A group of people were asked to what degree they agree or disagree with a statement at two time points.

```
Agreement <- matrix(c(794, 150, 86,
                      12, 888, 34,
                     570, 333, 23), nrow = 3,
                    dimnames = list(Before = c("Agree", "Meh",
"Disagree"),
                                    After = c("Agree", "Meh",
"Disagree")))
```

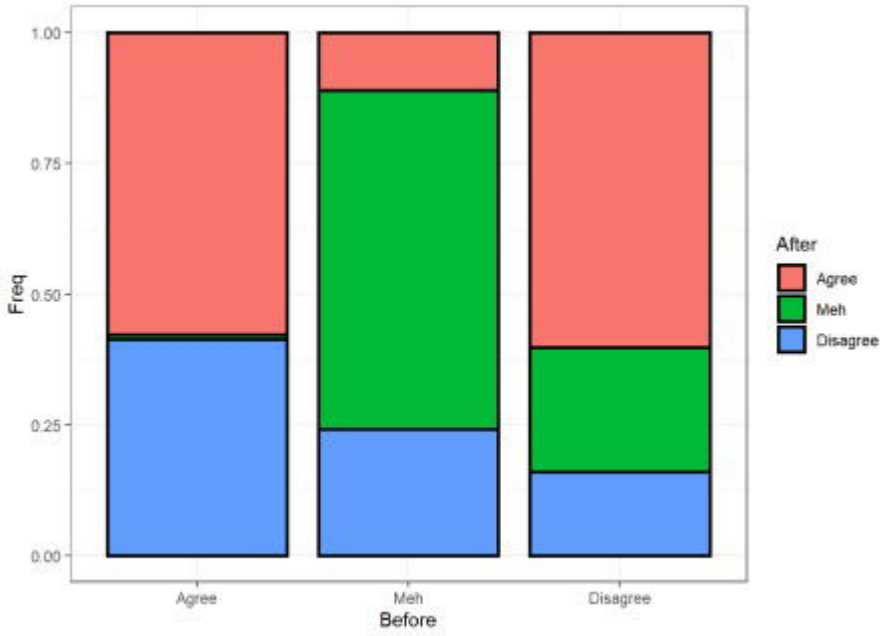
Our question is how many people changed their minds. Statistically we might use `mcnemar.test()` and `effectsize::cohens_g()`, but we will be focusing on visualization of the data with `ggplot2`.

We first need to re-structure this matrix into a data frame:

```
(Agreement_df <- as.data.frame(as.table(Agreement)))
#>     Before    After Freq
#> 1    Agree    Agree  794
#> 2      Meh    Agree  150
#> 3 Disagree    Agree   86
#> 4    Agree      Meh   12
#> 5      Meh      Meh  888
#> 6 Disagree      Meh   34
#> 7    Agree Disagree  570
#> 8      Meh Disagree  333
#> 9 Disagree Disagree   23
```

The basic plot is:

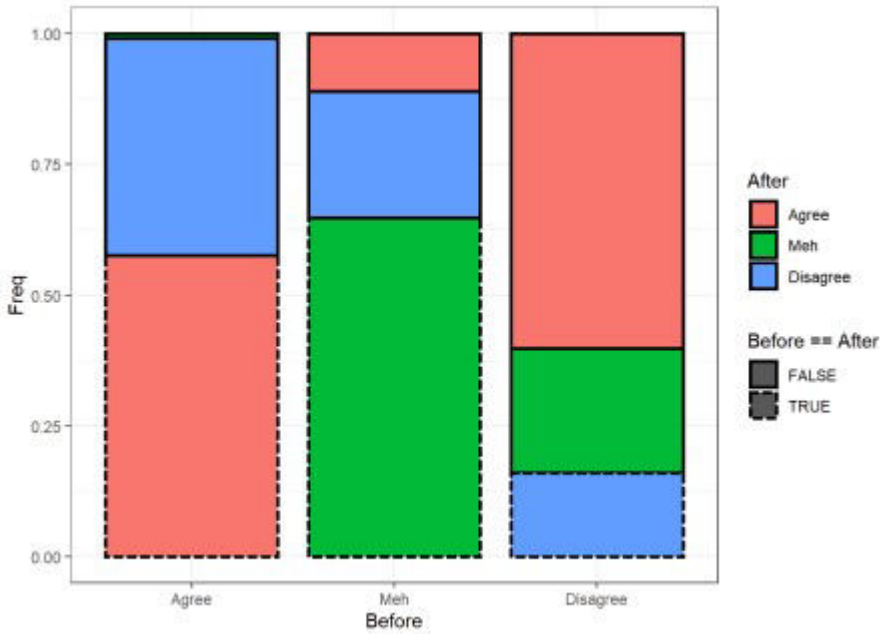
```
library(ggplot2)
theme_set(theme_bw())

ggplot(Agreement_df, aes(Before, Freq, fill = After)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1
  )
```



Simple enough.

What we want to do is mark the cells where people did not change their response - where `Before` is equal to `After` - with a different line type. We can do this by adding `linetype = Before == After` into the plots aesthetics. This *should* give diagonal cells a different line-type compared to the other cells. Simple enough, no?

```
ggplot(Agreement_df, aes(Before, Freq, fill = After)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1,
    mapping = aes(linetype = Before == After) #<<<<<<<<<<
  )
```



What the hell happened?? The ***order*** of cells has changed!

Grouping & Order of Mapping

The first thing to understand is that we have some implicit grouping going on.

> The group aesthetic is by default set to the interaction of all discrete variables in the plot. […] For most applications the grouping is set implicitly by mapping one or more discrete variables to `x`, `y`, `colour`, `fill`, `alpha`, `shape`, `size`, and/or `linetype`.

*From the `ggplot2` manual on **Aesthetics: grouping***

This means that our mapping of `fill` and `linetype` has been used to set the `group`ing of the cells.

The second thing to understand is the *order* in which these `group`ing aesthetics are used for grouping:

- First, the layer-specific aesthetics are used (in our case, `linetype = Before == After`, which is in the `geom_col()` layer).
- Then (if `inherit.aes = TRUE`, which is the default) any global aesthetics are used (`fill = After`, which is set in the call to `ggplot()`).

This is why the order of the cells has changed: Cells were grouped first by the before-after equality, and only then by the type of "after" response.

The Fix

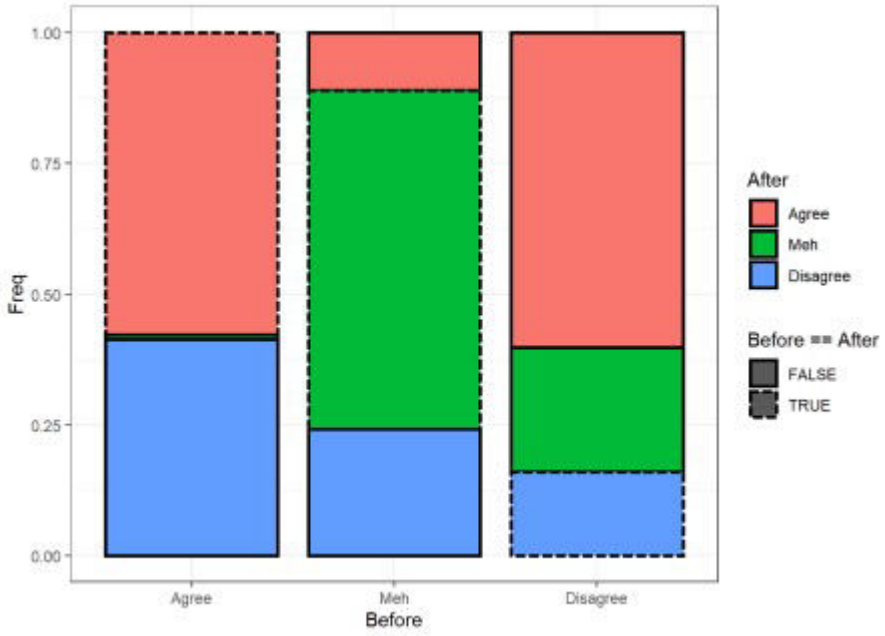
The fix is easy, we have to make sure the grouping aesthetics are specified in a way that `ggplot` pulls them in the correct order; that is first by "after" and then by the before-after equality.

Here are all the ways to do that:

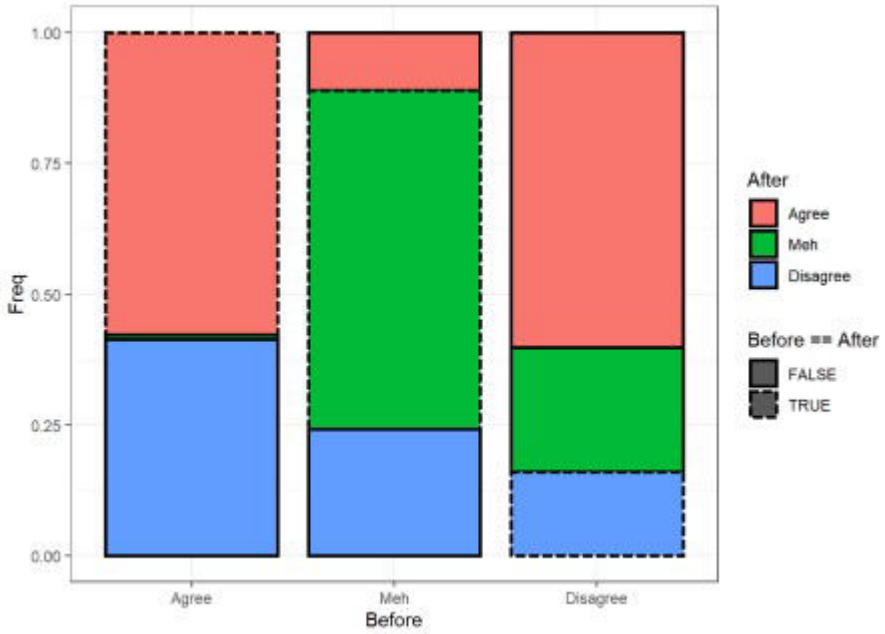
Option 1: Be Explicit

We can explicitly set the `group` aesthetic, using the `interaction()` function, but to add insult to injury, this function must be supplied with the grouping variables in the *reverse* order (unless you set `lex.order = TRUE`):

```
ggplot(Agreement_df, aes(Before, Freq, fill = After)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1,
    mapping = aes(linetype = Before == After,
                  group = interaction(Before == After, After))
#<<<<<<<<<<
  )
```




```
ggplot(Agreement_df, aes(Before, Freq, fill = After)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1,
    mapping = aes(linetype = Before == After,
                  group = interaction(After, Before == After,
#<<<<<<<<<<
                                      lex.order = TRUE))
#<<<<<<<<<<
  )
```

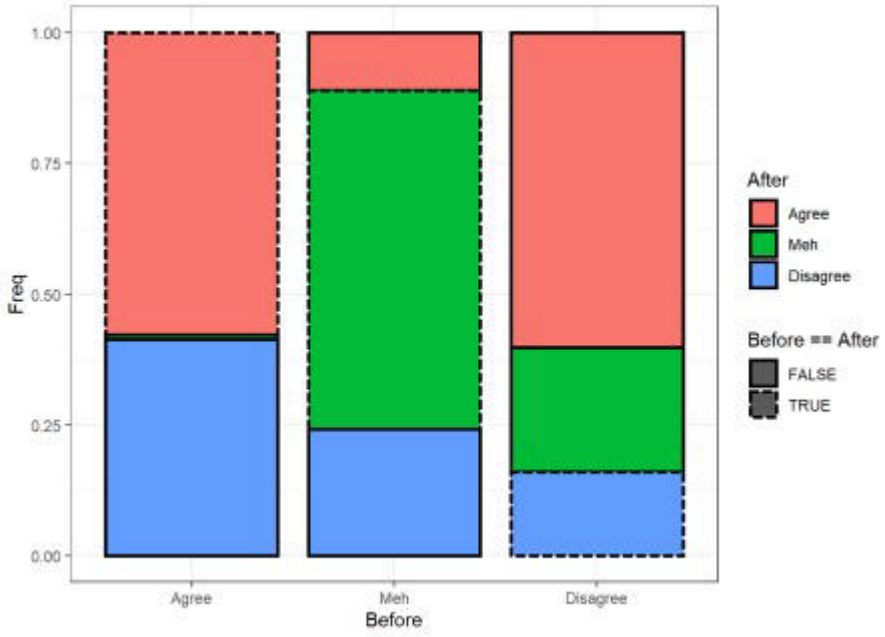


Option 2: Set All Grouping Aesthetics Globally / By Layer

We can also keep using the implicit setting for the grouping, but set all of the relevant aesthetics globally:

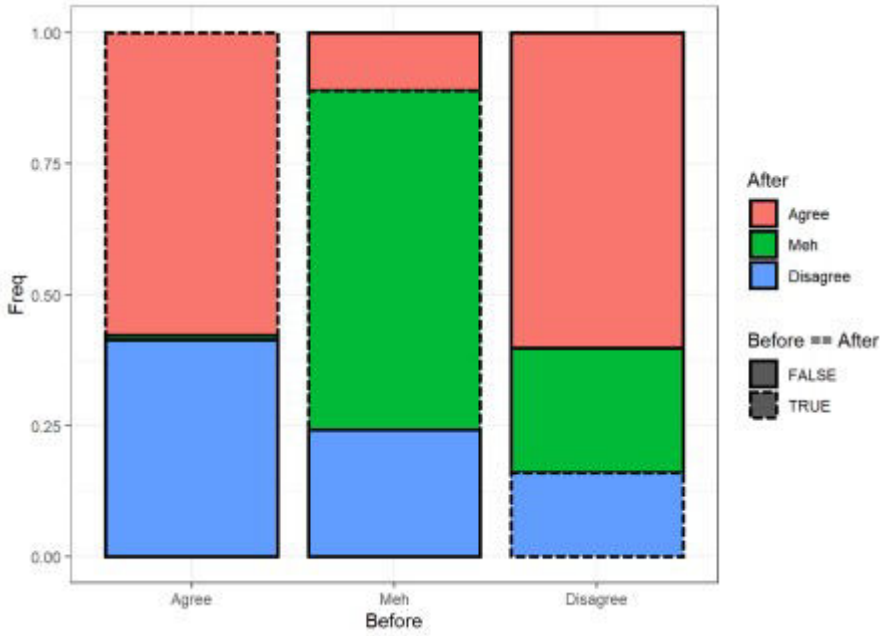
```
# Set both in the global aesthetics:
ggplot(Agreement_df, aes(Before, Freq,
```

```
                          fill = After, linetype = Before == After)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1
  )
```



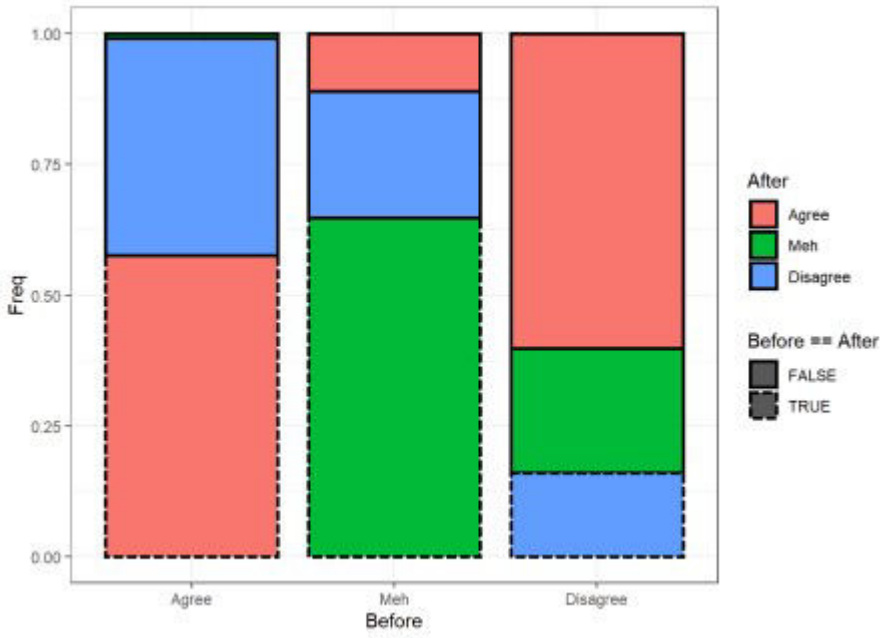
Or in the layer itself:

```
# Set both in the layer aesthetics:
ggplot(Agreement_df, aes(Before, Freq)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1,
    mapping = aes(fill = After, linetype = Before == After)
  )
```



Note then even when setting them globally or in the layer, the *order* still matters:

```
ggplot(Agreement_df, aes(Before, Freq)) +
  geom_col(
    position = "fill", width = 0.85,
    color = "black", size = 1,
    mapping = aes(linetype = Before == After, fill = After) # Wrong
order
  )
```



Conclusion

The location (global or by layer) and order of aesthetics matters. I didn't know this, and I felt like I was losing my mind; I hope that by writing this post I will be able to spare you some precious keyboard banging and yelps of sorrow.

Code away!