

SINGLE FACTOR EXPERIMENT

(Multiple conditions of one independent variable - 3 or more groups)
Post Test Control Group Design

Control Condition	R ₁		O ₁
Experimental Cond. #1	R ₂	X ₁	O ₂
Experimental Cond. #2	R ₃	X ₂	O ₃

Example - Festinger's Cognitive Dissonance Experiment
The Effects of Payment on Task Satisfaction

(C) \$0.00	(E ₁) \$10.00	(E ₂) \$1.00	
#1 0	#5 1	#09 5	
#2 2	#6 3	#10 7	
#3 2	#7 3	#11 7	
#4 4	#8 5	#12 9	
Mean _C = 2	Mean _{E1} = 3	Mean _{E2} = 7	Grand Mean = 4

Analyse by ANOVA - Analysis of Variance

ANOVA implies we divide the variation among the independent variable (treatment) conditions by the "leftover" (residual) variation to form an F-ratio. Therefore an F-ratio = the treatment variation / the residual variation. One treatment implies there is only one F-ratio.

The F-ratio = treatment (Between column) variance / residual (Within column) variance
(Remember the variance = the Sum of Squares (SS) / degrees of freedom (df))

The Between column SS = $4(2-4)^2 + 4(3-4)^2 + 4(7-4)^2 = 16 + 4 + 36 = 56$

The Between column df = number of columns - 1 = 2

Therefore, the Between column variance = Bet SS / Bet df = $56/2 = 28$.

The Within column SS = $(0-2)^2 + (2-2)^2 + (2-2)^2 + (4-2)^2 + (1-3)^2 + (3-3)^2 + (3-3)^2 + (5-3)^2 + (5-7)^2 + (7-7)^2 + (7-7)^2 + (9-7)^2 = 4 + 0 + 0 + 4 + 4 + 0 + 0 + 4 + 4 + 0 + 0 + 4 = 24$

The Within column df = N - the number of columns = $12 - 3 = 9$.

Therefore, the Within column variance = W/in SS / W/in df = $24 / 9 = 2.67$

Source of Var	SS	df	Var	F-value
Treatment	56	2	28	10.49
Residual	24	9	2.67	