

Scientists observed the activity of 31 adult rhesus monkeys, aged 5 to 27 years old. The animals were divided into three groups: young adults, 5 to 8 years old ($n = 10$), middle-aged adults, 12 to 17 years old ($n = 10$), and aged adults, 21 to 27 years old ($n = 11$). The daily home-cage activity, measured over a 30 day observation period by the average number of times per hour the animal moved in its cage across an infrared beam, had these summary statistics (mean \pm SD) by group: young (132 ± 16), middle-aged (56 ± 10), and aged (50 ± 13). Also, $SS(\text{between}) = 42,619.36$ and $SS(\text{within}) = 4894$.

- (a) State null and alternative hypotheses for a test of whether or not the population mean activity is the same in each age group of rhesus monkey.

Solution: The null hypothesis is that population mean activity is the same for all the adult monkey age groups. The alternative hypothesis is that they are not all the same. In symbols, let μ_1 , μ_2 , and μ_3 be the three population means for the young adult, middle-aged adult, and aged adult populations.

$$H_0: \mu_1 = \mu_2 = \mu_3$$

H_A : the μ_i are not all equal.

- (b) Construct an ANOVA table and compute the F test statistic.

Solution:

Source	df	SS	MS	F
between	2	42619.36	21309.68	121.92
within	28	4894	174.79	
total	30	47513.36		

- (c) The p -value of the test is extremely small, much smaller than 0.0001. Interpret the result in the context of the problem.

Solution: There is very strong evidence that adult rhesus monkeys of different ages have different levels of physical activities as measured under the experimental conditions ($p < 0.0001$, F test, one-way ANOVA).