

Lösung Zettel 3

2023-06-02

Aufgabe 1

Libraries

```
set.seed(42)
library(dplyr)
library(bcogsci)
library(brms)
library(lme4)
```

Laden der Daten

```
data("sleepstudy")
```

(a)

Schaue dir die Daten im Datensatz an. Welche Verteilung würdest du für die Reaktionszeit unterstellen? Gegeben der Daten welche Prior würdest du auswählen? (*Hinweis: Es gibt nicht die EINE richtige Antwort*)

```
summary(sleepstudy)
```

##	Reaction	Days	Subject
##	Min. :194.3	Min. :0.0	308 : 10
##	1st Qu.:255.4	1st Qu.:2.0	309 : 10
##	Median :288.7	Median :4.5	310 : 10
##	Mean :298.5	Mean :4.5	330 : 10
##	3rd Qu.:336.8	3rd Qu.:7.0	331 : 10
##	Max. :466.4	Max. :9.0	332 : 10
##			(Other):120

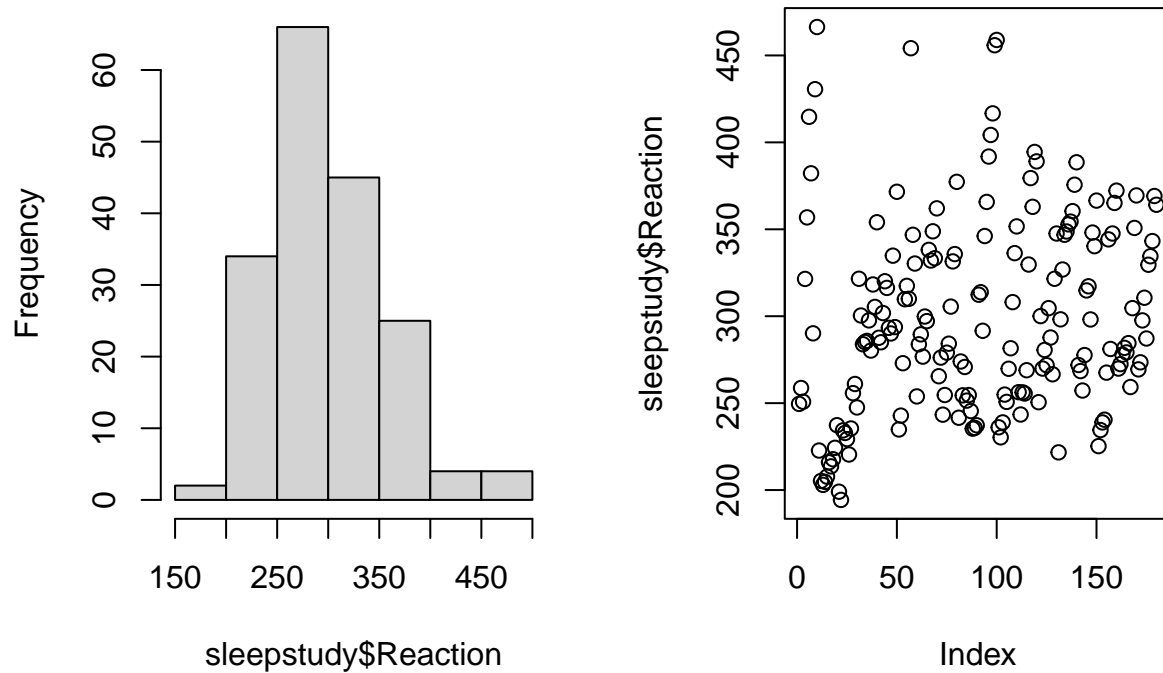
```
mean(sleepstudy$Reaction); sd(sleepstudy$Reaction)
```

```
## [1] 298.5079
```

```
## [1] 56.32876
```

```
par(mfrow = c(1, 2)) # zwei Grafiken in einer Figure
hist(sleepstudy$Reaction)
plot(sleepstudy$Reaction)
```

Histogram of sleepstudy\$Reaction



- die zu erklärende Variable scheint normalverteilt zu sein.
- ein gaussian prior scheint sinnvoll zu sein.

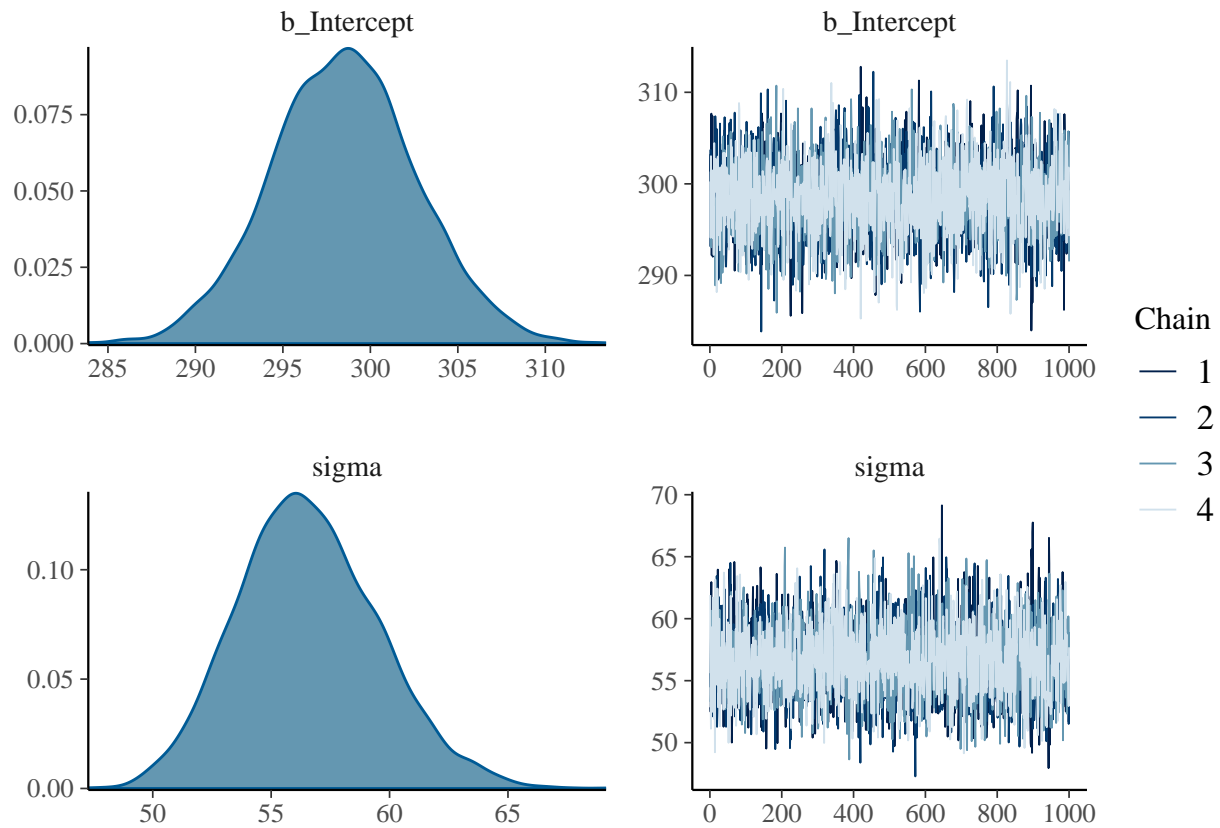
(b)

Fitte ein Intercept Model und ein Model welches die Tage als erklärende Variable in das Model mit aufnimmt. Vergleiche beide Modelle, welches scheint besser zu sein?

```
m_b1 = brm(Reaction ~ 1,
  family = gaussian(),
  data = sleepstudy,
  prior = c(prior(normal(300, 100), class = Intercept),
    prior(normal(0, 60), class = sigma)))
```

```
m_b1
```

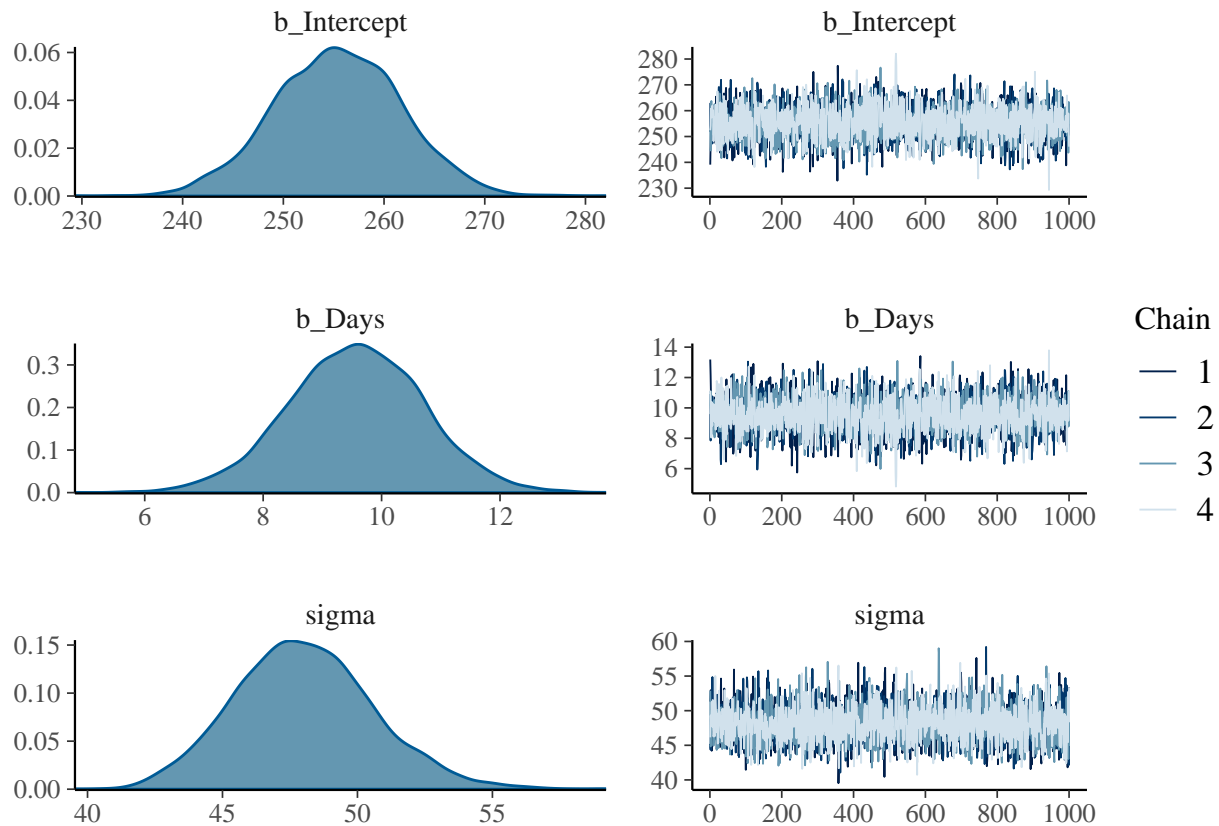
```
plot(m_b1)
```



```
m_b2 = brm(Reaction ~ 1 + Days,
  family = gaussian(),
  data = sleepstudy,
  prior = c(prior(normal(300, 100), class = Intercept),
    prior(normal(0, 60), class = sigma),
    prior(normal(4.5, 3), class = b, coef = Days)))
```

```
m_b2
```

```
plot(m_b2)
```



(c) - (d)

In den Daten ist die Variable **Subject** enthalten. Wir haben also wiederholte Messungen. Wie würdest du damit umgehen? Wie angebracht sind die bisherigen Modelle, wenn du bedenkst, dass es wiederholte Messungen gibt?

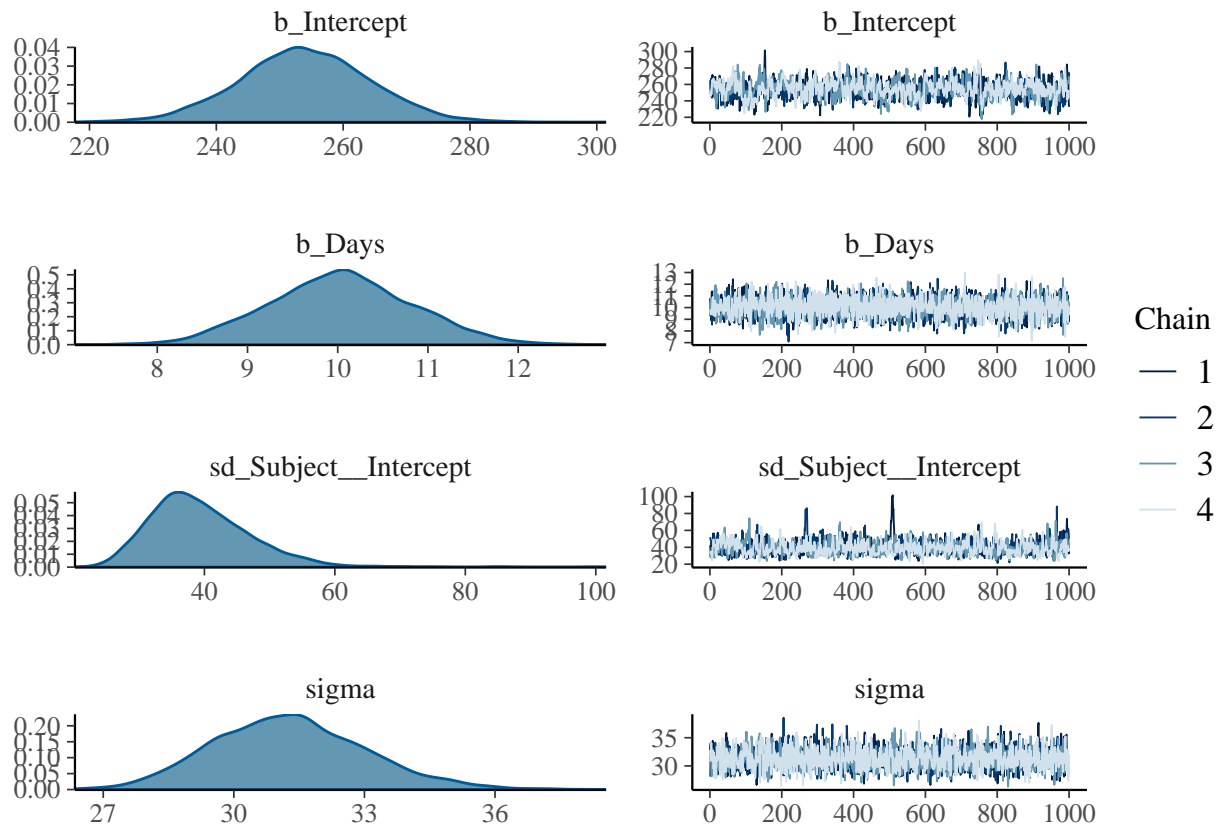
```
test = aggregate(sleepstudy$Reaction, list(sleepstudy$Subject), FUN=sd) # SD pro Gruppe
mean(test$x); sd(sleepstudy$Reaction)

## [1] 40.23369
## [1] 56.32876

m_c1 = brm(Reaction ~ 1 + Days + (1 | Subject),
  family = gaussian(),
  data = sleepstudy,
  prior = c(prior(normal(300, 100), class = Intercept),
    prior(normal(0, 60), class = sigma),
    prior(normal(4.5, 3), class = b, coef = Days),
    prior(normal(0, 60), class = sd, coef = Intercept, group = Subject)))

m_c1

plot(m_c1)
```



Aufgabe 2

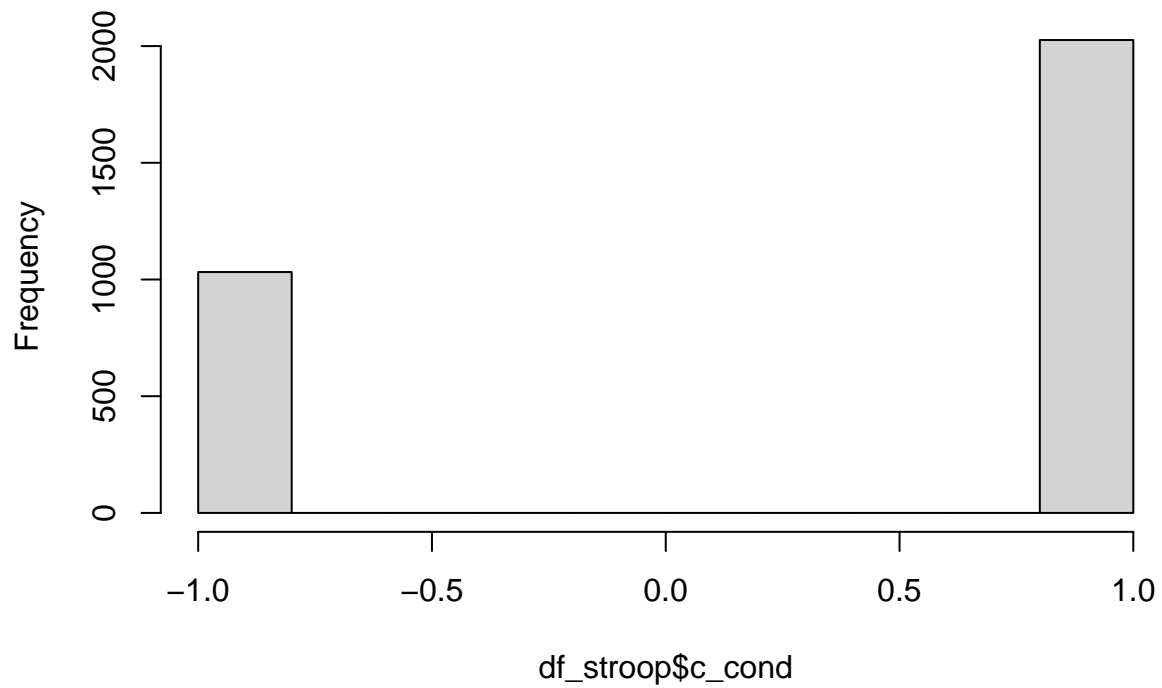
(a)

```
library(bcogsci)
data("df_stroop")

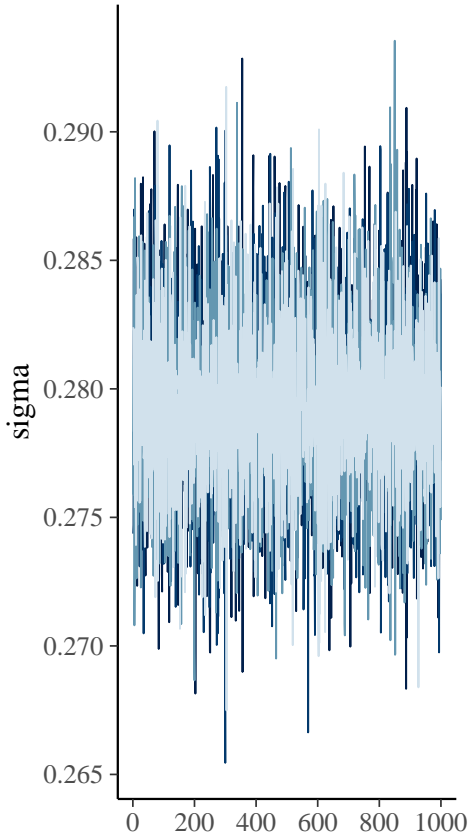
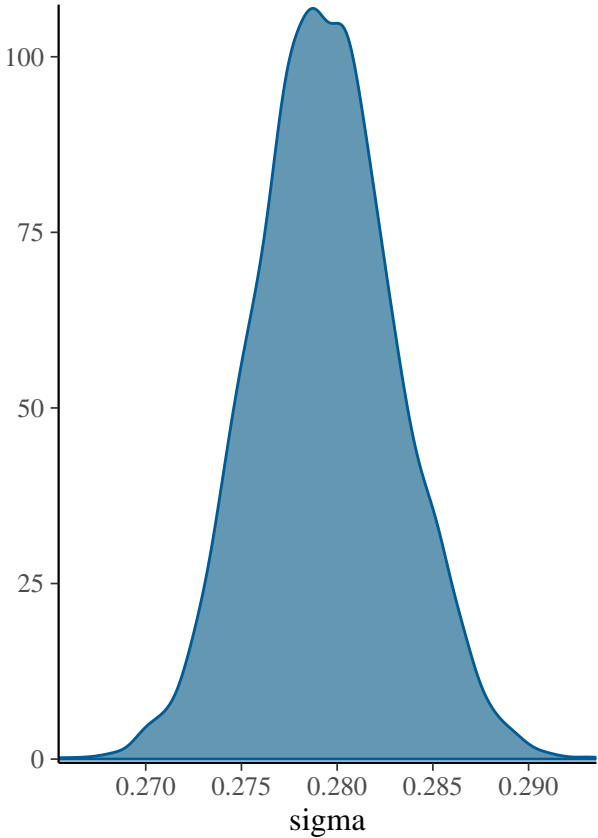
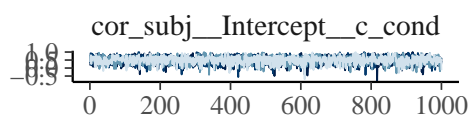
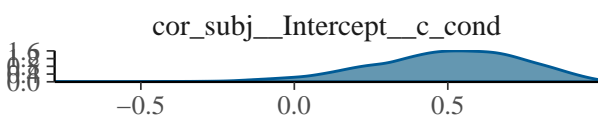
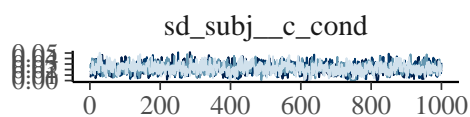
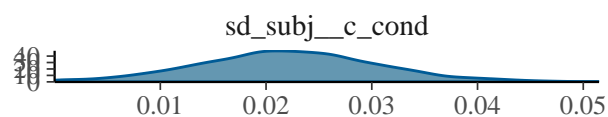
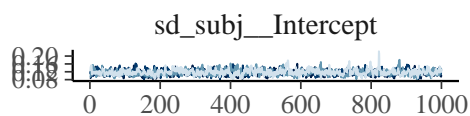
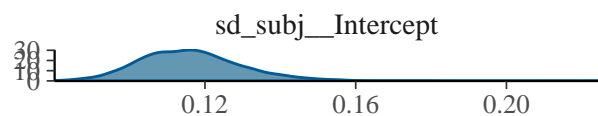
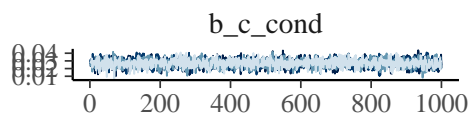
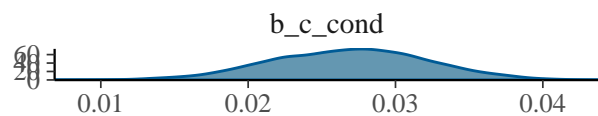
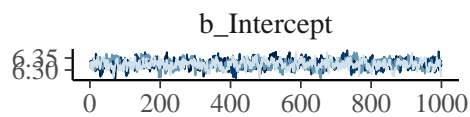
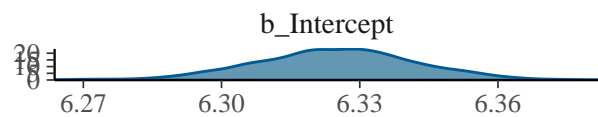
df_stroop = df_stroop %>%
  mutate(c_cond = if_else(condition == 'Incongruent', 1, -1))

hist(df_stroop$c_cond)
```

Histogram of df_stroop\$c_cond



```
m_2a <- brm(RT ~ c_cond + (c_cond | subj),  
  family = lognormal(),  
  prior =  
    c(  
      prior(normal(6, 1.5), class = Intercept),  
      prior(normal(0, .01), class = b),  
      prior(normal(0, 1), class = sigma),  
      prior(normal(0, 1), class = sd),  
      prior(lkj(2), class = cor)  
    ),  
  data = df_stroop  
)  
m_2a  
plot(m_2a)
```



Chain

- 1
- 2
- 3
- 4

Chain

- 1
- 2
- 3
- 4

```
posterior_summary(m_2a, variable = "b_c_cond")
```