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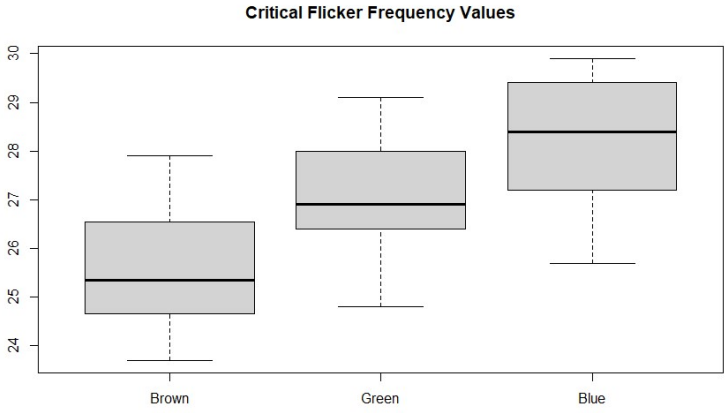
DATA PROJECT 6: CH 10 QUESTION 42

This data set is based on the effects of iris color on the critical flicker frequency (cff), in cycles/sec. The critical flicker frequency is the highest frequency at which a person can detect the flicker in a flickering light source. At frequencies above the cff, the light source appears to be continuous even though it is actually flickering. The iris is a prominent area in the eye of non-photosensitive pigmentation. The light-absorbing characteristics of the eye are affected by the amount of non-photosensitive pigment present. Several studies have indicated that visual sensitivity is a function of the extent of the iris and/or retinal pigmentation at some wavelength. Furthermore, there is unpublished evidence that suggests that cff may also be affected by the amount of non-photosensitive pigmentation present. This experiment was designed to determine whether a relationship exists between cff and iris colour. This information would be important in fields such as ophthalmology, clinical neurology, neurophysiology, and so on.



The boxplot shows that the median for the cff of the green iris colour group is between the medians for the brown and blue iris colour groups. The article suggests that if the cff sensitivity is linearly related to the pigmentation of the iris and/or its correlates, then the threshold (median) of the green iris colour group should be in between the brown and blue iris colour groups.

Now we do the ANOVA (Analysis of Variance). The largest sample standard deviation is equal than 1.19 times the smallest sample standard deviation. Hence, we can say that we have sufficient evidence to conclude that the population standard deviations are equal. Using the quantile-quantile plots, we can say that the population is normally distributed. The samples are independent, too, and we are done with the assumptions.
Now, the **null hypothesis** is that all the population means, that is, the true mean cff for brown, green and blue iris colour groups are equal. The **alternate hypothesis** is that at least one of the true mean cff differs from at least one other. Through RStudio, we find that the **p value** for the ANOVA test is 0.0175. Therefore, we can say we have **strong evidence** to support the claim that true mean cff of one of the iris colour groups differs from at least one other iris colour group.
Using the "post hoc" pairwise testing using the Bonferroni p value adjustment method, we notice the following p values when comparing two groups:

	Blue	**Brown**
Brown	0.025	N/A
Green	0.817	0.413

So, the probability that the true mean for blue and brown iris colour groups being equal is 0.025. The **null hypothesis** was that the true means were equal and the **alternate hypothesis** was that the true means were different. So now we can say that the true mean for the blue iris colour group is different from the brown iris colour group, which completes our analysis and confirms that the conclusion we drew was true and there was no type 1 error.

James M. Smith & Henryk Misiak (1973) The Effect of Iris Color on Critical Flicker Frequency (Cff), The Journal of General Psychology, 89:1, 91-95, DOI: 10.1080/00221309.1973.9710821
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