I conducted a study examining the relationship between study habits and exam performance in my Statistics class. The experiment involved tracking 200 students' preferred study methods (solo studying, group studying, or mixed approach) and their final exam grades (pass or fail).

This experiment perfectly fits the conditions for a chi-square test of homogeneity. Firstly, I have categorical variables - study habits and exam outcomes. Each observation falls into exactly one category for each variable, creating mutually exclusive groups (Bluman, 2017). The data represents the numbers of students, meeting the requirement for frequency data. Additionally, each expected frequency exceeds 5, satisfying another crucial condition for valid chi-square analysis.

The independence assumption is met since each student was counted only once, and their choice of study method didn't influence other students' choices or outcomes. The random sampling condition is satisfying as students freely choose their study methods without any interference, representing typical student behaviors in a university setting.

According to McHugh (2013), the chi-square test for homogeneity will reject the null hypothesis when the calculated chi-square statistic exceeds the critical value at our chosen significance level ($\alpha = 0.05$). In my experiment's context, rejecting Ho would indicate that the distribution of exam outcomes (pass/fail) differs significantly across study methods.

For instance, if the p-value is less than 0.05, I would reject Ho and conclude there's sufficient evidence to suggest that exam performance depends on study habits. This could reveal whether certain study methods are associated with higher pass rates, though causation couldn't be claimed.

If the calculated chi-square value is 12.5 with 2 degrees of freedom ((rows-1)(columns-1) = (3-1)(2-1) = 2), compared to the critical value of 5.991, we would reject Ho. This would suggest that study habits and exam performance aren't independent, potentially highlighting the effectiveness of certain study approaches over others.

References:

Bluman, A. G. (2017). *Elementary statistics: A step-by-step approach* (9th ed.). McGraw Hill. https://www.amazon.com/Elementary-Statistics-Step-Approach/dp/1259755339

McHugh, M. L. (2013). The Chi-square test of independence. *Biochemia Medica*, 143–149. https://doi.org/10.11613/bm.2013.018