13}=29$
Method 2	$Y_{21}=14$	$Y_{22}=17$	$Y_{23}=28$
Method 3	$Y_{31}=21$	$Y_{32}=22$	$Y_{33}=31$

$$a=3, b=3, n=1, n_T = abn = 9$$

```
> pr=read.table("prosthetic.txt",header=TRUE)
> pr$Method=as.factor(pr$Method)
> pr
```

```
      Days Method  Age
1       19      1  Young
2       14      2  Young
3       21      3  Young
4       21      1 Middle
5       17      2 Middle
6       22      3 Middle
7       29      1   Old
8       28      2   Old
9       31      3   Old
```

```
> attach(pr)
> by(Days,list(Method),mean)
```

```
: 1
[1] 23
```

```
-----
: 2
[1] 19.66667
```

```
-----
: 3
[1] 24.66667
```

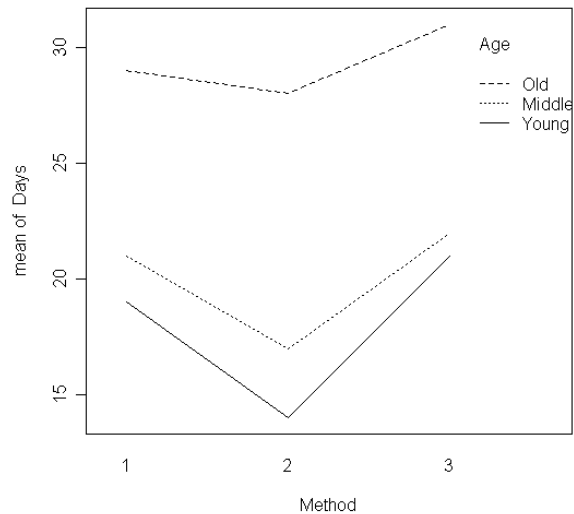
```
> by(Days,list(Age),mean)
```

```
: Middle
[1] 20
```

```
-----
: Old
[1] 29.33333
```

```
-----
: Young
[1] 18
```

```
> interaction.plot(Method, Age, Days)
```



```
> # 1 obs per cell, so can't use interaction term; notice R output:
```

```
> a=aov(Days~Method+Age+Method:Age)
```

```
> anova(a)
```

```
Analysis of Variance Table
```

```
Response: Days
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Method	2	38.889	19.444		
Age	2	219.556	109.778		
Method:Age	4	5.778	1.444		
Residuals	0	0.000			

```
> a=aov(Days~Method+Age) # no interaction term, as required
```

```
> anova(a)
```

```
Analysis of Variance Table
```

```
Response: Days
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Method	2	38.889	19.444	13.461	0.0167323 *
Age	2	219.556	109.778	76.000	0.0006575 ***
Residuals	4	5.778	1.444		

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
> TukeyHSD(a, "Method")
```

```
Tukey multiple comparisons of means  
95% family-wise confidence level
```

```
Fit: aov(formula = Days ~ Method + Age)
```

```
$Method
```

	diff	lwr	upr	p adj
2-1	-3.333333	-6.830700	0.1640329	0.0579344
3-1	1.666667	-1.830700	5.1640329	0.3116520
3-2	5.000000	1.502634	8.4973663	0.0152812