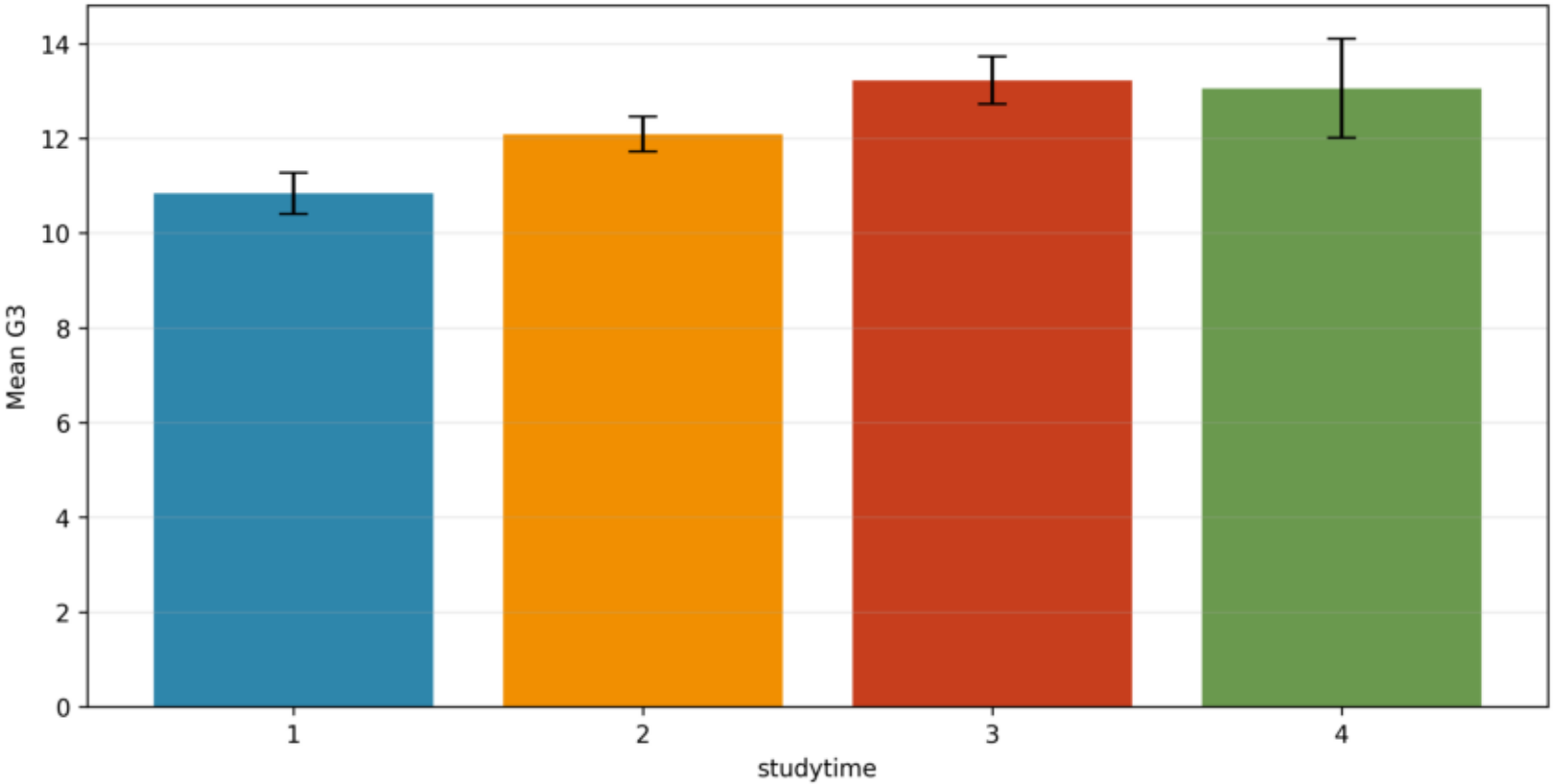
```
Welch's ANOVA Report
====================

Outcome: G3
Factor: studytime
n = 649, groups = 4

Welch F(3, 139.1006) = 18.182877
p-value = 0.00000000
Decision: Reject equal group means

Brown-Forsythe/Levene p-value: 0.38035752
Variance decision: No strong variance difference detected

Welch's ANOVA is used when variances and/or group sizes are unequal.
```

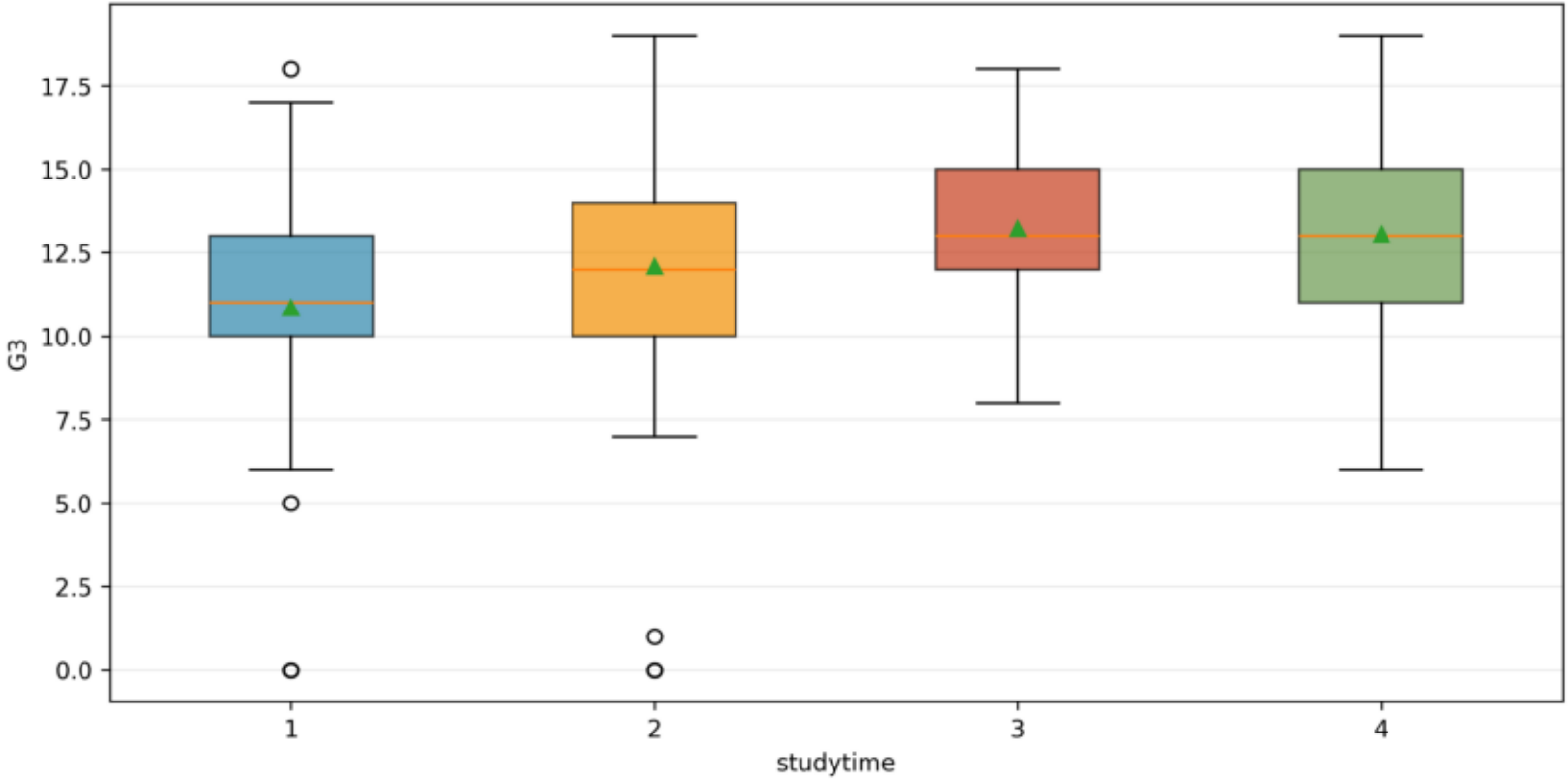
Welch's ANOVA: Group Means with 95% Confidence Intervals

Welch's ANOVA compares group means without assuming equal variances.



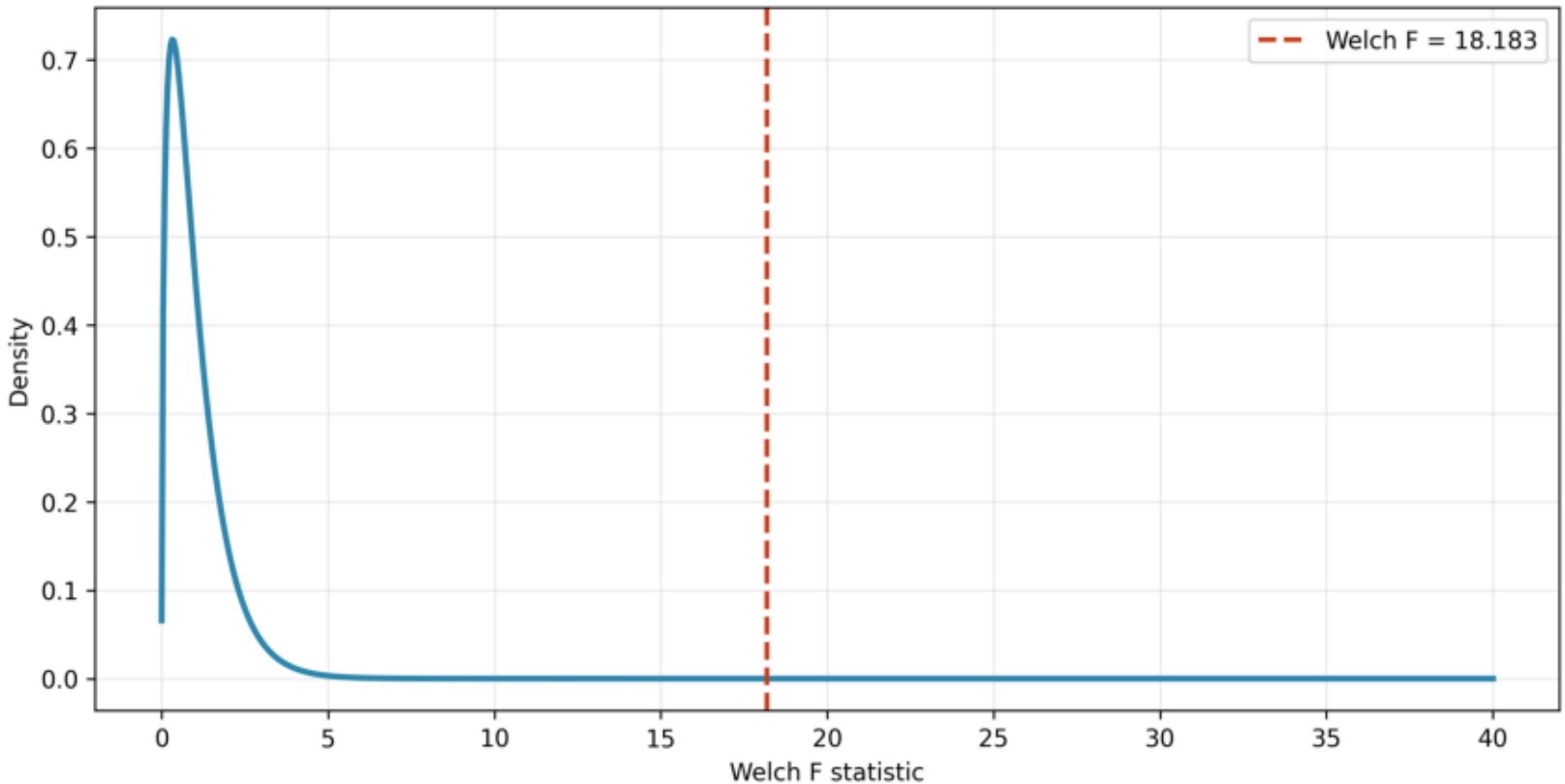
Welch's ANOVA: Distribution by Group

Boxplots show spread, median, mean marker, and possible outliers.



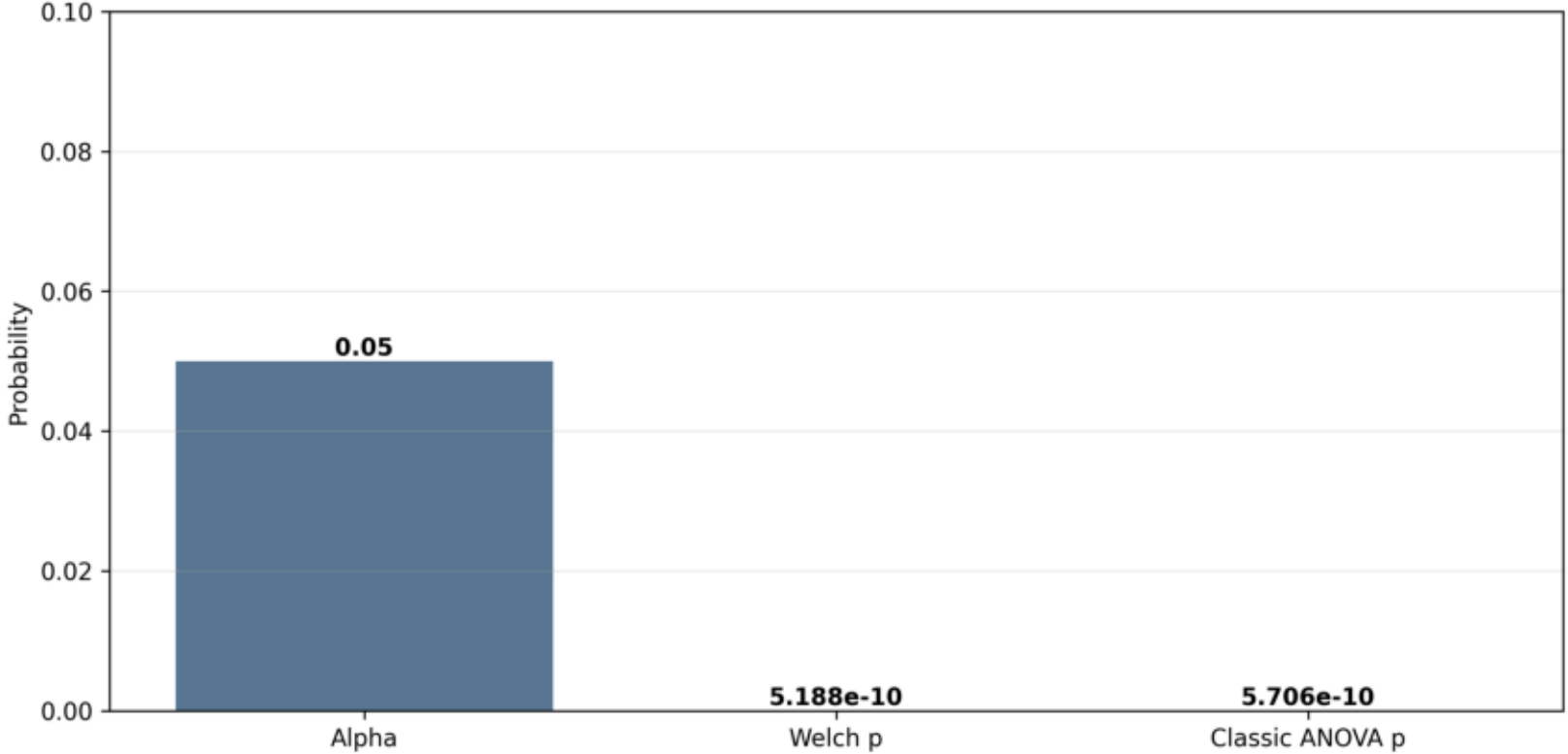
Welch's ANOVA: Observed Statistic on F Distribution

Right-tail p-value = 5.188e-10; df1 = 3, df2 = 139.10.



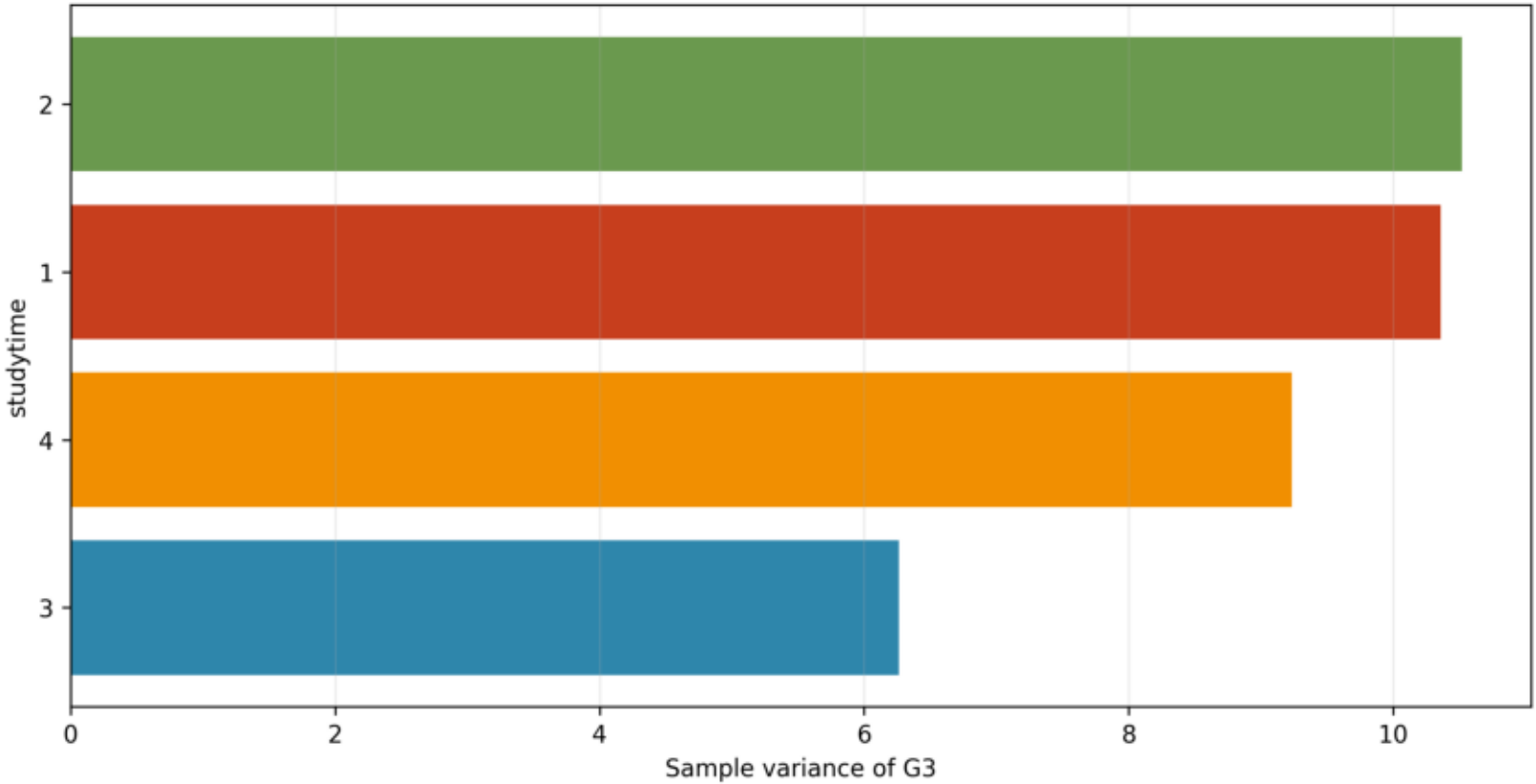
Welch's ANOVA: p-value Decision

Use the Welch p-value when variances or group sizes are unequal.



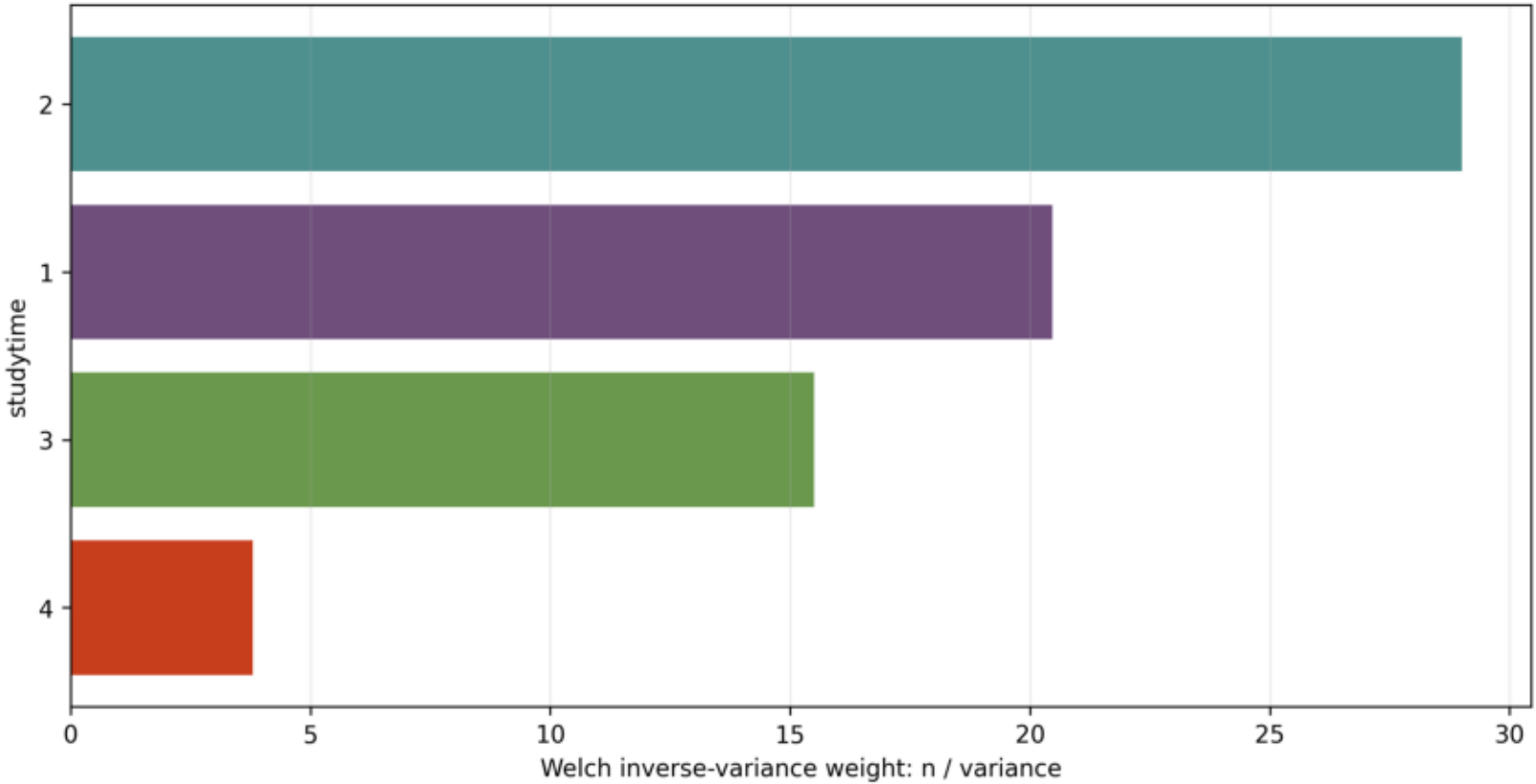
Variance Context by Group

Brown-Forsythe/Levene p = 0.3804; unequal variance supports Welch's ANOVA.



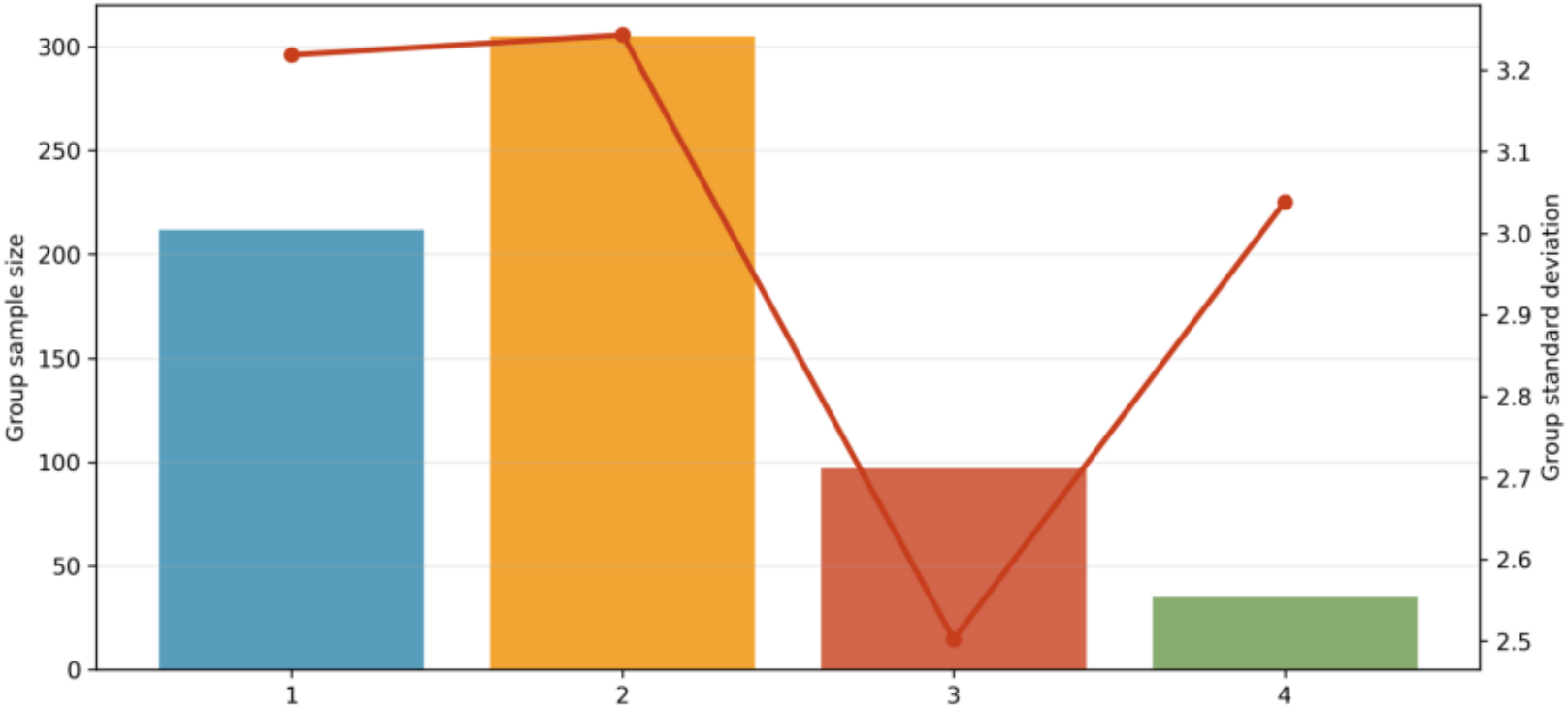
Welch's ANOVA: Group Weights

Groups with lower variance and larger n contribute more weight to Welch's adjusted test.



Welch's ANOVA: Group Size and Standard Deviation

Welch's ANOVA adjusts for unequal group sizes and unequal standard deviations.



Welch's ANOVA Summary Table

Welch $F(3, 139.10) = 18.183$, $p = 5.188e-10$; Reject equal group means

Group	n	Mean	SD	Variance	Welch weight
1	212	10.8	3.22	10.4	20.5
2	305	12.1	3.24	10.5	29
3	97	13.2	2.5	6.26	15.5
4	35	13.1	3.04	9.23	3.79