Exercises 1.2: How many Parameters in each Model?

Henrik Singmann

July 2019 (updated: 2019-07-23)

Formula Interface for Statistical Models: ~

- Allows symbolic specification of statistical model, e.g. linear models:
  `lm(reasoning ~ binding, ds_vb_18)`
- Everything to the left of `~` is the dependent variable.
- Independent variables are to the right of the `~`:

Formula	Interpretation
`~ x` or `~1+x`	Intercept and main effect of `x`
`~ x-1` or `~0 + x`	Only main effect of `x` and no intercept (questionable)
`~ x+y`	Main effects of `x` and `y`
`~ x:y`	Interaction between `x` and `y` (and no main effect)
`~ x*y` or `~ x+y+x:y`	Main effects and interaction between `x` and `y`

Continuous Variables: How many Parameters in each Model?

```
lm(reasoning ~ binding + updating, ds_vb_18)   # a
lm(reasoning ~ binding : updating, ds_vb_18)   # b
lm(reasoning ~ 0 + binding:updating, ds_vb_18) # c
lm(reasoning ~ binding*updating, ds_vb_18)     # d
lm(reasoning ~ 0+binding*updating, ds_vb_18)   # e
```

Categorical Variables: How many Parameters in each Model?

```
lm(reasoning ~ order, ds_vb_18)                # a
lm(reasoning ~ 0+order, ds_vb_18)              # b
lm(reasoning ~ order+training, ds_vb_18)       # c
lm(reasoning ~ 0+order+training, ds_vb_18)     # d
lm(reasoning ~ order:training, ds_vb_18)       # e
lm(reasoning ~ 0+order:training, ds_vb_18)     # f
lm(reasoning ~ order*training, ds_vb_18)       # g
lm(reasoning ~ 0+order*training, ds_vb_18)     # h
lm(reasoning ~ order+order:training, ds_vb_18)# i
```

```
levels(ds_vb_18$order)    ## 2
```

```
## [1] "A" "B"
```

```
levels(ds_vb_18$training) ## 3
```

```
## [1] "control"  "updating" "binding"
```