# Effects on projectivity ratings by Embedding Operator and Trigger — Data Analysis

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## Contents



## 1 Introducing the dataset

```
> str(df)

'data.frame': 57160 obs. of  9 variables:
 $ workerid     : int  1 1 1 1 1 1 1 1 1 1 ...
 $ content      : chr  "charley" "danny" "emily" "emma" ...
 $ short_trigger: chr  "acknowledge" "hear" "reveal" "discover" ...
 $ ai_block     : chr  "block1" "block1" "block1" "block1" ...
 $ ai           : num  0.98 0.99 0.99 0.99 0.98 0.98 1 0.99 0.99 0.99 ...
 $ projective   : num  0.3 0.98 0.01 0.99 0.98 0.99 0.01 0.01 0.27 0.01 ...
 $ verb         : chr  "acknowledge" "hear" "reveal" "discover" ...
 $ op           : chr  "q" "q" "q" "q" ...
 $ exp_block    : int  1 1 1 1 1 1 1 1 1 1 ...

> df$workerid <- as.factor(df$workerid)
> length(levels(df$workerid))

[1] 2682
```

The dataset consists of 57160 observations from 2682 participants (recruited on the online platforms Prolific and Amazon Mechanical Turk), across 12 experiments.

We are interested in how highly participants rate speaker commitment to the truth of an embedded complement clause, coded as `projective` on a real-numbered sliding scale between $0 - 1$.

The complement clause was embedded under an attitude verb, which in turn was embedded under an entailment-cancelling operator. Our fixed effects factors manipulate the following:

1. The choice of attitude verb (coded as `verb`)
2. The entailment-cancelling operator (coded as `op`)

The levels for our fixed effects factors are the following:

```
> df$verb <- as.factor(df$verb)
> levels(df$verb)
```

```
 [1] "acknowledge" "admit"       "announce"    "be_annoyed"  "be_right"
 [6] "confess"     "confirm"     "demonstrate" "discover"    "establish"
[11] "hear"        "inform"      "know"        "pretend"     "prove"
[16] "reveal"      "say"         "see"         "suggest"     "think"

> length(levels(df$verb))

[1] 20

> df$op <- as.factor(df$op)
> levels(df$op)

[1] "c" "m" "n" "q"

> length(levels(df$op))

[1] 4
```

We are interested in the effect on `projective` of `verb` and `op`, as well as their interaction, corresponding to a $20 \times 4$ factorial design, yielding

```
> length(levels(df$verb))*length(levels(df$op))

[1] 80
```

conditions.

We have 20 items, corresponding to the content of the complement clause.

```
> df$content <- as.factor(df$content)
> levels(df$content)

 [1] "charley"  "danny"    "emily"    "emma"     "frank"    "grace"
 [7] "isabella" "jackson"  "jayden"   "jon"      "josh"     "josie"
[13] "julian"   "mary"     "mia"      "olivia"   "owen"     "sophia"
[19] "tony"     "zoe"

> length(levels(df$content))

[1] 20
```

We have roughly 36 observations by item and condition. This is an approximate number, because the `op` manipulation is a between-studies manipulation, and the number of participants differs by experiment:

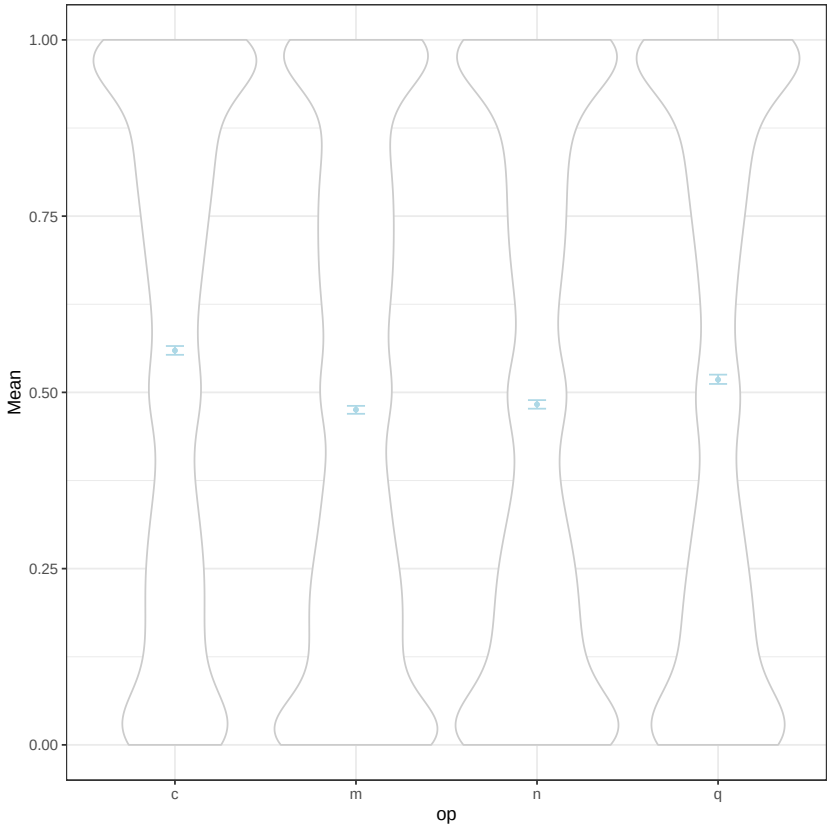
```
> # n observations
> length(df[,1])

[1] 57160

> # observations by item
> length(df[,1])/length(levels(df$content))

[1] 2858

> table(df$content)


 charley    danny    emily     emma    frank    grace isabella  jackson
    2858     2858     2858     2858     2858     2858     2858     2858
  jayden      jon     josh    josie   julian     mary      mia   olivia
    2858     2858     2858     2858     2858     2858     2858     2858
    owen   sophia     tony      zoe
    2858     2858     2858     2858
```

```
> # observations by verb
> length(df[,1])/length(levels(df$verb))

[1] 2858

> table(df$verb)


acknowledge       admit    announce  be_annoyed    be_right     confess
       2858        2858        2858        2858        2858        2858
    confirm demonstrate    discover   establish        hear      inform
       2858        2858        2858        2858        2858        2858
       know     pretend       prove      reveal         say         see
       2858        2858        2858        2858        2858        2858
    suggest       think
       2858        2858

> # observations by operator
> length(df[,1])/length(levels(df$op))

[1] 14290

> table(df$op)


    c     m     n     q
14400 14680 14340 13740

> # observations by item and condition
> length(df[,1])/length(levels(df$content))/
+   (length(levels(df$verb))*length(levels(df$op)))

[1] 35.725
```

# 2 Statistical Summaries and Graphs

## 2.1 Projectivity rating by operator

Distribution of projectivity ratings by operator with means and 95% bootstrapped confidence intervals.

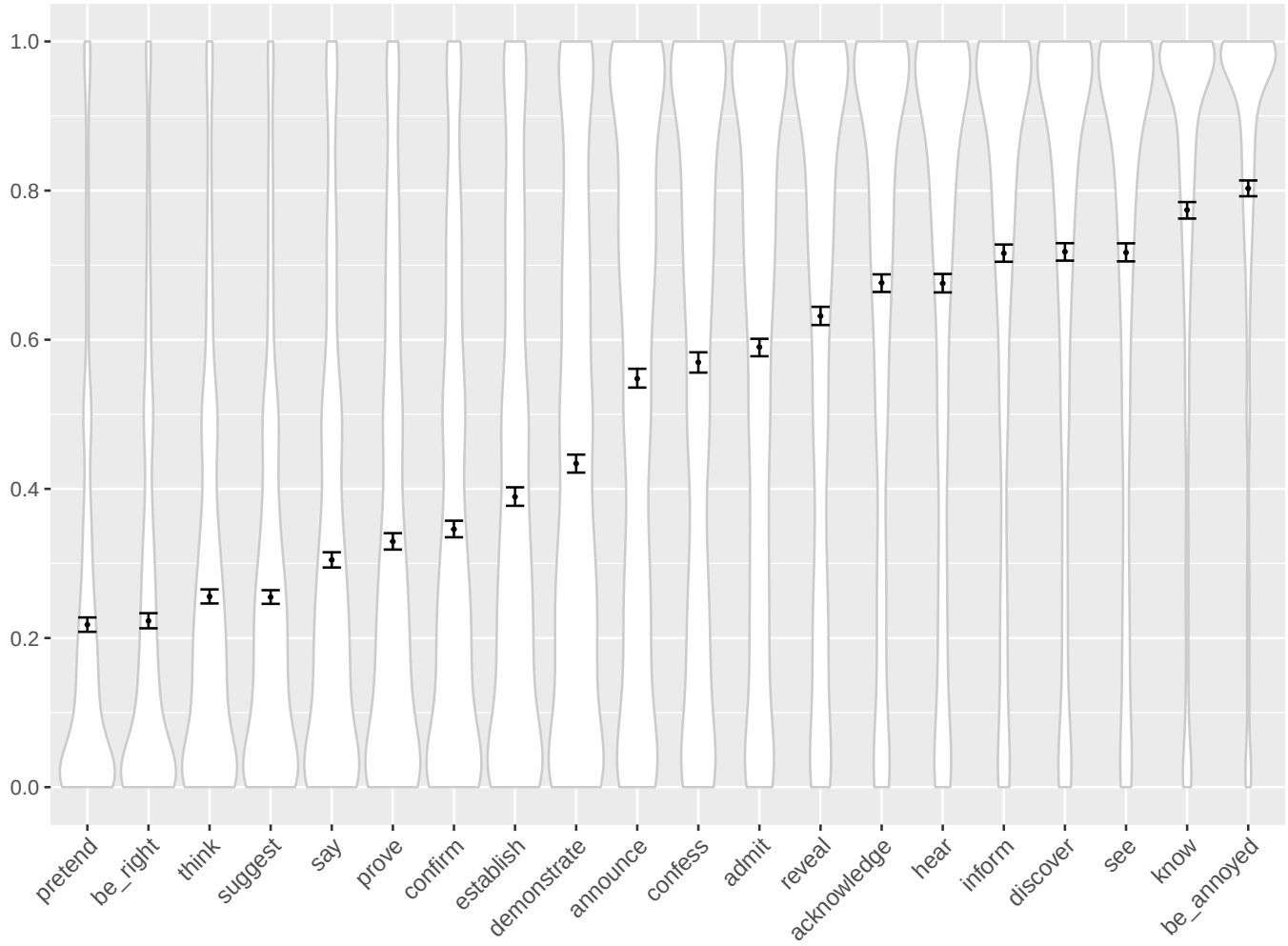



The following generalizations emerge:

- Conditionals have the highest projectivity ratings
- Projectivity ratings for questions are higher than those for modals and negation, but lower than those for conditionals
- Modals and negation have the lowest projectivity ratings
- The ratings for negation look a little higher than for modals, but error bars overlap

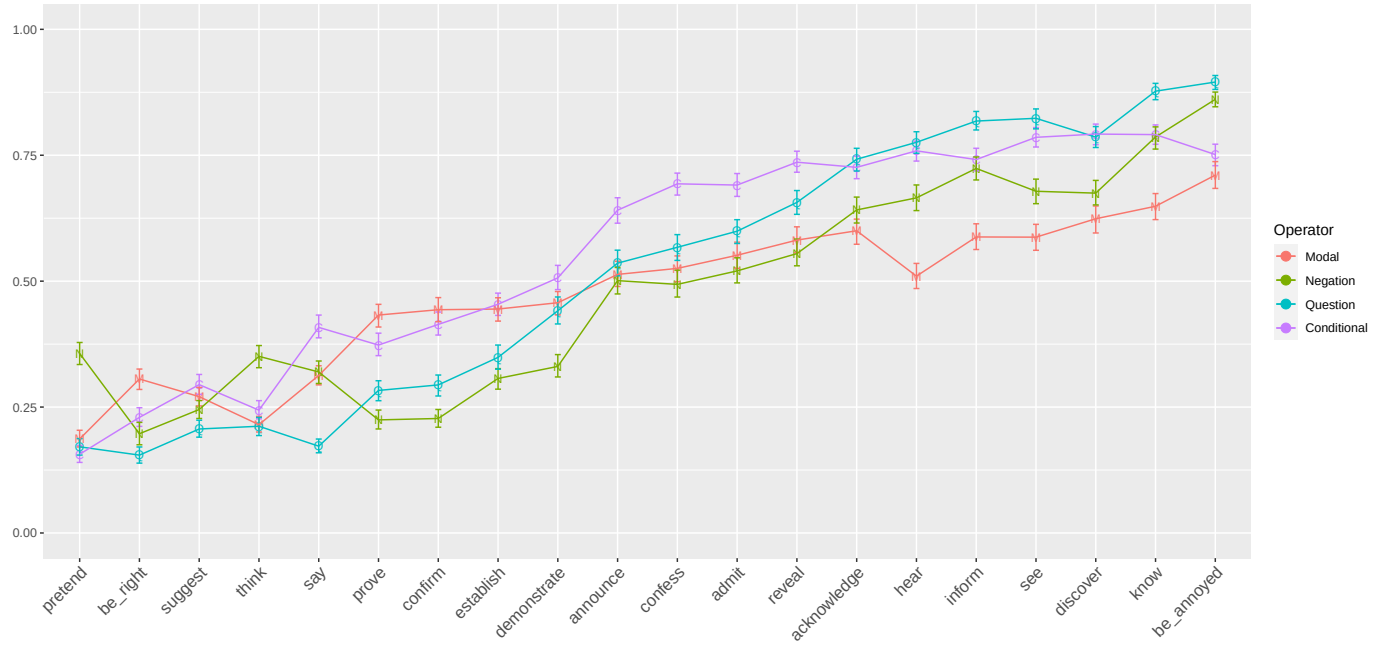
Although these differences appear to be significant, they are quite small.

## 2.2 Distributions of projectivity rating by verb with means and 95% bootstrapped confidence interval:




- We see gradual differences in projectivity between verbs

## 2.3 Means and confidence intervals for projectivity rating by verb and operator:


1.00
0.75
0.50
0.25
0.00
pretend
be_right
suggest
think
say
prove
confirm
establish
demonstrate
announce
confess
admit
reveal
acknowledge
hear
inform
see
discover
know
be_annoyed
Operator
Modal
Negation
Question
Conditional