

EPRS8540

One-Way ANOVA vs. Two-Way ANOVA

One-Way ANOVA

	Treatment (TRT)			
	X	Y	Z	
	12,16,17	13,9,8	14,15,13	
	6,10,8	11,8,8	12,10,8	
mean	11.5	9.5	12	grand mean = 11

ANOVA Table (in general)

Source	SS	df	MS	F
Between (TRT)	SS_b	$k-1$	MS_b	$MS_b/MS_w \Leftarrow$ TRT effect
Within	SS_w	$N-k$	MS_w	
Total	SS_t	$N-1$		

Critical Value $F_{\alpha, k-1, N-k}$

ANOVA Table (for this case)

Source	SS	df	MS	F
Between (TRT)	21	2	10.50	1.04 $\Leftarrow H_0: \mu_X = \mu_Y = \mu_Z$
Within	151	15	10.07	
Total	172	17		

Critical Value $F_{.05, 2, 15} = 3.68$

Two-Way ANOVA

	Treatment (TRT)			
	X	Y	Z	row mean
Male	12,16,17 cell mean = 15	13,9,8 cell mean = 10	14,15,13 cell mean = 14	13
Female	6,10,8 cell mean = 8	11,8,8 cell mean = 9	12,10,8 cell mean = 10	9
column mean	11.5	9.5	12	grand mean = 11

ANOVA Table (in general)

Source	SS	df	MS	F
Sex (Factor A)	SS_A	$I-1$	MS_A	$MS_A/MS_w \leftarrow$ Main effect A
TRT (Factor B)	SS_B	$J-1$	MS_B	$MS_B/MS_w \leftarrow$ Main effect B
Sex*TRT (A*B)	SS_{AB}	$(I-1)(J-1)$	MS_{AB}	$MS_{AB}/MS_w \leftarrow$ Interaction
Within (Error)	SS_w	$N-IJ$	MS_w	
Total	SS_T	$N-1$		

Critical Value for Main Eeffect A $F_{\alpha, k-1, N - IJ}$
 Critical Value for Main Eeffect B $F_{\alpha, J-1, N - IJ}$
 Critical Value for Main Eeffect AB $F_{\alpha, (I-1)(J-1), N - IJ}$

ANOVA Table (for this case)

Source	SS	df	MS	F
Sex (Factor A)	72	1	72.00	$16.62^* \leftarrow H_0: \mu_M = \mu_F$
TRT (Factor B)	21	2	10.50	$2.42 \leftarrow H_0: \mu_X = \mu_Y = \mu_Z$
Sex*TRT (A*B)	27	2	13.50	$3.12 \leftarrow H_0: \text{no interaction}$
Within (Error)	52	12	4.33	
Total	172	17		

Critical Value for Main Eeffect A $F_{.05, 1, 12} = 4.75$
 Critical Value for Main Eeffect B $F_{.05, 2, 12} = 3.89$
 Critical Value for Main Eeffect AB $F_{.05, 2, 12} = 3.89$