Introduction to R for Data Management and Analysis

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Session 3

Notes on the Thursday's lecture

- assignment operator <- (in English: "gets")
- extract vector from `data.frame` with `$`
- converting between data types (e.g., `as.numeric`)
  - a.k.a. coercion (`as.`**classname**)
- importing and exporting data
  - read and write functions
- general data categories: tabular / non-tabular (unstructured)
- class names: vector, list, and matrix

Lists


Hadley Wickham
@hadleywickham
Follow
Indexing lists in #rstats. Inspired by the Residence Inn
x
x[1]
x[[1]]
x[[1]][[1]]
4:09 AM - 14 Sep 2015
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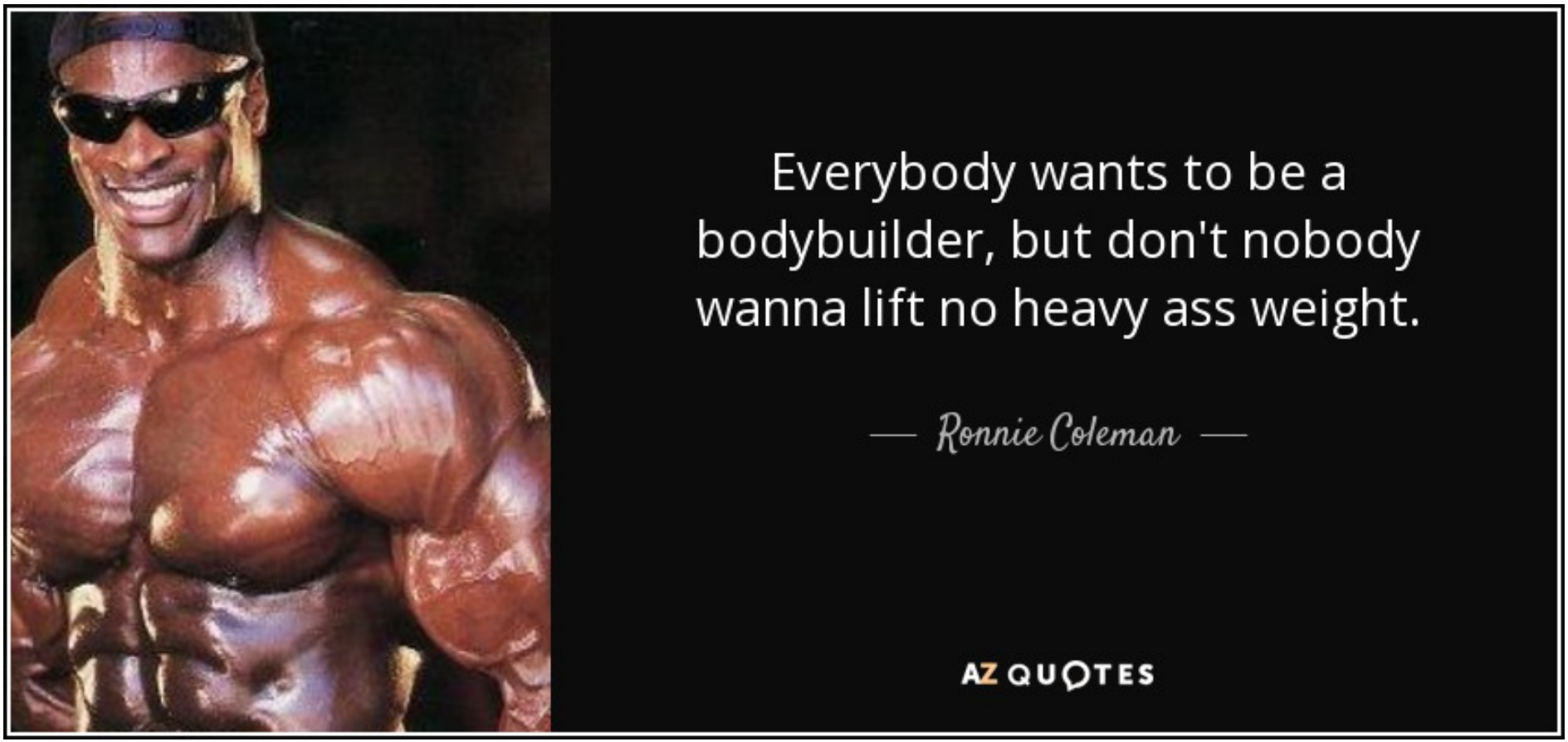
Notes on Thursday's lecture (cont.)

- generating random numbers and matrix
- Up arrow in RStudio
- more on RMarkdown

Recap

- Classes (bicycle analogy)
  - can have particular operations
  - some functions (methods) are similar across classes
  - identify a class by using the `class` function
- Assignment creates objects and puts them in the `.GlobalEnv` (see `ls()`)
- Factors and levels
  - Changing the levels of a factor
- `data.frames` and `lists`
- Import and Export data
  - Know your paths!
  - Most export functions include "write" (i.e., `write.table`)
  - Most import functions include "read" (i.e., `read.csv`)
  - Use relative paths for Rmd files
    - Put the data and file in the same folder
  - You can use absolute paths for interactive sessions (console)
- subsetting using vectors
  - Accessing rows and columns with `[`

Motivation


Everybody wants to be a bodybuilder, but don't nobody wanna lift no heavy ass weight.
— Ronnie Coleman —
AZ QUOTES

Motivation (cont.)

- Learning R requires practice (doing)
- Persistence
- Find fun exercises (Trello Board)
- Follow along with the live coding examples
- Enjoy it!

Expectations

Expectations (cont.)

- Exposure to the R language
  - vocabulary and common verbs
- Basics of troubleshooting and debugging
  - Using examples, documentation
- Learning R won't happen overnight

Data Manipulation Overview

- Inspecting a data.frame
  - dimension
  - rownames, colnames
  - head
- Subsetting (cont.)
  - vectors and `[` with character, numeric, logical
  - `lists` and `[` / `$`
  - double bracket extraction `[[`
  - using conditions
- Sorting and aggregating data
- removing duplicated records
- removing records with `NA`
- merging and binding
- transformations

Subsetting

- Reduce dimensionality of data (rows or columns)
- can be done with either the `[` bracket or tidyverse operations
- Think about dimensions before doing the subset
- Think in terms of verbs (slice, select)
- Draw it out!
- `$` extracts a vector from a `data.frame`
- `[[` extracts and reduces to a single vector where possible from a `data.frame` or `list`
- conditions help us specify what parts of the data we want
  - `sex == "males"`
  - `age >= 18`

Sorting and aggregating data

- `order` function - returns an index of ordered positions
- tidyverse equivalent: `arrange` - returns the arranged data

Formula notation in R

- Uses the ~ for denoting a formula
  - `y ~ m*x + b`
- Good for working with statistical models / tables
- Mainly used in base R code
- Useful for creating crosstabs!
  - `xtabs(A ~ B, data = blue)`
- Look out for `formula` class inputs
  - see `?xtabs`
  - see `?t.test`
- Functions with `formula` inputs usually have a `data` argument
  - R needs to know where the variables can be found

Useful conditions for subsetting

- Removing duplicated rows
  - `duplicated` on a `data.frame`
- Removing records with `NA`
  - `is.na` to get a logical vector

Merging and Binding

- `merge` function
  - takes two `data.frames` as input
  - arguments tell it how to merge
  - see example
- `cbind` and `rbind`
  - concatenate by columns or rows
  - `rbind`: names in columns must match
  - `cbind`: number of rows must match
- Creating bins from continuous variables
  - `Hmisc::cut2` - easy way to create categories from numeric variables
- Tidyverse
  - `join` construct
  - see RStudio cheatsheet

Transformations / Manipulations

- long to wide format
- `dplyr` and `reshape2` packages
- `aggregate` / `group_by`

Discussion

- Working with data
  - Tools at your disposal
  - String together functions to reach a desired outcome
  - Add comments to code to explain steps
- Recognize how data should be represented
  - long - longitudinal data
  - wide - survey data
- Recognize what data format is best for visualization
  - ggplot2 may want long data