Unbalanced ANOVA Report

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Outcome: G3
Primary factor: studytime
Secondary factor: school

Minimum group n: 35
Maximum group n: 305
Imbalance ratio max/min: 8.714

Type I order sensitivity is shown because base R uses sequential sums of squares.
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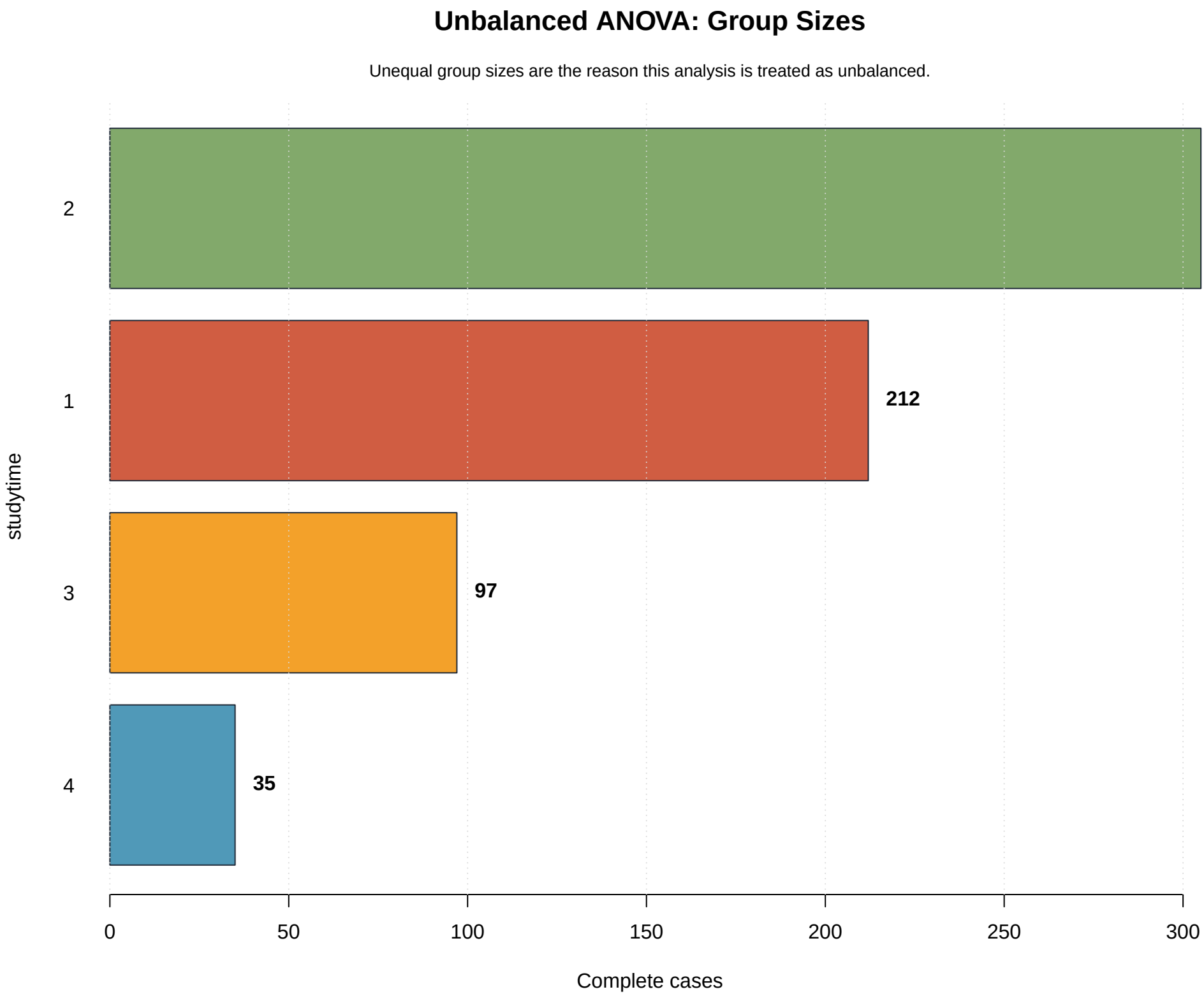
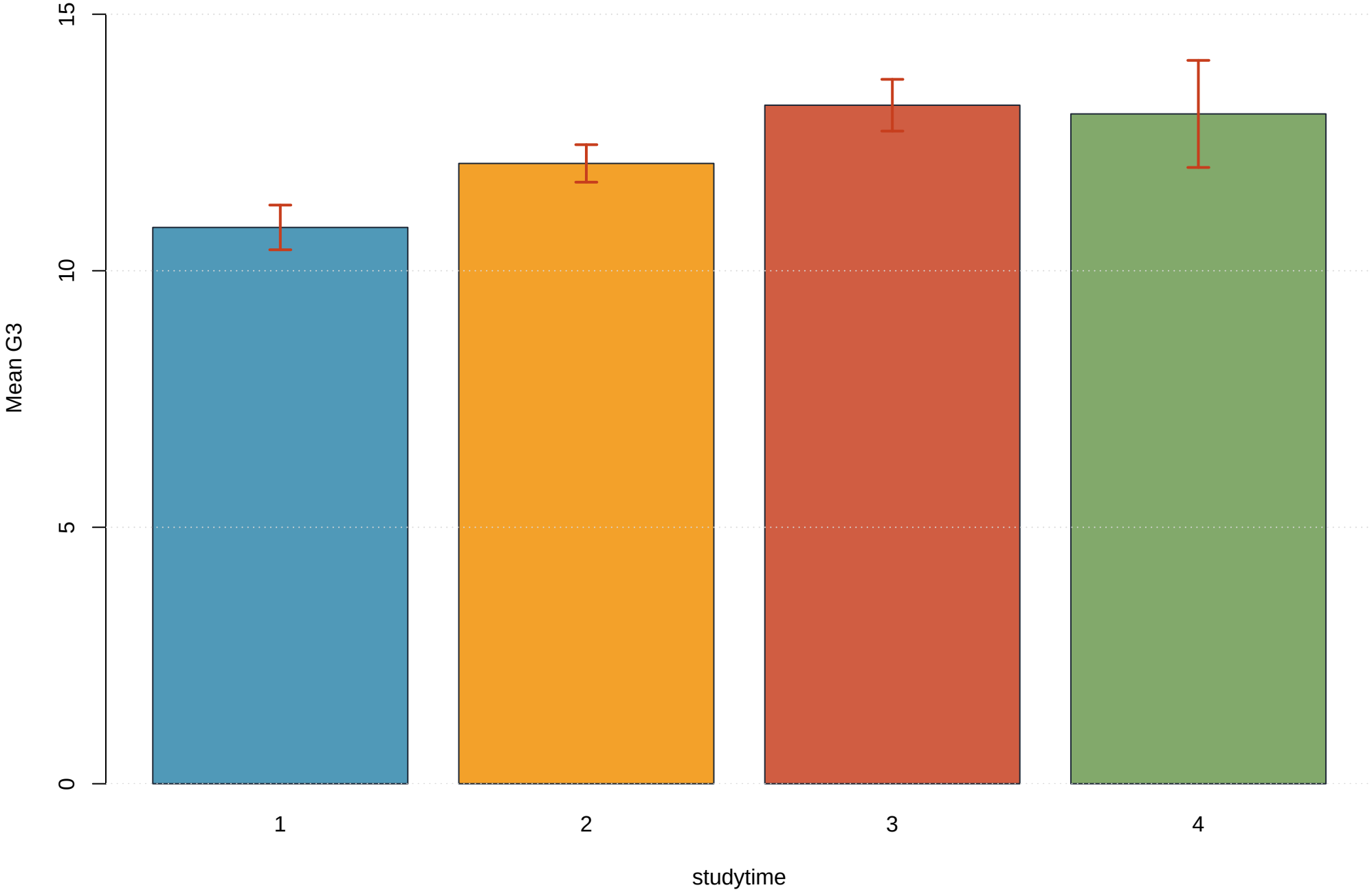

Unbalanced ANOVA: Group Sizes
Unequal group sizes are the reason this analysis is treated as unbalanced.
studytime
2
1
3
4
212
97
35
0
50
100
150
200
250
300
Complete cases

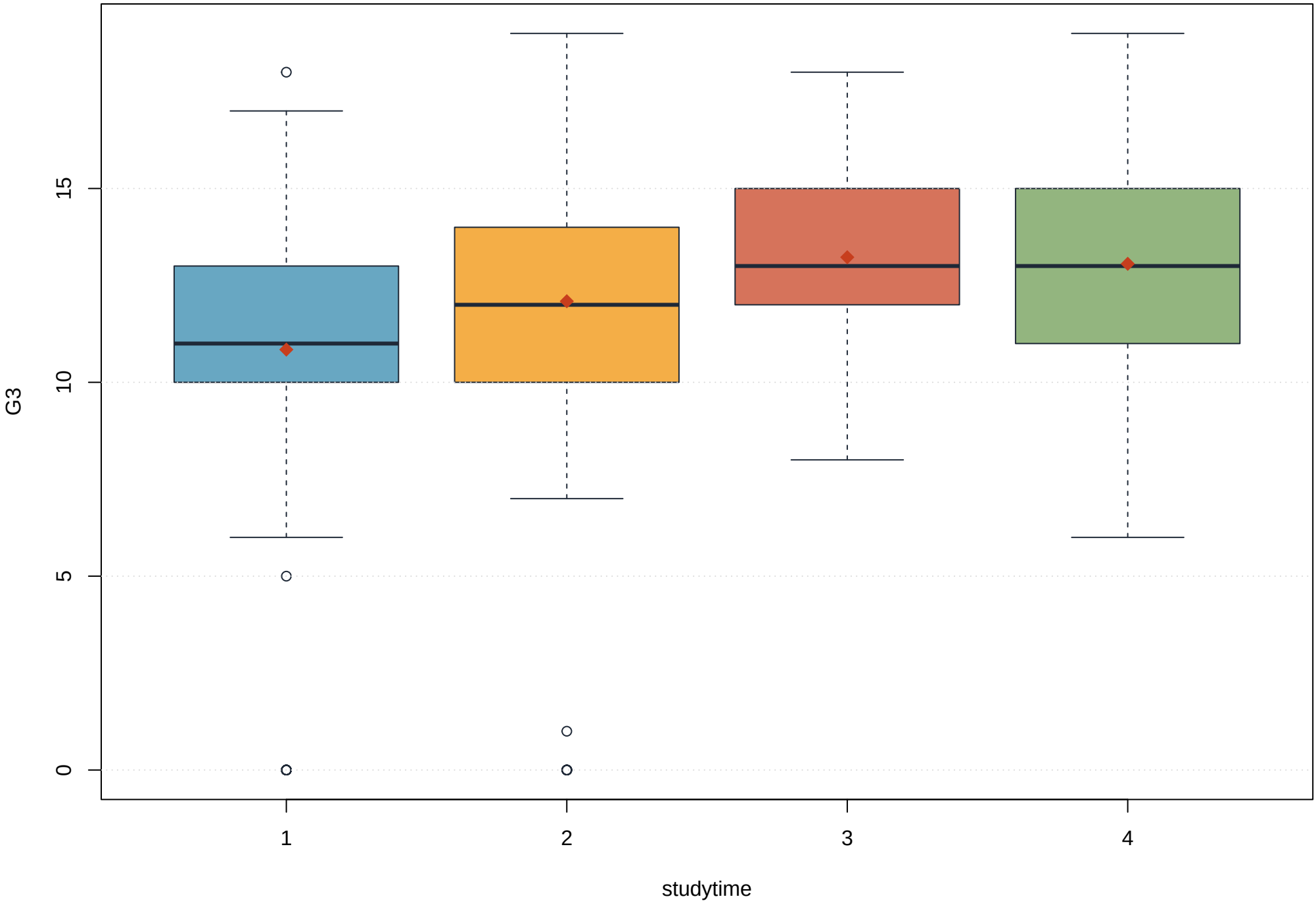
Mean G3 by studytime

Bars show means with 95% confidence intervals despite unequal group sizes.



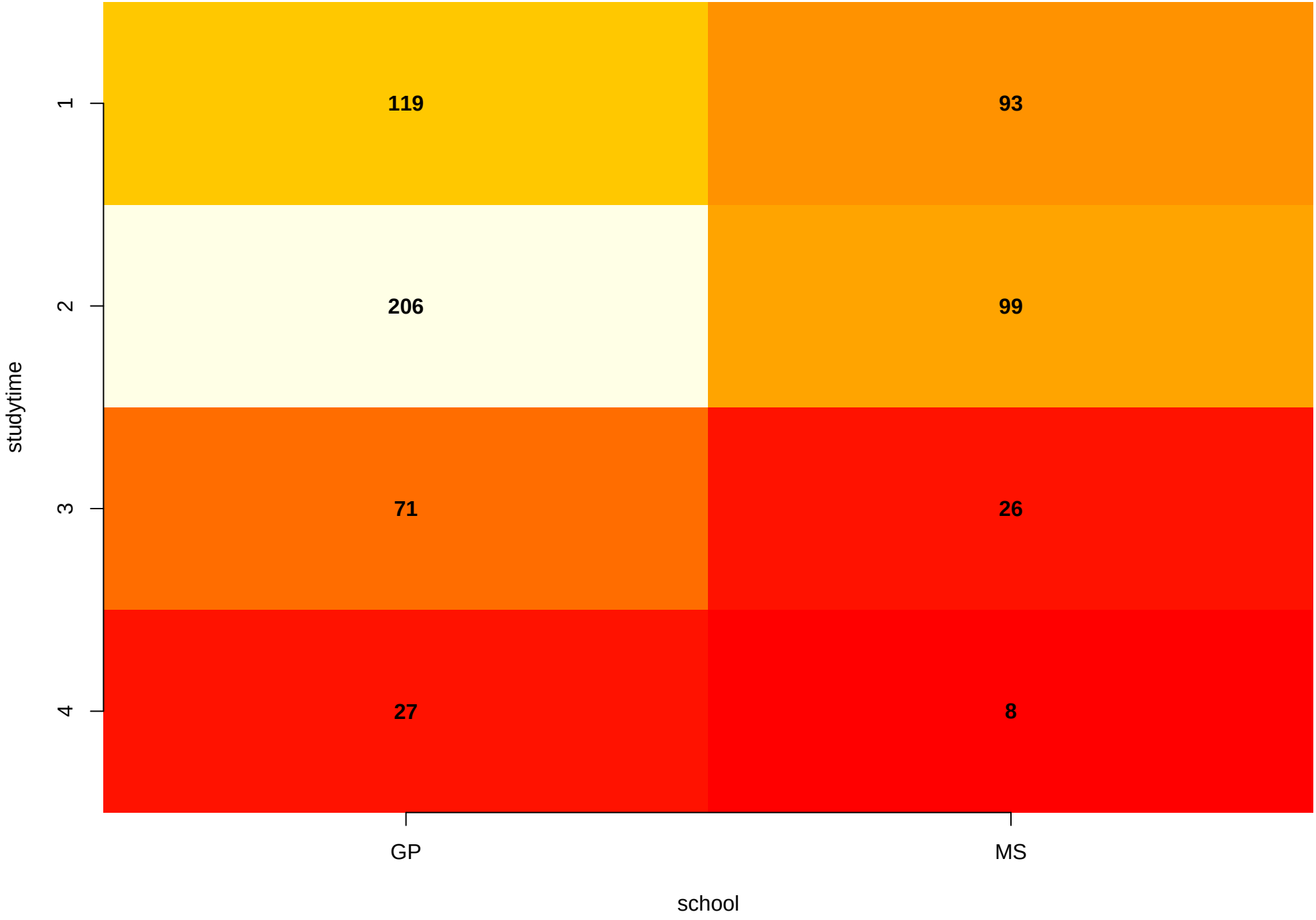
Distribution of G3 by studytime

Colorful boxplots show spread, median, mean marker, and possible outliers.



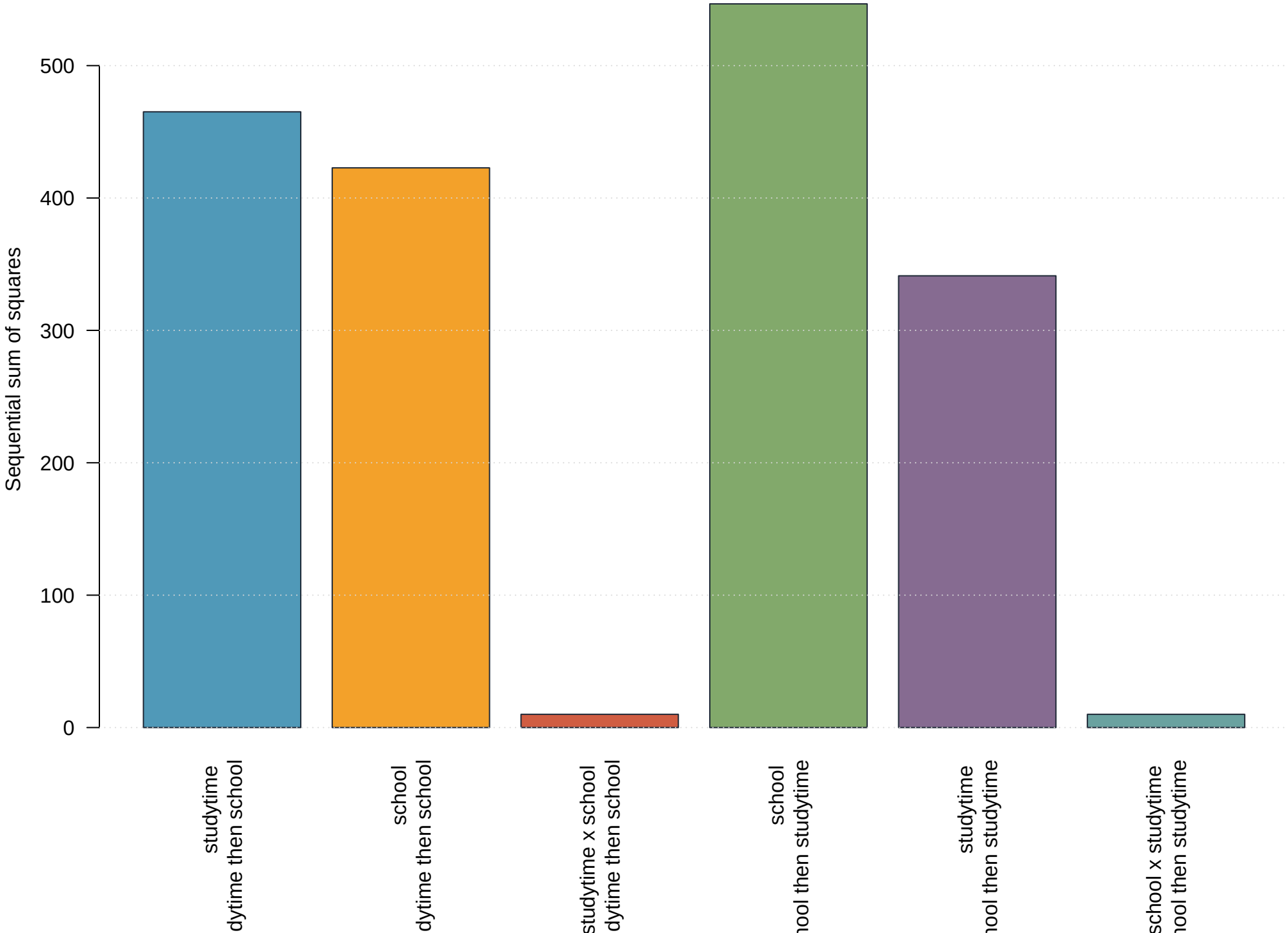
Unbalanced ANOVA: Cell Size Heatmap

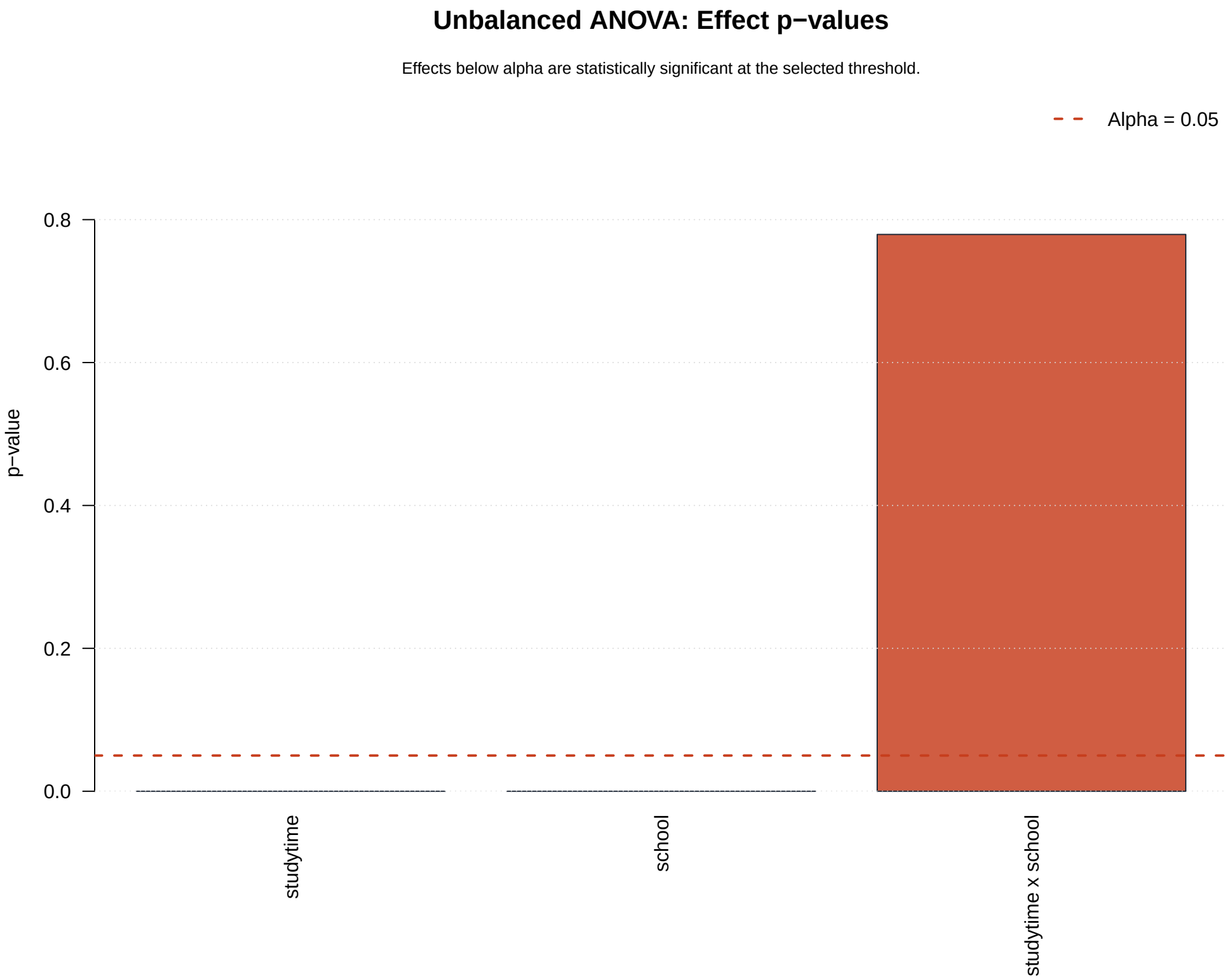
The heatmap shows which factor combinations have more or fewer observations.



Type I Order Sensitivity in Unbalanced ANOVA

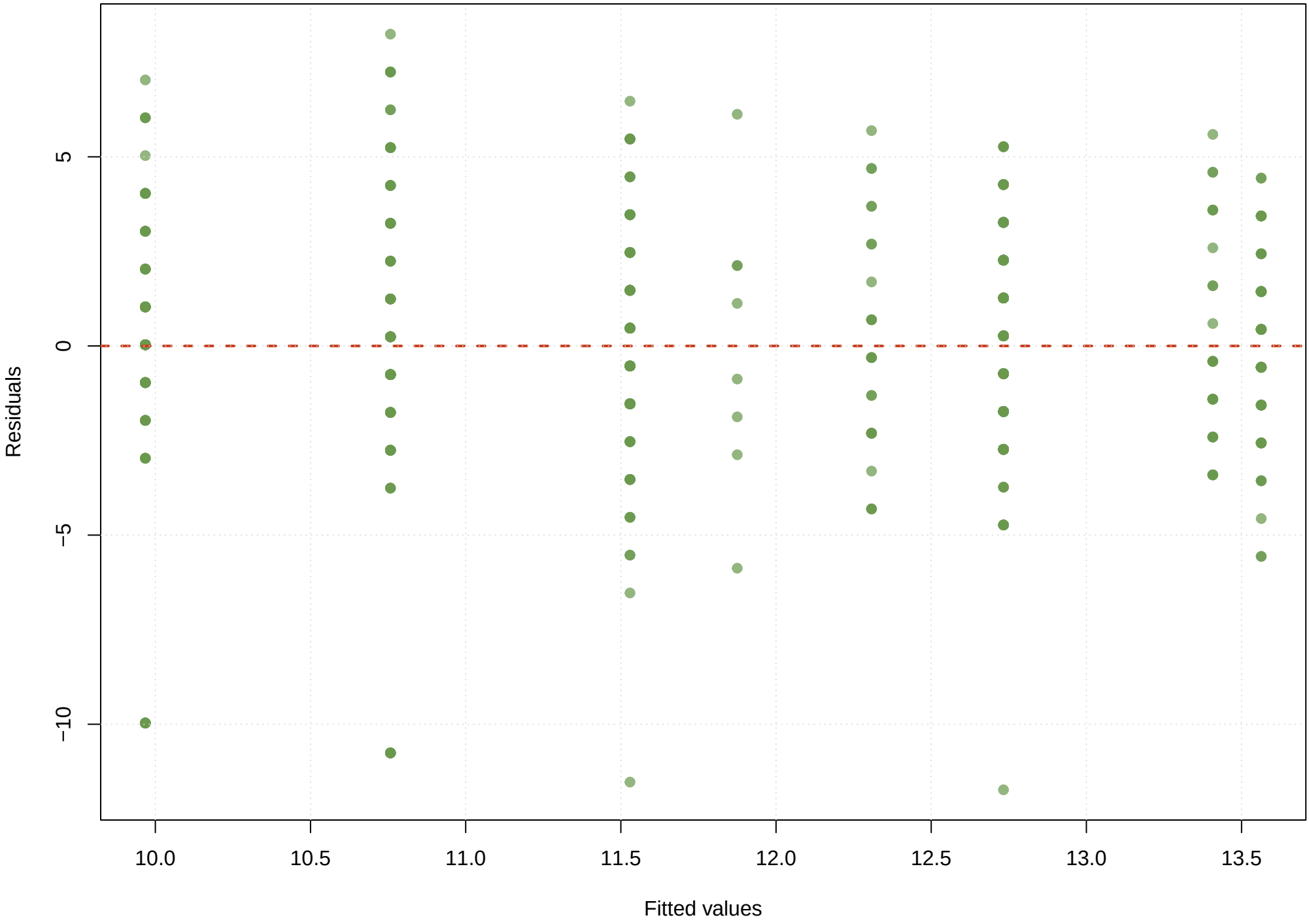
Sequential sums of squares can change when factor order changes.




Unbalanced ANOVA: Effect p−values
Effects below alpha are statistically significant at the selected threshold.
Alpha = 0.05
p−value
0.0
0.2
0.4
0.6
0.8
studytime
school
studytime x school

Residuals vs Fitted Values

A random pattern around zero supports ANOVA model interpretation.



Unbalanced ANOVA Result Summary

Group−size imbalance ratio max/min = 8.71.

Effect	df	F	p	Partial eta squared	Label	Decision
studytime	3	16.94	1.337e−10	0.0735	Medium	Reject H0
school	1	46.2	2.445e−11	0.0672	Medium	Reject H0
studytime x school	3	0.3636	0.7793	0.0017	Very small	Fail to reject H0