Part 2
Introduction to R

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Outline

1. What is R?

2. R syntax

3. R objects

What is R?

- statistical computing environment (from *t*-test to generalized linear models, and more…)
    - core distribution “base”
    - add-on packages (> 10K as of June 2017)
- programming language
- tools for creation of publication-quality plots

Where to get R?

- Distribution and packages: CRAN (Comprehensive R Archive Network) http://cran.r-project.org/
- Information: http://www.r-project.org/

RStudio

- Highly recommended (easy to manage projects, packages, data, graphs, etc.)!
- Available from http://www.rstudio.com/products/RStudio/

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Input and output

```
> 2 + 2
[1] 4

> month.name
 [1] "January"   "February"  "March"     "April"     "May"
 [6] "June"      "July"      "August"    "September" "October"
[11] "November"  "December"

> 2+2;4+4
[1] 4
[1] 8
```

Creation of objects

```
> a <- 3
> a
[1] 3
> a + 5
[1] 8
```

Beware: = and ==

> a = 3 # creates an object a with the value 3, an alternative to "a <- 3"

> a == 3 # tests if a equals 3

[1] TRUE

> a == 10 # tests if a equals 10

[1] FALSE

R is case-sensitive!

```
> b <- 7
> a + b
[1] 10
> a + B
Error: object 'B' not found
```

Managing your objects

```
> ls() #returns a list of objects
 [1] "a"       "b“

> rm(b) #removes an object
> ls()
 [1] "a"
```

Saving your workspace

1. Click on the cross or type

```
> q()
```

Select the action (to save or not to save).

```
> getwd() #to find out where your workspace will be saved
[1] "C:/Users/Your/Directory"
> setwd("C:/Users/Your/Directory") #to change it, if you like
```

2. Next session: restart R or, if you have many different workspaces, click on the R from the directory; alternatively:

```
> load("yourDirectory/yourFile.RData")
```

Getting help

> ?cor #to open a help file with information about function ‘cor’

> ??correlation #returns a list of functions that contain this expression

Errors

```
> x <- 1:10 # creates a numeric vector with numbers from 1 to 10
> x
 [1]  1  2  3  4  5  6  7  8  9 10
> meann(x) # we want to compute the mean value of x: a typo
Error: could not find function "meann"
> mean(x) # correct
[1] 5.5
```

Warning messages

```
> mytable <- rbind(c(1, 2), c(3, 4)) # create a 2-by-2 table
> mytable
     [,1] [,2]
[1,]    1    2
[2,]    3    4
> chisq.test(mytable)
Pearson's Chi-squared test with Yates' continuity correction
data: mytable
X-squared = 0, df = 1, p-value = 1
Warning message:
In chisq.test(mytable) : Chi-squared approximation may be incorrect
```

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Main data types in R

- Numeric vectors
- Character vectors
- Factors
- Matrices
- Data frames

Numeric vectors

```
> vnum <- 1:5 # a vector of integers from 1 to 5
> vnum
[1] 1 2 3 4 5
```

If it's not a sequence:

```
> fibonacci10 <- c(1, 1, 2, 3, 5, 8, 13, 21, 34, 55)
> fibonacci10
 [1]  1  1  2  3  5  8 13 21 34 55
```

Character vectors

```
> stein <- c("a", "rose", "is", "a", "rose", "is", "a", "rose")
> stein
[1] "a"    "rose" "is"   "a"    "rose" "is"   "a"    "rose"
```

Factors

```
> stein.fac <- factor(stein)
> stein.fac
[1] a    rose is   a    rose is   a    rose
Levels: a is rose
```

Matrices

```
> m <- cbind(1:5, 10:6)
> m
     [,1] [,2]
[1,]    1   10
[2,]    2    9
[3,]    3    8
[4,]    4    7
[5,]    5    6
```

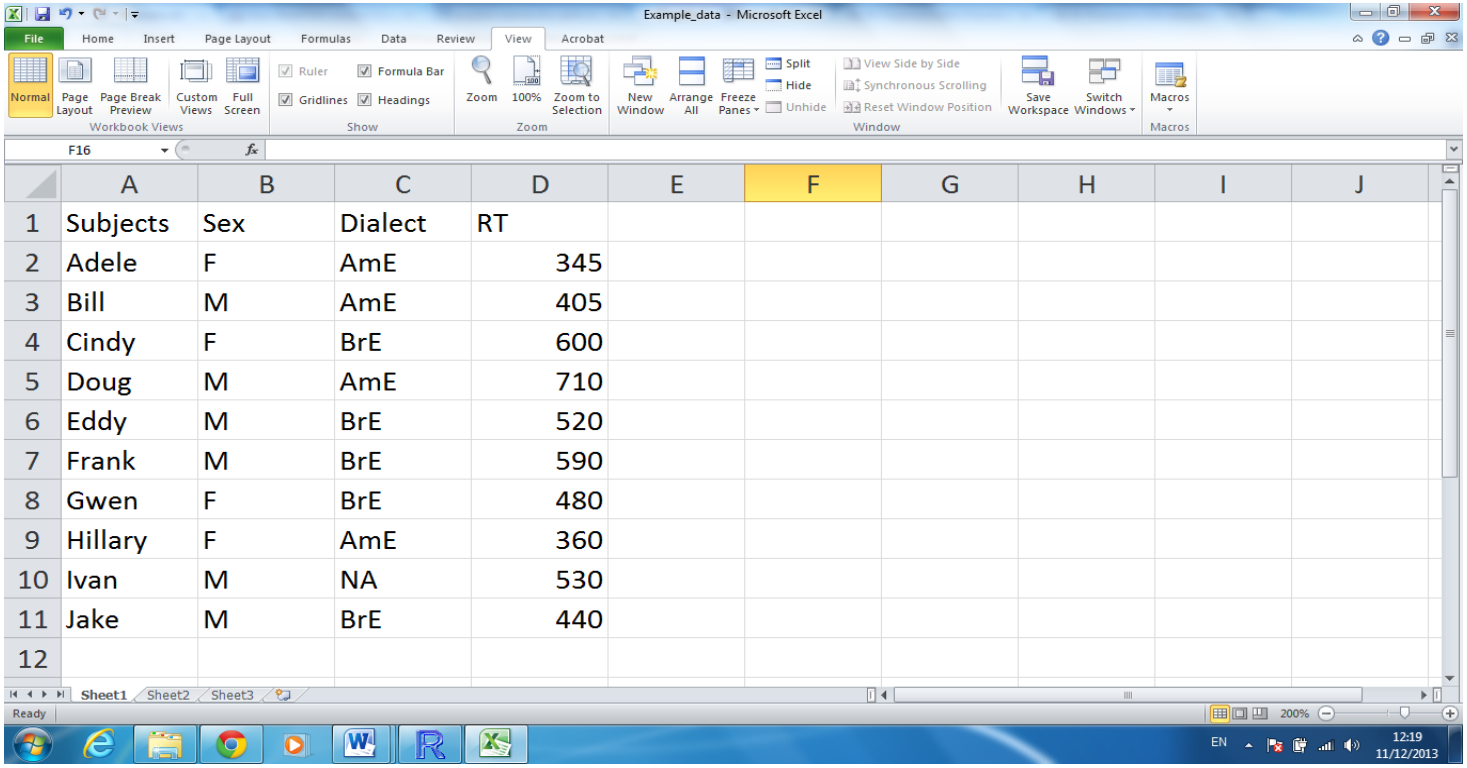
Data frames

```
> sex <- c("f", "m", "m", "f")
> sex
[1] "f" "m" "m" "f"

> rt <- c(455, 773, 512, 667)
> rt
[1] 455 773 512 667

> df <- data.frame(sex, rt)
> df
  sex  rt
1   f 455
2   m 773
3   m 512
4   f 667
```

Exercise

Create a character vector with the names of your fellow students. Create a vector with their heights (in cm). Combine the vectors in one data frame.

Importing your data to R



	A	B	C	D	E	F	G	H	I	J
1	Subjects	Sex	Dialect	RT						
2	Adele	F	AmE	345						
3	Bill	M	AmE	405						
4	Cindy	F	BrE	600						
5	Doug	M	AmE	710						
6	Eddy	M	BrE	520						
7	Frank	M	BrE	590						
8	Gwen	F	BrE	480						
9	Hillary	F	AmE	360						
10	Ivan	M	NA	530						
11	Jake	M	BrE	440						
12										

Importing your data to R

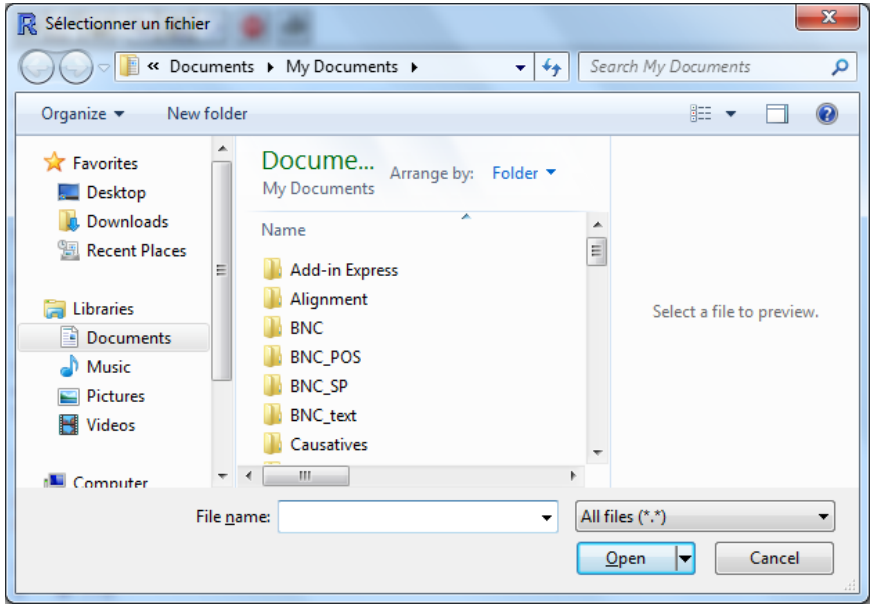
1. Create a similar table in Excel (or OpenOffice Calc). Don't forget to create a header. In case of missing values, put NA. No empty cells!

2. Save the file as a tab delimited text file (.txt).

3. Read the file in R:

```
> mydata <- read.table(file = file.choose(), header = TRUE)
```

Interactive choice



Exercise

Create the following table in Excel (or OpenOffice Calc) and import it in R as a data frame under the name *Linguists*.

Last name	**First name**	**Framework**	**Born**	**Died**
de Saussure	Ferdinand	Structuralism	1857	1913
Chomsky	Noam	Generative Linguistics	1928	NA
Lakoff	George	Cognitive Linguistics	1941	NA

Exporting your data from R

```
> write.table(mydata, file = "C:/Your/Directory/Exported.txt",
quote = FALSE, sep = "\t", row.names = FALSE)
```

NB: in Windows, use either forward slashes, as in the example, or double backward slashes, e.g. C:\\Your\\Directory\\mydata.txt !

Rling

- My package with data sets and some functions for this course
- Save the .tar.gz file to a local directory
- Install in R by typing in

```
> install.packages(pkgs = file.choose(), repos = NULL, type = "source")
```