Basics of R:
Data manipulation

Research Methods for Human Inquiry

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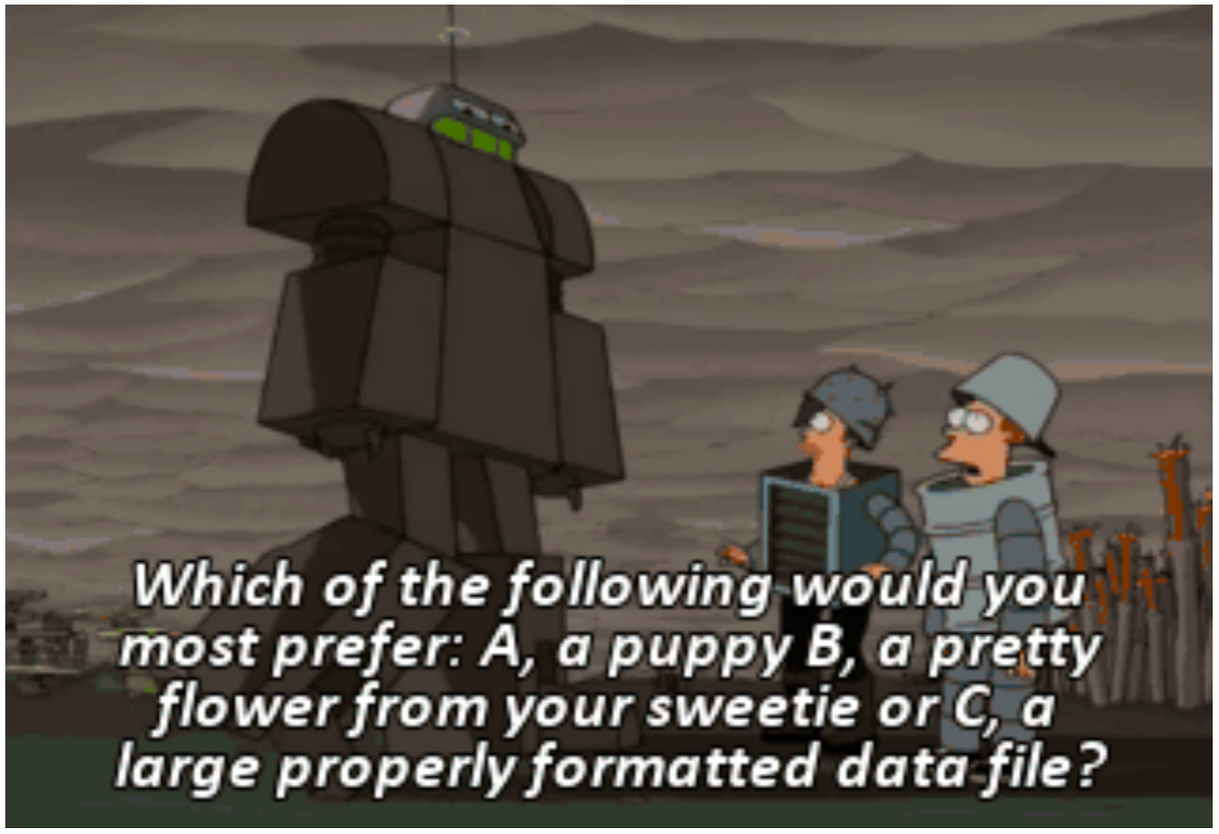
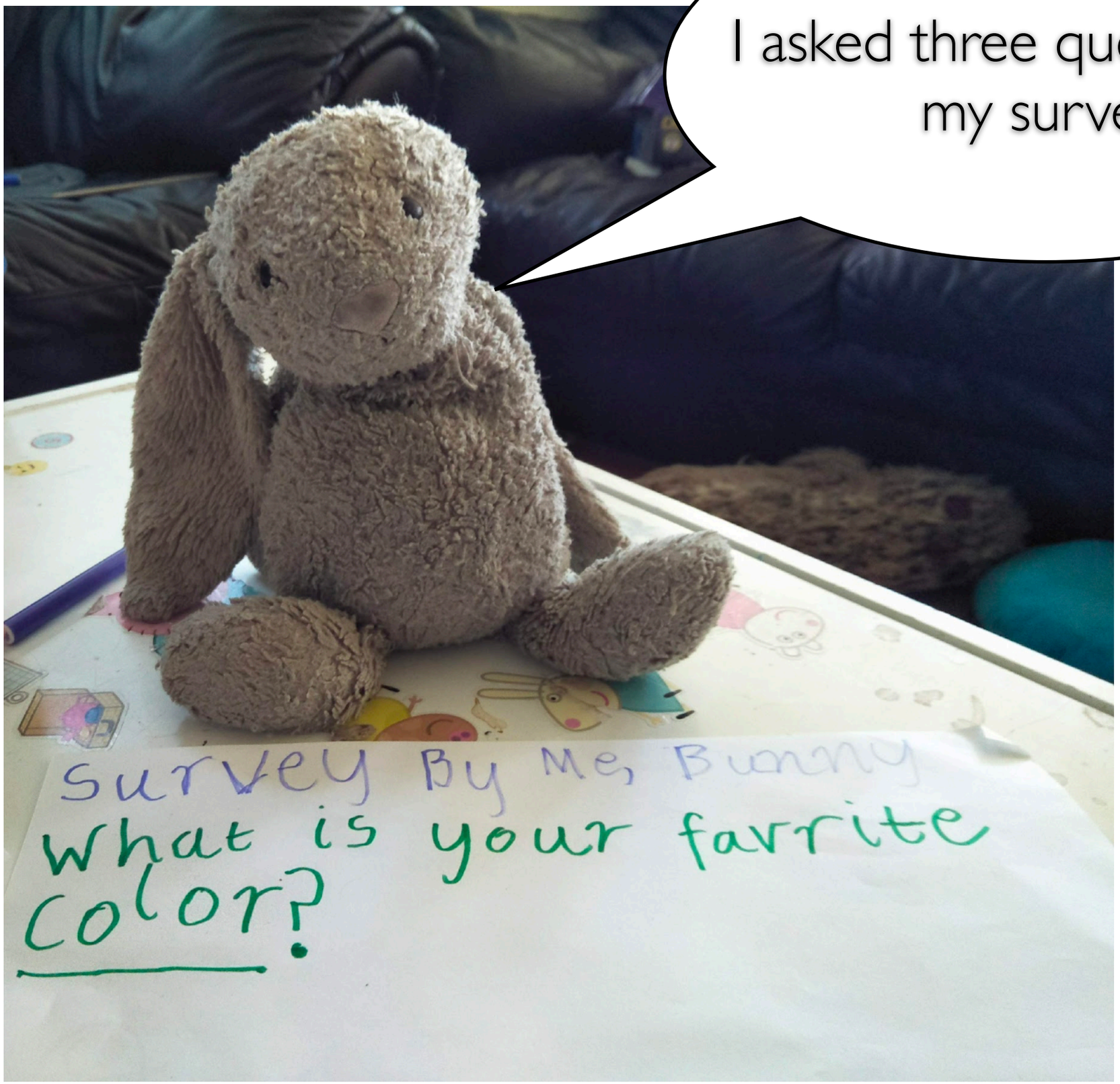
Still don’t know what to get Shadow…



I know! I'll get Shadow a dataset. I can ask all sorts of questions to our friends about what they really think and how they think in general.



1. What is your favourite colour?

2. How tall are you in cm?

3. Rank the following from best to worst: (a) bunnies; (b) bears; (c) doggies

Let’s take a look at Bunny’s survey

Reading the file

You should have successfully loaded the file in the last video.


```
> data <- read_csv(file=loc)

── Column specification ────────────────────────────────────────────────────────
cols(
  name = col_character(),
  colour = col_character(),
  height = col_double(),
  bunnyrank = col_double(),
  bearrank = col_double(),
  doggyrank = col_double()
)
```

Viewing the data

Type `data` at the prompt and you should see:

```
> data
# A tibble: 7 x 6
  name         colour height bunnyrank bearrank doggyrank
  <chr>        <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny        grey       20          1        3          2
2 gladly       purple     18          3        1          2
3 flopsy       black      20          1        2          3
4 shadow       red        20          1        3          2
5 lfb          purple     24          1        2          3
6 cuddly paws  NA         24         NA       NA         NA
7 doggie       blue       17          2        3          1
```

`data` is a special kind of variable called a tibble, which is basically a dataset.

Viewing the data

Type `data` at the prompt and you should see:

```
> data
# A tibble: 7 x 6
  name        colour  height bunnyrank bearrank doggyrank
  <chr>       <chr>    <dbl>      <dbl>    <dbl>     <dbl>
1 bunny       grey        20          1        3         2
2 gladly      purple      18          3        1         2
3 flopsy      black       20          1        2         3
4 shadow      red         20          1        3         2
5 lfb         purple      24          1        2         3
6 cuddly paws NA          24         NA       NA        NA
7 doggie      blue        17          2        3         1
```

These are the seven vectors. I created each vector individually and put them all together using the following command:

```
> data <- tibble(name,colour,height,bunnyrank,bearrank,doggyrank)
```

Viewing the data

```
> name <- c(“bunny”, “gladly”, “flopsy”, “shadow”, “lfb”,
“cuddly paws”, “doggie”)
```

Viewing the data

```
> colour <- c(“grey”, “purple”, “black”, “red”, “purple”, NA, “blue”)
```

Viewing the data

```
> height <- c(20,18,20,20,24,24,17)
```

Viewing the data

```
> bunnyrkank <- c(1,3,1,1,1,NA,2)
> bearrank <- c(3,1,2,3,2,NA,3)
> doggyrank <- c(2,2,3,2,3,NA,1)
```

3. Rank the following from best to worst: (a) bunnies; (b) bears; (c) doggies

```
> data
# A tibble: 7 x 6
  name          colour height bunnyrank bearrank doggyrank
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny         grey       20          1        3          2
2 gladly        purple     18          3        1          2
3 flopsy        black      20          1        2          3
4 shadow        red        20          1        3          2
5 lfb           purple     24          1        2          3
6 cuddly paws   NA         24         NA       NA         NA
7 doggie        blue       17          2        3          1
```

By being put into a tibble these vectors are given a special relationship to each other….

But they are still ordinary vectors, which I can pick out using the `$` operator

```
> data$height
 [1] 20 18 20 20 24 24 17
```

`data$height` tells R to look for a vector called `height` stored in a tibble called `data`.

```
> data
# A tibble: 7 x 6
  name          colour height bunnyrank bearrank doggyrank
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny         grey       20          1        3          2
2 gladly        purple     18          3        1          2
3 flopsy        black      20          1        2          3
4 shadow        red        20          1        3          2
5 lfb           purple     24          1        2          3
6 cuddly paws   NA         24         NA       NA         NA
7 doggie        blue       17          2        3          1
```

```
> data$colour
[1] "grey"   "purple" "black"  "red"    "purple" NA       "blue"
```

```
> data
# A tibble: 7 x 6
  name          colour height bunnyrank bearrank doggyrank
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny         grey       20          1        3          2
2 gladly        purple     18          3        1          2
3 flopsy        black      20          1        2          3
4 shadow        red        20          1        3          2
5 lfb           purple     24          1        2          3
6 cuddly paws   NA         24         NA       NA         NA
7 doggie        blue       17          2        3          1
```

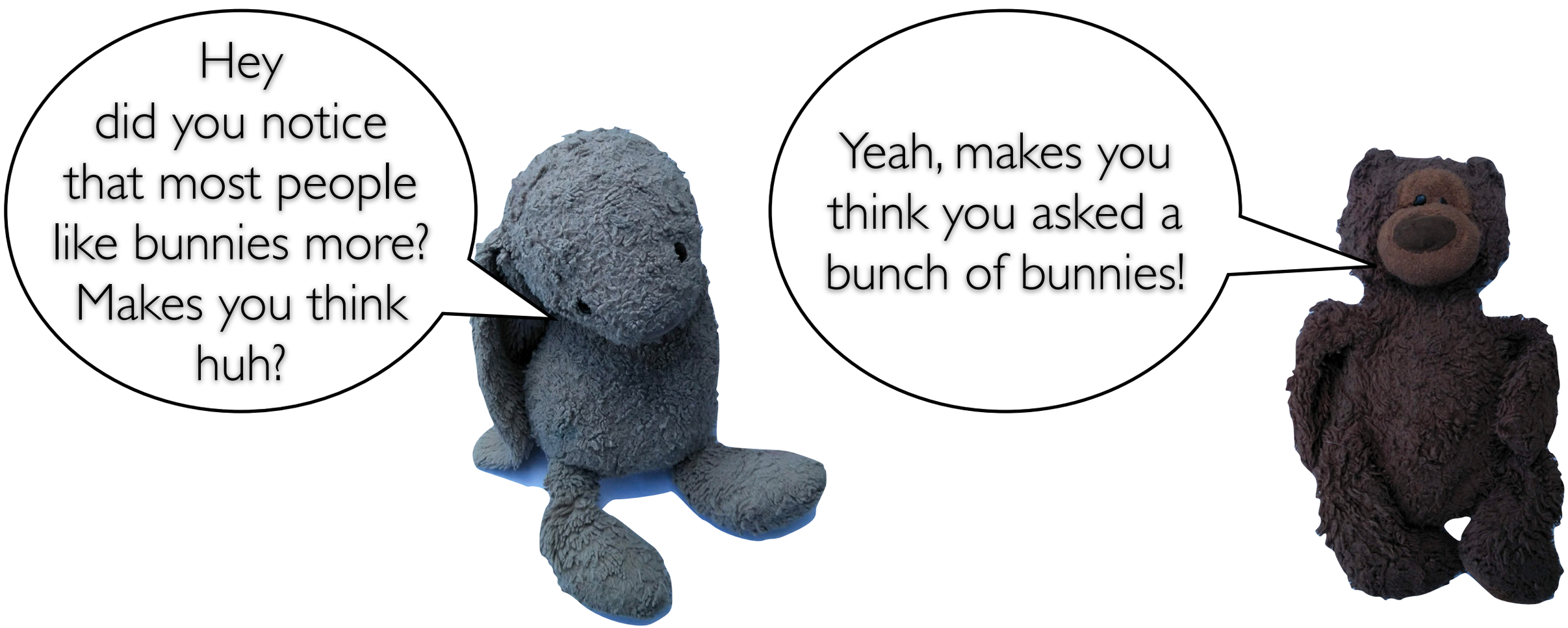
```
> data$bunnyrank
 [1]  1  3  1  1  1 NA  2

> bunnyrank
Error: object 'bunnyrank' not found
```

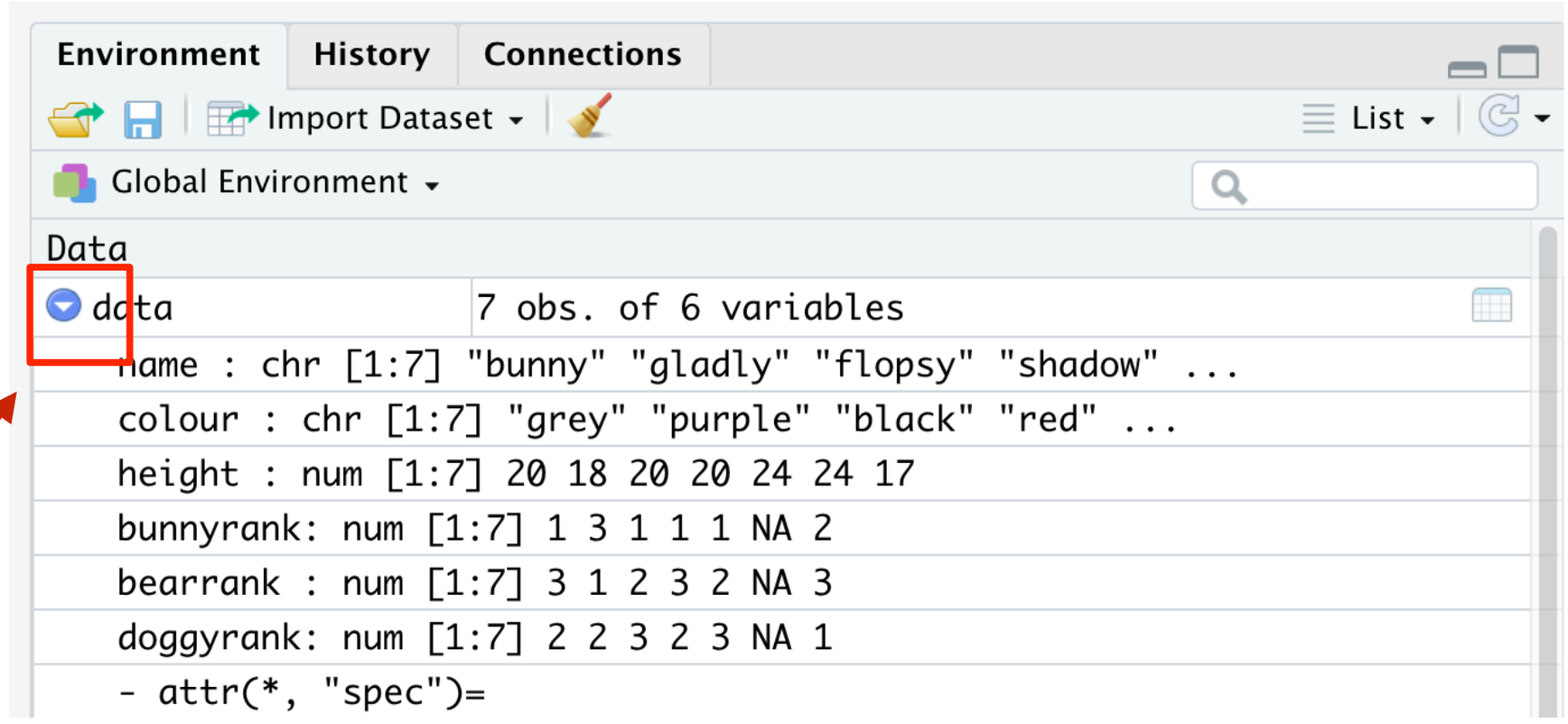
Yep, this $ trick works for all of them!

But you need the $…

```
> data
# A tibble: 7 x 6
  name          colour height bunnyrank bearrank doggyrank
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny         grey       20          1        3          2
2 gladly        purple     18          3        1          2
3 flopsy        black      20          1        2          3
4 shadow        red        20          1        3          2
5 lfb           purple     24          1        2          3
6 cuddly paws   NA         24         NA       NA         NA
7 doggie        blue       17          2        3          1
```



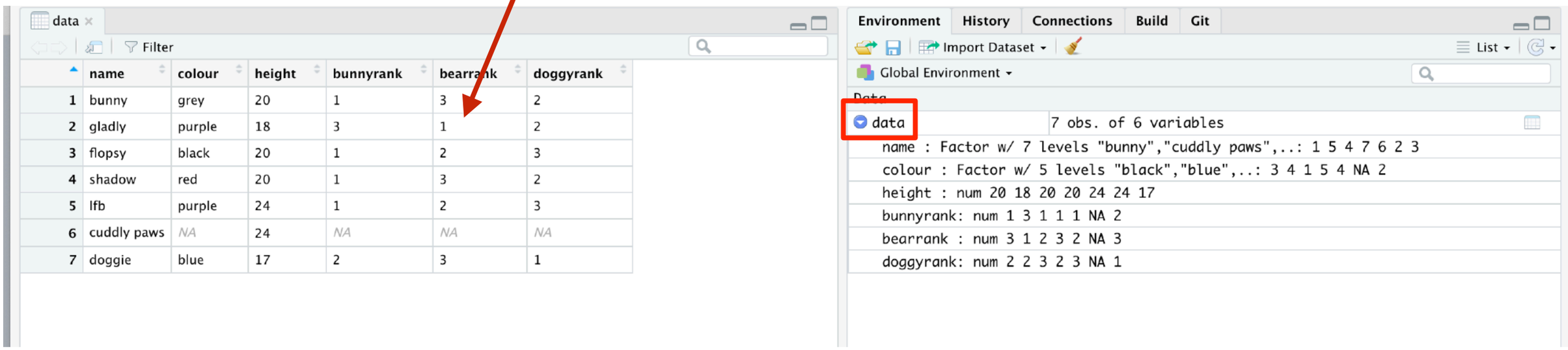
You can also view the dataset using RStudio



Clicking here (in List view) lets you see the entire dataset

You can also view the dataset using RStudio

Clicking it again shows you the dataset in another panel.



Variables inside tibbles behave the same way as any other variable

```
> data$height
 [1] 20 18 20 20 24 24 17
```

```
> data$height + 100
 [1] 120 118 120 120 124 124 117
```

```
> data$height[1]
[1] 20
```

You can change the values of variables in a tibble in the usual way...

```
> data$height[1] <- 99
> data
# A tibble: 7 x 6
  name          colour height bunnyrank bearrank doggyrank
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny         grey       99          1        3          2
2 gladly        purple     18          3        1          2
3 flopsy        black      20          1        2          3
4 shadow        red        20          1        3          2
5 lfb           purple     24          1        2          3
6 cuddly paws   NA         24         NA       NA         NA
7 doggie        blue       17          2        3          1
```

Remember to change it back!

```
> data$height[1] <- 20
```

You can add variables to a tibble…

```
> data$tall <- data$height > 19
> data
# A tibble: 7 x 7
  name          colour height bunnyrank bearrank doggyrank tall
  <chr>         <chr>   <dbl>      <dbl>    <dbl>      <dbl> <lgl>
1 bunny         grey       99          1        3          2 TRUE
2 gladly        purple     18          3        1          2 FALSE
3 flopsy        black      20          1        2          3 TRUE
4 shadow        red        20          1        3          2 TRUE
5 lfb           purple     24          1        2          3 TRUE
6 cuddly paws   NA         24         NA       NA         NA TRUE
7 doggie        blue       17          2        3          1 FALSE
```

Removing them is even easier...

```
> data$tall <- NULL
> data
# A tibble: 7 x 6
  name         colour height bunnyrank bearrank doggyrank
  <chr>        <chr>   <dbl>      <dbl>    <dbl>      <dbl>
1 bunny        grey       99          1        3          2
2 gladly       purple     18          3        1          2
3 flopsy       black      20          1        2          3
4 shadow       red        20          1        3          2
5 lfb          purple     24          1        2          3
6 cuddly paws  NA         24         NA       NA         NA
7 doggie       blue       17          2        3          1
```

`NULL` is a special “value” in R that means “this variable does not exist” or “it has no value”. It is different to `NA`, which means “the variable exists (and in principle has a value), but the value is missing/unknown”

Selecting elements from a tibble

```
> data$height[1]
[1] 20
```

`data$height` is a vector, and we're requesting the 1st element of it

```
> data[1, 3]
# A tibble: 1 x 1
  height
   <dbl>
1     20
```

`data` is a tibble, and we're requesting part of the tibble found in the 1st row, and the 3rd column

```
> data[1,"height"]
# A tibble: 1 x 1
  height
   <dbl>
1     20
```

`data` is a tibble, and we're requesting the part of the tibble found in the 1st row, and the column named "`height`"

Selecting a whole row

```
> data[3,]
# A tibble: 1 x 7
  name   colour height bunnyrank bearrank doggyrank tall
  <chr>  <chr>   <dbl>     <dbl>    <dbl>     <dbl> <lgl>
1 flopsy black      20         1        2         3 TRUE
```

Note the comma and then no number for columns, just the square bracket]. This empty bit after the comma indicates that we want to select all columns. If we don't specify that it assumes we're selecting by column:

```
> data[3]
# A tibble: 7 x 1
  height
   <dbl>
1     20
2     18
3     20
4     20
5     24
6     24
7     17
```

Selecting multiple rows

```
> data[c(1,2,4),]
# A tibble: 3 x 7
  name   colour height bunnyrank bearrank doggyrank tall
  <chr>  <chr>   <dbl>      <dbl>    <dbl>      <dbl> <lgl>
1 bunny  grey       20          1        3          2 TRUE
2 gladly purple     18          3        1          2 FALSE
3 shadow red        20          1        3          2 TRUE
```

```
> data[1:4,]
# A tibble: 4 x 7
  name   colour height bunnyrank bearrank doggyrank tall
  <chr>  <chr>   <dbl>      <dbl>    <dbl>      <dbl> <lgl>
1 bunny  grey       20          1        3          2 TRUE
2 gladly purple     18          3        1          2 FALSE
3 flopsy black      20          1        2          3 TRUE
4 shadow red        20          1        3          2 TRUE
```

Selecting rows and columns?

```
> data[c(1,2,4),c("name","colour")]
# A tibble: 3 x 2
  name   colour
  <chr>  <chr>
1 bunny  grey
2 gladly purple
3 shadow red
```

```
> data[1:4,1:3]
# A tibble: 4 x 3
  name   colour height
  <chr>  <chr>   <dbl>
1 bunny  grey       20
2 gladly purple     18
3 flopsy black      20
4 shadow red        20
```

Selecting rows that match a criterion?

```
> smallOnes <- data$height < 20
> data[smallOnes,]
# A tibble: 2 x 7
  name   colour height bunnyrank bearrank doggyrank tall
  <chr>  <chr>   <dbl>      <dbl>    <dbl>      <dbl> <lgl>
1 gladly purple     18          3        1          2 FALSE
2 doggie blue       17          2        3          1 FALSE
```

```
> data[data$height < 20,]
# A tibble: 2 x 7
  name   colour height bunnyrank bearrank doggyrank tall
  <chr>  <chr>   <dbl>      <dbl>    <dbl>      <dbl> <lgl>
1 gladly purple     18          3        1          2 FALSE
2 doggie blue       17          2        3          1 FALSE
```

Exercises

1. Load the `bunnysurvey.csv` dataset. Make a new dataframe called `d` which is just a copy of `data`.

2. In `d`, add 1 to every entry for `height`. Then subtract it again.

3. Create a new variable in `d` called `dislikesDogs` which is `TRUE` if that person ranked dogs as #3, and `FALSE` otherwise.

4. Create a new variable in `d` called `inches` which gives the height in inches (hint: inches is cm divided by 2.54).

5. Select the first three rows (with all columns) out of `d`.

6. Select only the rows of `d` that contain an `NA` for the colour variable. (hint: use the `is.na()` function). For an extra challenge, try to select only the rows of `d` that do *not* contain an `NA` for the colour variable. (Remember our logical operators from last week).