

## **This is the relationship between the valence categories of Spotify's most popular songs...**

My first hypothesis test is about the valence means for all the popular songs on Spotify. My null hypothesis was that valence means for each category have no difference. My alternative hypothesis was that the valence mean for the higher valence category is greater than the valence mean for the lowest valence category. The significance level for this hypothesis was 0.05. I conducted a permutation test for this hypothesis set three times (for Low and Medium, Medium and High, and Low and High). I got a p-value of 0 for all of these permutations, which indicates strong evidence against the null hypothesis and that it occurs very unlikely by chance.

## **There was a close call between the popular songs of 2016 vs 2017...**

For my second hypothesis, I decided to analyze the relationship between popular songs of 2016 vs popular songs of 2017. The null hypothesis was that the mean popularity of R&B songs was the same as the mean popularity of metal songs. The alternative hypothesis was that the mean popularity of R&B songs is different from the mean popularity of metal songs. The significance level I used for this test was 0.05. I conducted a z-test on this null and alternative hypothesis. I got a p-value of 0.026, which satisfies the close call conditions and barely rejects the null hypothesis. This indicates strong evidence that the mean popularity of R&B songs is different from the mean popularity of metal songs.

## **The difference in mean energy level based on the popularity level of songs is nonexistent!**

For my last hypothesis, I decided to analyze the relationship between energy and popularity of songs. My null hypothesis was that the mean energy of the more popular songs was the same as the mean energy of the less popular songs. My alternative hypothesis was that the mean energy of the more popular songs is different from the mean energy of the less popular songs. My significance level was 0.05. I used a permutation test for this hypothesis test. My p-value was 0.65. This is much greater than the significance level, which means we fail to reject the null hypothesis. This means that there is not convincing evidence that the true mean

energy of the more popular songs is different from the true mean energy of the less popular songs.

## Narrow Query

**M:** `mean(songs_normalize$popularity) = 59.875`

**M<sub>0</sub>:** `mean(songs_normalize[songs_normalize$explicit == 'TRUE' & songs_normalize$artist == 'Britney Spears', ]$popularity) = 0`

`59.875 > 2 * 0`

`59.875 > 0`