

## 10.9: What's the Difference Between McNemar and Independence?

Let's go all the way back to the beginning of the chapter, and look at the `cards` data set again. If you recall, the actual experimental design that I described involved people making *two* choices. Because we have information about the first choice and the second choice that everyone made, we can construct the following contingency table that cross-tabulates the first choice against the second choice.

```
cardChoices <- xtabs( ~ choice_1 + choice_2, data = cards )
cardChoices
```

```
##           choice_2
## choice_1  clubs diamonds hearts spades
##   clubs      10        9     10      6
##   diamonds   20        4     13     14
##   hearts     20       18      3     23
##   spades     18       13     15      4
```

Suppose I wanted to know whether the choice you make the second time is dependent on the choice you made the first time. This is where a test of independence is useful, and what we're trying to do is see if there's some relationship between the rows and columns of this table. Here's the result:

```
chisq.test( cardChoices )
```

Alternatively, suppose I wanted to know if *on average*, the frequencies of suit choices were different the second time than the first time. In that situation, what I'm really trying to see is if the row totals in `cardChoices` (i.e., the frequencies for `choice_1`) are different from the column totals (i.e., the frequencies for `choice_2`). That's when you use the McNemar test:

```
mcnemar.test( cardChoices )
```

```
##
## McNemar's Chi-squared test
##
## data:  cardChoices
## McNemar's chi-squared = 16.033, df = 6, p-value = 0.01358
```

Notice that the results are different! These aren't the same test.

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