

Experiment 2 (self-paced reading)

R code to reproduce the analysis of Experiment 2 reported in the manuscript *"Does case marking affect agreement attraction in comprehension?"*.

Participants

Table 1: Summary of participants' demographic characteristics. Data from all 48 participants were included in the analysis.

age	gender	handedness	education	impairment	vision
Min. :18.00	female:28	left : 1	higher :44	minor head injury: 1	corrected :12
1st Qu.:20.75	male :20	right:47	secondary : 1	neurosis : 1	good :35
Median :22.00			vocational: 3	none :46	uncorrected near-sightedness: 1
Mean :23.19					
3rd Qu.:26.00					
Max. :34.00					

Contrast coding

Note that the term “interference” applies to sentences with singular attractors in grammatical sentences (i.e., “a”) but plural attractors in ungrammatical sentences (i.e., “d”).

Main effects and interaction

```
# Contrasts to evaluate the main effects of grammaticality ('gram'),  
# number interference ('int'), and their interaction  
##          a    b    c    d  
#gram      1    1   -1   -1 # grammatical is 1, ungrammaticals is -1  
#int       1   -1   -1    1 # No-interference is -1, interference is 1  
target$gram<-ifelse(target$cond%in%c("a","b"),1,-1)  
target$int<-ifelse(target$cond%in%c("a","d"),1,-1)  
target$gramxint<-target$gram*target$int
```

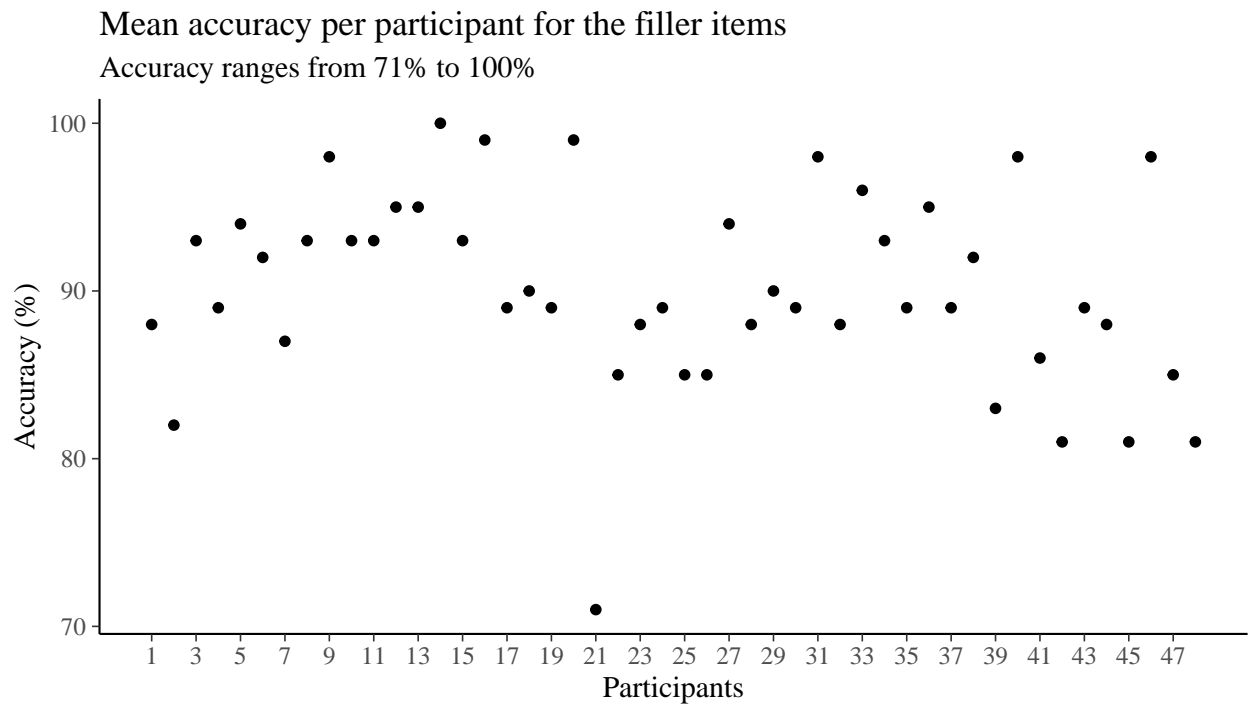
Nested comparisons

```
# Contrasts to evaluate the number interference effect in grammatical (int_g)  
# and ungrammatical (int_u) sentences separately  
##          a    b    c    d  
#gram      1    1   -1   -1 # grammatical is 1, ungrammaticals is -1  
#int_g     1   -1    0    0 # No-interference is -1, interference is 1  
#int_u     0    0   -1    1  
target$int_g <-ifelse(target$cond=="a",1,ifelse(target$cond=="b",-1,0))  
target$int_u <-ifelse(target$cond=="c",-1,ifelse(target$cond=="d",1,0))
```

Filler accuracy

- Overall accuracy (%) for the filler items

```
##  fillerAccuracy fillerSE
## 1           90.1      0.5
```



Target accuracy

- Overall accuracy (%) for the experimental items

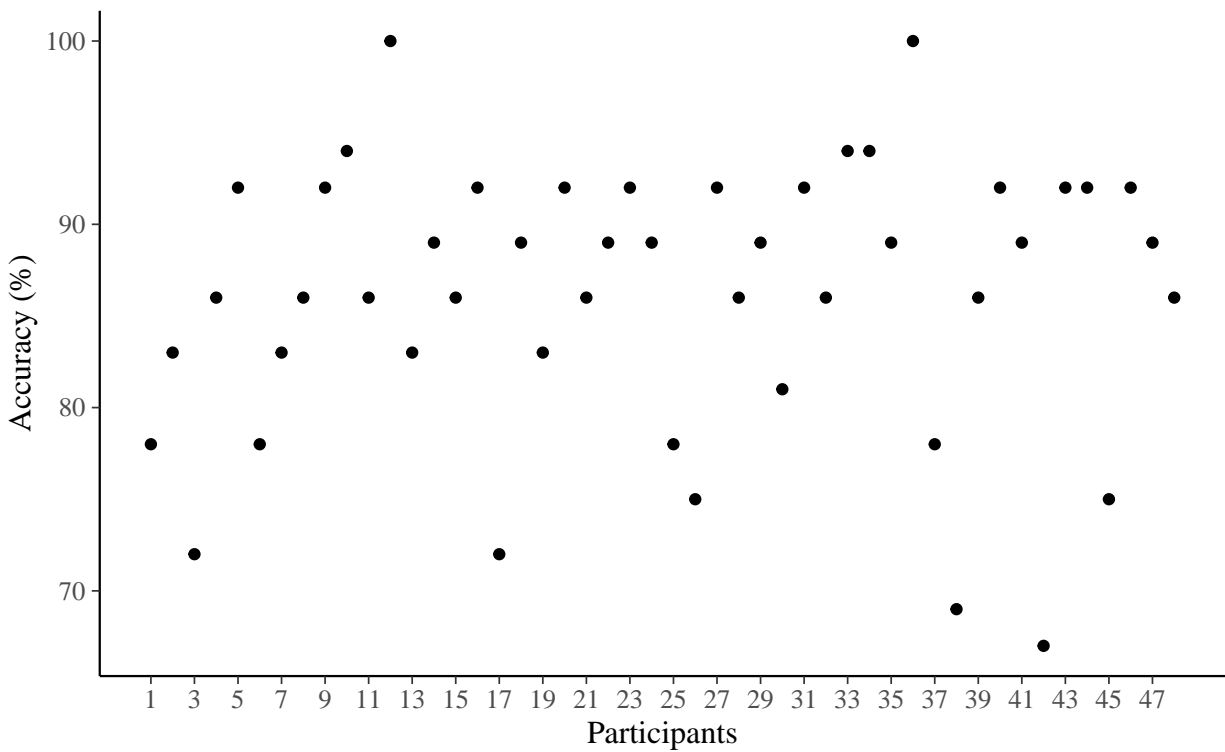
```
##   trgAccuracy trgSE
## 1          86.1   0.8
```

Table 2: Mean accuracy per condition for the experimental items

	Condition	Accuracy [%]	SE
grammatical, interference (w/sg. attractor)	a	86.3	1.7
grammatical, no-interference (w/pl. attractor)	b	86.1	1.7
ungrammatical, no-interference (w/sg. attractor)	c	88.0	1.6
ungrammatical, interference (w/pl. attractor)	d	84.0	1.8

Mean accuracy per participant for the experimental items

Accuracy ranges from 67% to 100%



Reading time data

RT trimming. RTs below 200ms and above 8000ms are excluded.

```
## percent of data points trimmed across all regions
targetTrimmed<-subset(targetRT, rt>200 & rt<8000)
round(100*((dim(targetRT)[1]-dim(targetTrimmed)[1])/dim(targetRT)[1]), digits=1)

## [1] 0.3

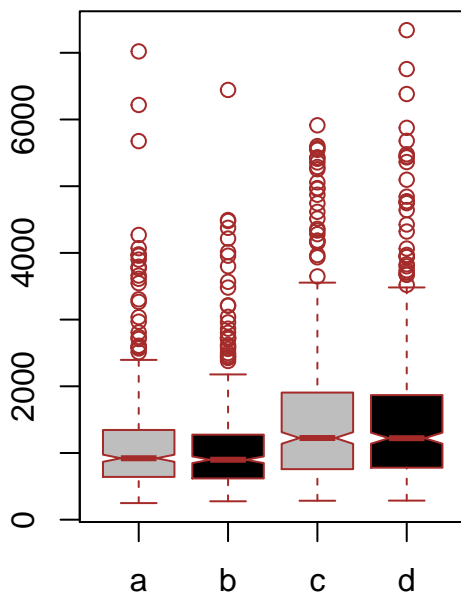
## percent of data points trimmed in the critical region
rcverb_trimmed<-subset(rcverb, rt>200 & rt<8000)
round(100*((dim(rcverb)[1]-dim(rcverb_trimmed)[1])/dim(rcverb)[1]), digits=2)

## [1] 0.17

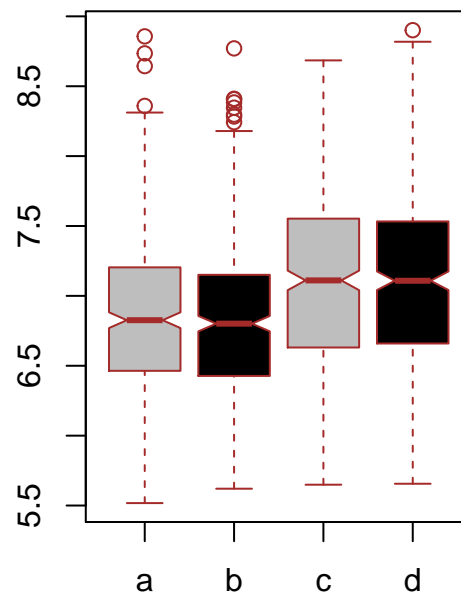
## percent of data points trimmed in the post-critical region
rcadv1_trimmed<-subset(rcadv1, rt>200 & rt<8000)
round(100*((dim(rcadv1)[1]-dim(rcadv1_trimmed)[1])/dim(rcadv1)[1]), digits=2)

## [1] 0.12
```

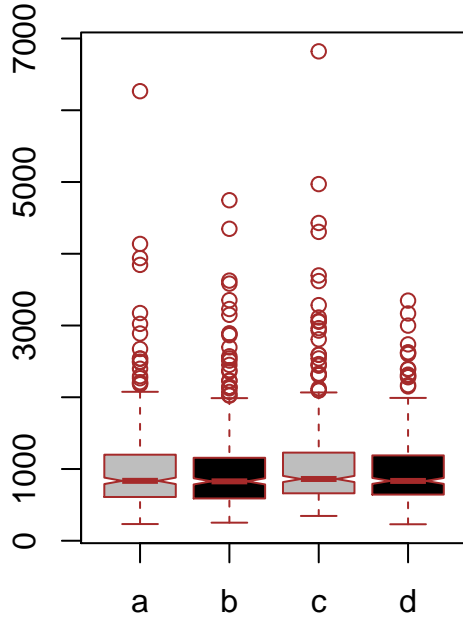
Raw RTs in critical region



Log RTs in critical region



Raw RTs in post-critical region



Log RTs in post-critical region

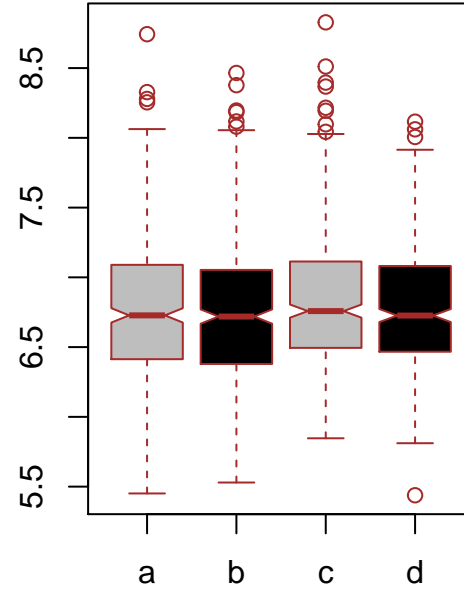


Table 3: Mean reading times in the critical region for the four conditions

	Condition	Mean RT [ms]	SE
grammatical, interference (w/sg. attractor)	a	1147	40
grammatical, no-interference (w/pl. attractor)	b	1096	36
ungrammatical, no-interference (w/sg. attractor)	c	1540	53
ungrammatical, interference (w/pl. attractor)	d	1525	54

Table 4: Mean reading times in the post-critical region for the four conditions

	Condition	Mean RT [ms]	SE
grammatical, interference (w/sg. attractor)	a	989	29
grammatical, no-interference (w/pl. attractor)	b	971	28
ungrammatical, no-interference (w/sg. attractor)	c	1050	32
ungrammatical, interference (w/pl. attractor)	d	963	23

Priors

```
# Priors for reading time analysis involving main effects and interaction
priors_two_way <- c(set_prior("normal(0,10)", class="Intercept"),
  set_prior("normal(0,1)", class="b", coef="gram"),
  set_prior("normal(0,1)", class="b", coef="int"),
  set_prior("normal(0,1)", class="b", coef="gramxint"),
  set_prior("normal(0,1)", class="sd"),
  set_prior("normal(0,1)", class="sigma"),
  set_prior("lkj(2)", class="cor"))
```

```
# Priors for reading time analysis involving nested comparisons
priors_nested<- c(set_prior("normal(0,10)", class="Intercept"),
  set_prior("normal(0,1)", class="b", coef="gram"),
  set_prior("normal(0,1)", class="b", coef="int_g"),
  set_prior("normal(0,1)", class="b", coef="int_u"),
  set_prior("normal(0,1)", class="sd"),
  set_prior("normal(0,1)", class="sigma"),
  set_prior("lkj(2)", class="cor"))
```

Reading time analysis results

In the tables below, each effect is described in terms of its posterior mean on log scale and the lower and upper bound of 95% credible interval.

Critical region

Table 5: Analysis results for the reading times in the critical region showing estimates for the main effects of grammaticality ('gram') and number interference ('int') as well as their interaction.

	Estimate	Est.Error	Q2.5	Q97.5
Intercept	6.9843228	0.0656493	6.8537843	7.1126898
gram	-0.1336708	0.0191183	-0.1720791	-0.0959395
int	0.0033734	0.0126420	-0.0222865	0.0286214
gramxint	0.0085661	0.0126050	-0.0162555	0.0336149

Model estimates back-transformed to milliseconds

```
## Estimate_gram      95% CrI
## 1      -291 ms [-397, -195]

## Estimate_int      95% CrI
## 1         7 ms [-48, 62]

## Estimate_gramxint  95% CrI
## 1         19 ms [-35, 74]
```

Table 6: Analysis results for the reading times in the critical region showing estimates for the number interference effect in the grammatical (int_g) and ungrammatical sentences (int_u) separately.

	Estimate	Est.Error	Q2.5	Q97.5
Intercept	6.9779858	0.0676559	6.8445537	7.1062190
gram	-0.1344498	0.0197940	-0.1742605	-0.0955689
int_g	0.0121506	0.0167456	-0.0208310	0.0453080
int_u	-0.0052339	0.0186108	-0.0420719	0.0313422

Model estimates back-transformed to milliseconds

```
## Estimate_int_grammatical  95% CrI
## 1              26 ms [-44, 98]

## Estimate_int_ungrammatical  95% CrI
## 1             -11 ms [-91, 67]
```

Post-critical region

Table 7: Analysis results for the reading times in the post-critical region showing estimates for the main effects of grammaticality ('gram') and number interference ('int') as well as their interaction.

	Estimate	Est.Error	Q2.5	Q97.5
Intercept	6.7740593	0.0535700	6.6709926	6.8850469
gram	-0.0213145	0.0098234	-0.0415032	-0.0021825
int	-0.0107626	0.0093315	-0.0291852	0.0077659
gramxint	0.0186497	0.0094252	0.0003084	0.0369975

Model estimates back-transformed to milliseconds

```
## Estimate_gram 95% CrI
## 1 -37 ms [-72, -4]

## Estimate_int 95% CrI
## 1 -19 ms [-51, 14]

## Estimate_gramxint 95% CrI
## 1 33 ms [1, 66]
```

Table 8: Analysis results for the reading times in the post-critical region showing estimates for the number interference effect in the grammatical (int_g) and ungrammatical sentences (int_u) separately.

	Estimate	Est.Error	Q2.5	Q97.5
Intercept	6.7726445	0.0549820	6.6679847	6.8774427
gram	-0.0208679	0.0101460	-0.0407317	-0.0015244
int_g	0.0081799	0.0127716	-0.0173799	0.0331611
int_u	-0.0293320	0.0141737	-0.0573918	-0.0011076

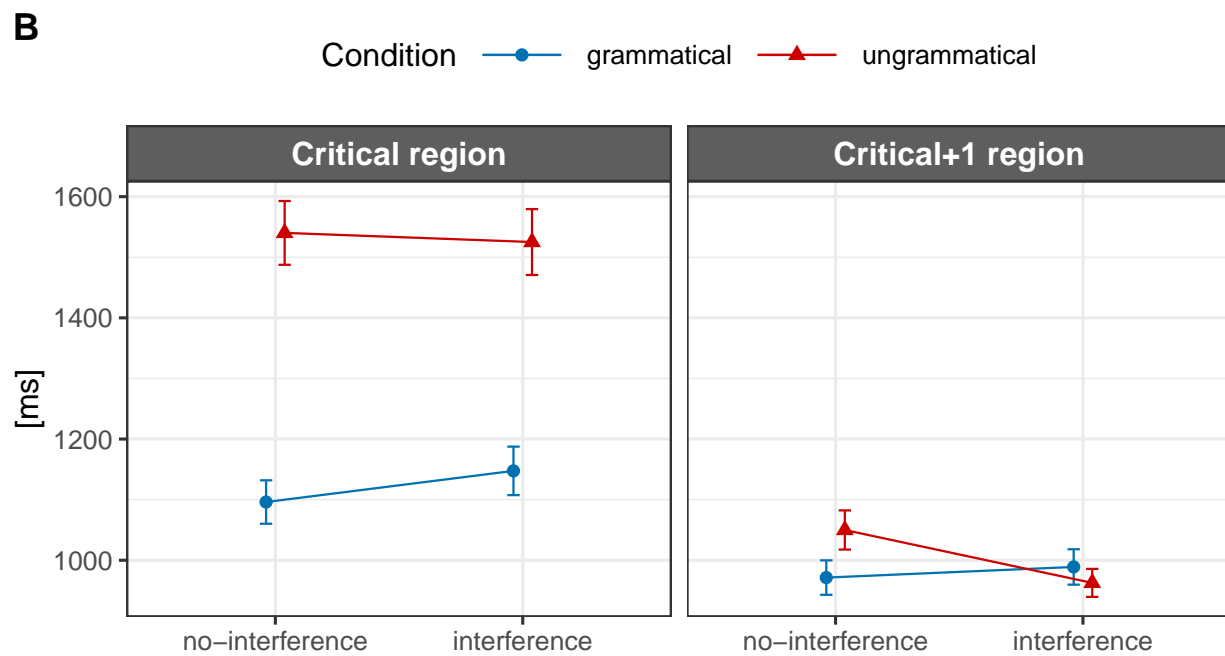
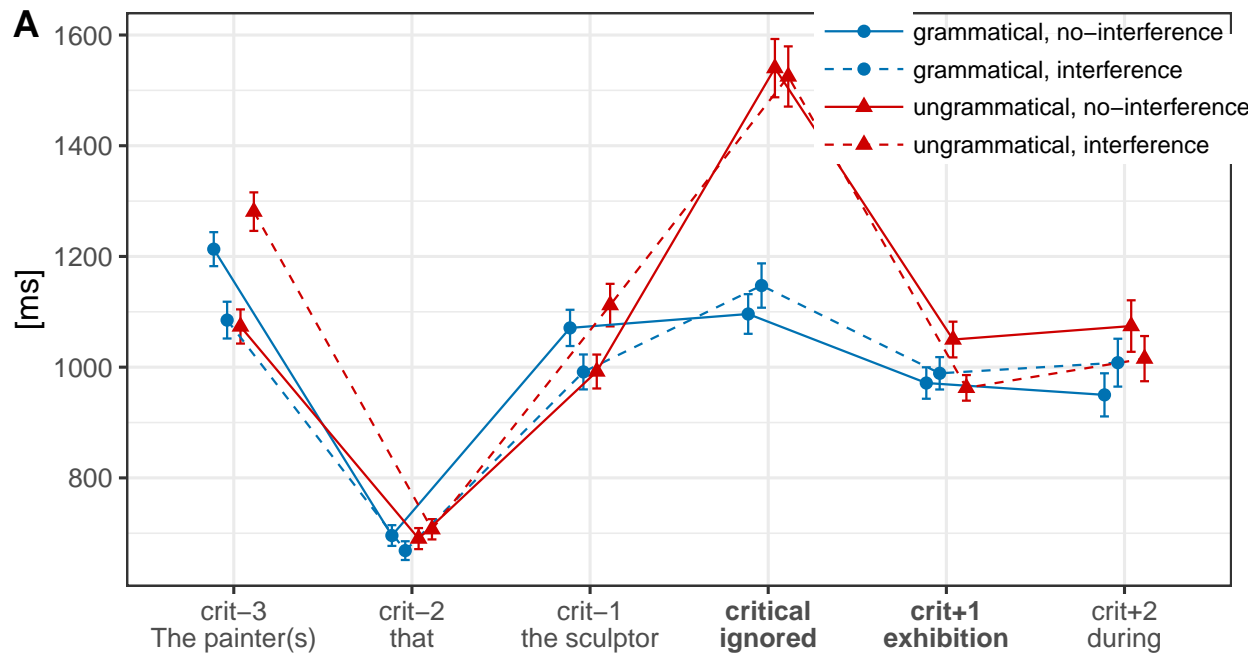
Model estimates back-transformed to milliseconds

```
## Estimate_int_grammatical 95% CrI
## 1 14 ms [-30, 58]

## Estimate_int_ungrammatical 95% CrI
## 1 -51 ms [-100, -2]
```


Plots

By-region RT plot



Density plots

