Simon 1

Table des matières

Raw data

Let's first have a look on the distribution of DMC parameters vs. age.

And the distribution of the parameters.

Fits by parameter

Priors

We use normal(0,1) priors for alpha and half normal(0,1) prior for beta and gamma.

```
prior <-  prior(normal(0, 1), nlpar = "b1", class = 'b', lb = 0) +
prior(normal(0, 1), nlpar = "b2", class = 'b', lb = 0) +
prior(normal(0, 1), nlpar = "b3", class = 'b', lb = 0)
```

drift

```
fit.v.exp <- brm(bf(param ~  -b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'v'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_pars = save_pars(all = TRUE),
```

```
       save_model = 'v_exp.stan',file = 'v_exp'
       )

fit.v.puissance <- brm(bf(param ~ -b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'v'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .99,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'v_puissance.stan',
       #file = 'v_puissance',
       save_pars = save_pars(all = TRUE)
       )

fit.v.linear <- brm(param ~  age,
       data = data %>% filter(type == 'v'),
       prior = c(set_prior("normal(0,1)",  class = "b")),
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .99,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'v_linear.stan',
       save_pars = save_pars(all = TRUE),
       file = 'v_linear'
       )

loo.v.exp <-  loo(fit.v.exp, moment_match = TRUE)
loo.v.puissance <-  loo(fit.v.puissance, moment_match = TRUE)
loo.v.linear <-  loo(fit.v.linear, moment_match = TRUE)
loo.v <- loo_compare(loo.v.exp, loo.v.puissance, loo.v.linear)
```

boundary

```
fit.a.exp <- brm(bf(param ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'a'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .99,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'a_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'a_exp'
       )
summary(fit.a.exp)
fit.a.puissance <- brm(bf(param ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'a'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .99,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'a_puissance.stan',
```

```
       save_pars = save_pars(all = TRUE),
       file = 'a_puissance'
       )
summary(fit.a.puissance)
fit.a.linear <- brm(param ~  age,
       data = data %>% filter(type == 'a'),
       prior = c(set_prior("normal(0,1)", class = "b")),
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'a_linear.stan',
       save_pars = save_pars(all = TRUE),
       file = 'a_linear'
       )
summary(fit.a.linear)

loo.a.puissance <-  loo(fit.a.puissance, moment_match = TRUE)
loo.a.linear <-  loo(fit.a.linear, moment_match = TRUE)
loo.a.exp <- loo_compare(loo.a.exp, loo.a.puissance, loo.a.linear)
```

Residual Time

```
fit.ter.exp <- brm(bf(param ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'ter'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'ter_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'ter_exp'
       )
summary(fit.ter.exp)
fit.ter.puissance <- brm(bf(param ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'ter'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'ter_puissance.stan',
       save_pars = save_pars(all = TRUE),
       file = 'ter_puissance'
       )
summary(fit.ter.puissance)
fit.ter.linear <- brm(param ~  age,
       data = data %>% filter(type == 'ter'),
       prior = c(set_prior("normal(0,1)", class = "b")),
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'ter_linear.stan',
```

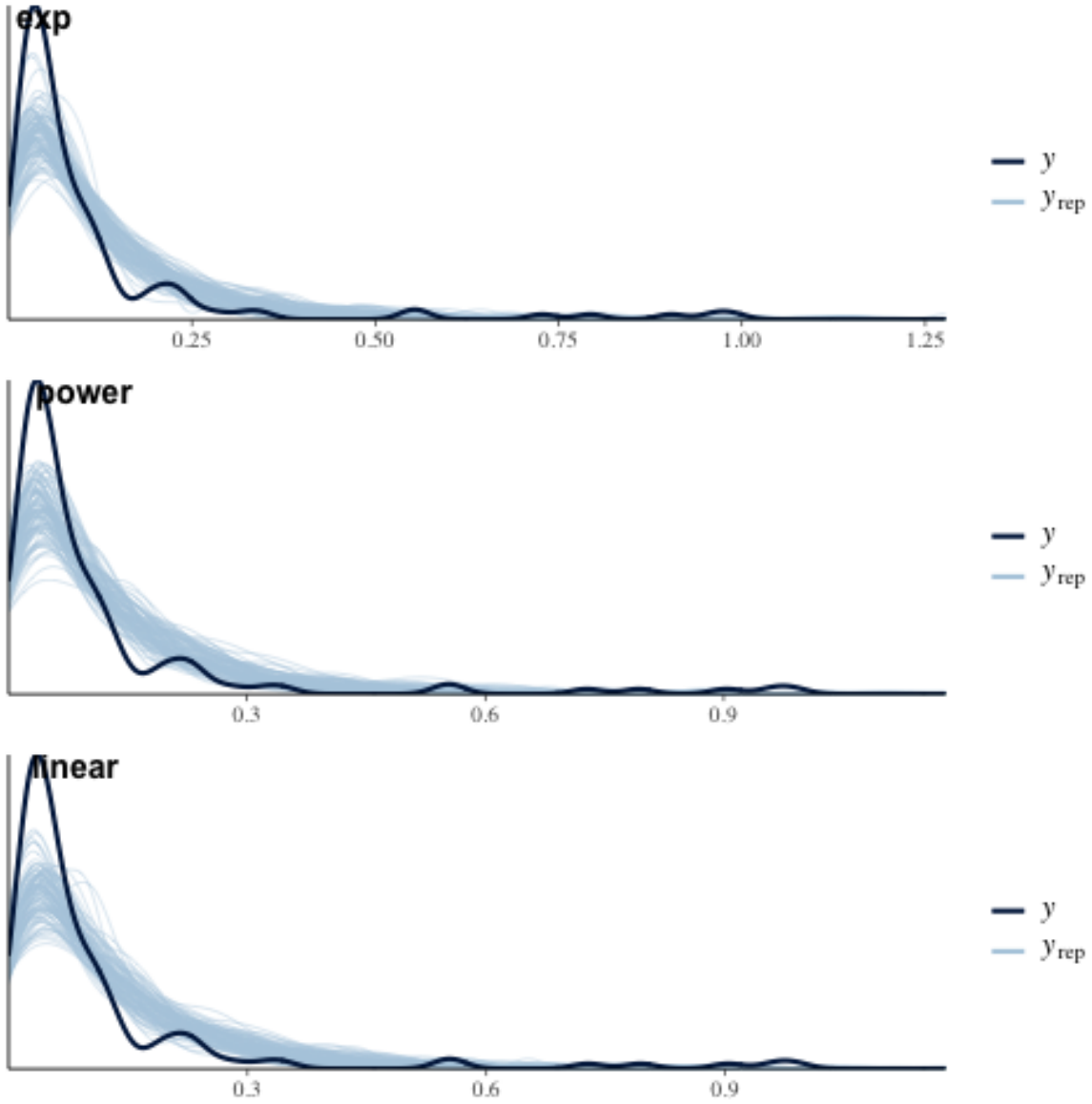
```
       save_pars = save_pars(all = TRUE),
       file = 'ter_linear'
       )
summary(fit.ter.linear)
```

```
loo.ter.exp <-  loo(fit.ter.exp, moment_match = TRUE)
loo.ter.puissance <-  loo(fit.ter.puissance, moment_match = TRUE)
loo.ter.linear <-  loo(fit.ter.linear, moment_match = TRUE)
loo.ter <- loo_compare(loo.ter.exp, loo.ter.puissance, loo.ter.linear)
```

tau

```
fit.tau.exp <- brm(bf(param ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'tau'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 25),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'tau_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'tau_exp'
       )
summary(fit.tau.exp)
fit.tau.puissance <- brm(bf(param ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'tau'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'tau_puissance.stan',
       save_pars = save_pars(all = TRUE),
       file = 'tau_puissance'
       )
summary(fit.tau.puissance)
fit.tau.linear <- brm(param ~  age,
       data = data %>% filter(type == 'tau'),
       prior = c(set_prior("normal(0,1)", class = "b")),
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'tau_linear.stan',
       save_pars = save_pars(all = TRUE),
       file = 'tau_linear'
       )
```

```
loo.tau.exp <-  loo(fit.tau.exp, moment_match = TRUE, reloo = TRUE)
loo.tau.puissance <-  loo(fit.tau.puissance, moment_match = TRUE)
loo.tau.linear <-  loo(fit.tau.linear, moment_match = TRUE)
loo.tau <- loo_compare(loo.tau.exp, loo.tau.puissance, loo.tau.linear)
```

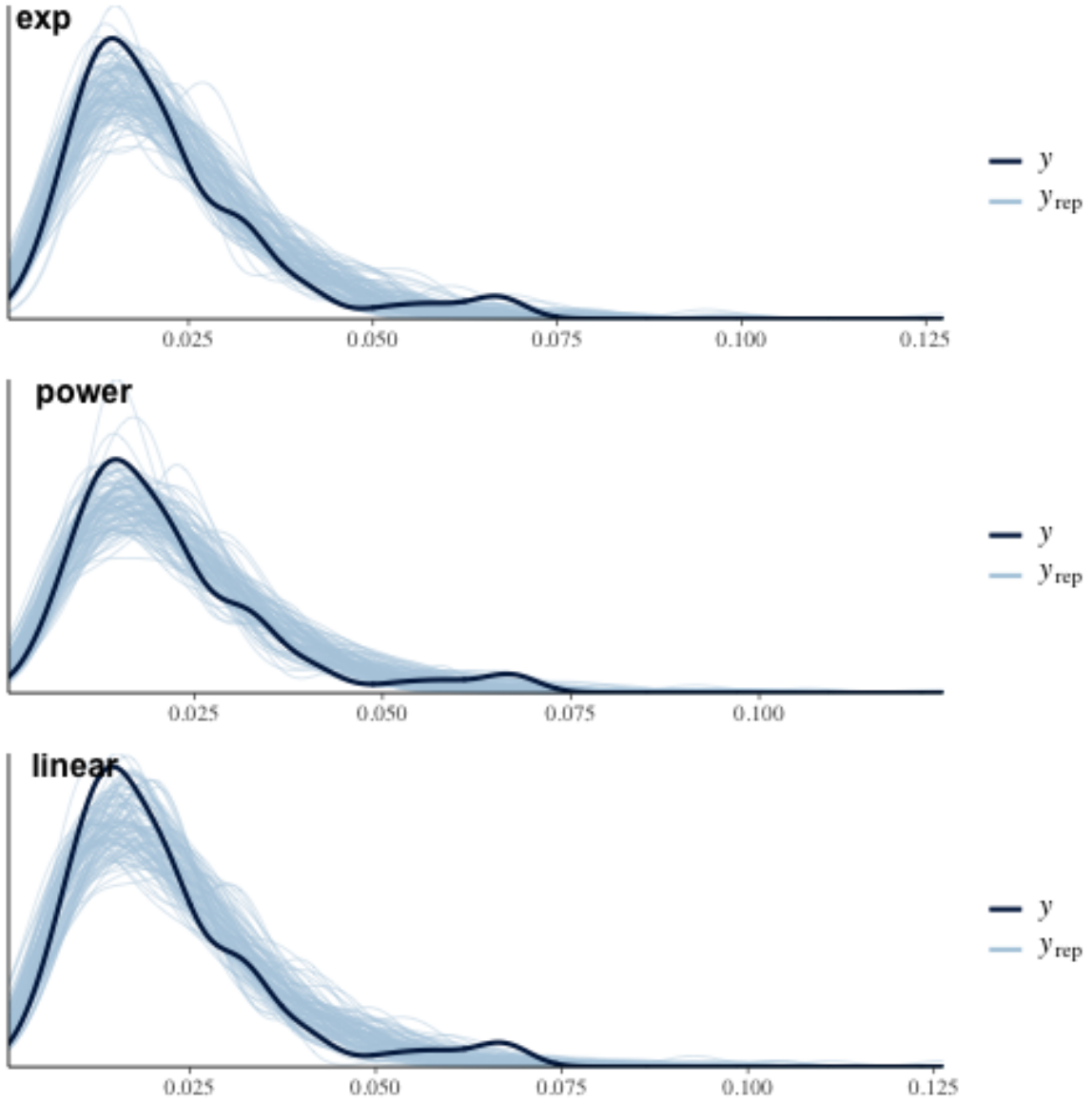


max amplitude

```
fit.max_ampl.exp <- brm(bf(param ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'max_ampl'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'max_ampl_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'max_ampl_exp'
       )
fit.max_ampl.puissance <- brm(bf(param ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'max_ampl'),
       prior = prior,
```

```
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'max_ampl_puissance.stan',
        save_pars = save_pars(all = TRUE),
        file = 'max_ampl_puissance'
        )
fit.max_ampl.linear <- brm(param ~  age,
        data = data %>% filter(type == 'max_ampl'),
        prior = c(set_prior("normal(0,1)", class = "b")),
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'max_ampl_linear.stan',
        save_pars = save_pars(all = TRUE),
        file = 'max_ampl_linear'
        )

loo.max_ampl.exp <-  loo(fit.max_ampl.exp, moment_match = TRUE)
loo.max_ampl.puissance <-  loo(fit.max_ampl.puissance, moment_match = TRUE)
loo.max_ampl.linear <-  loo(fit.max_ampl.linear, moment_match = TRUE)
loo.max_ampl <- loo_compare(loo.max_ampl.exp, loo.max_ampl.puissance, loo.max_ampl.linear)
```

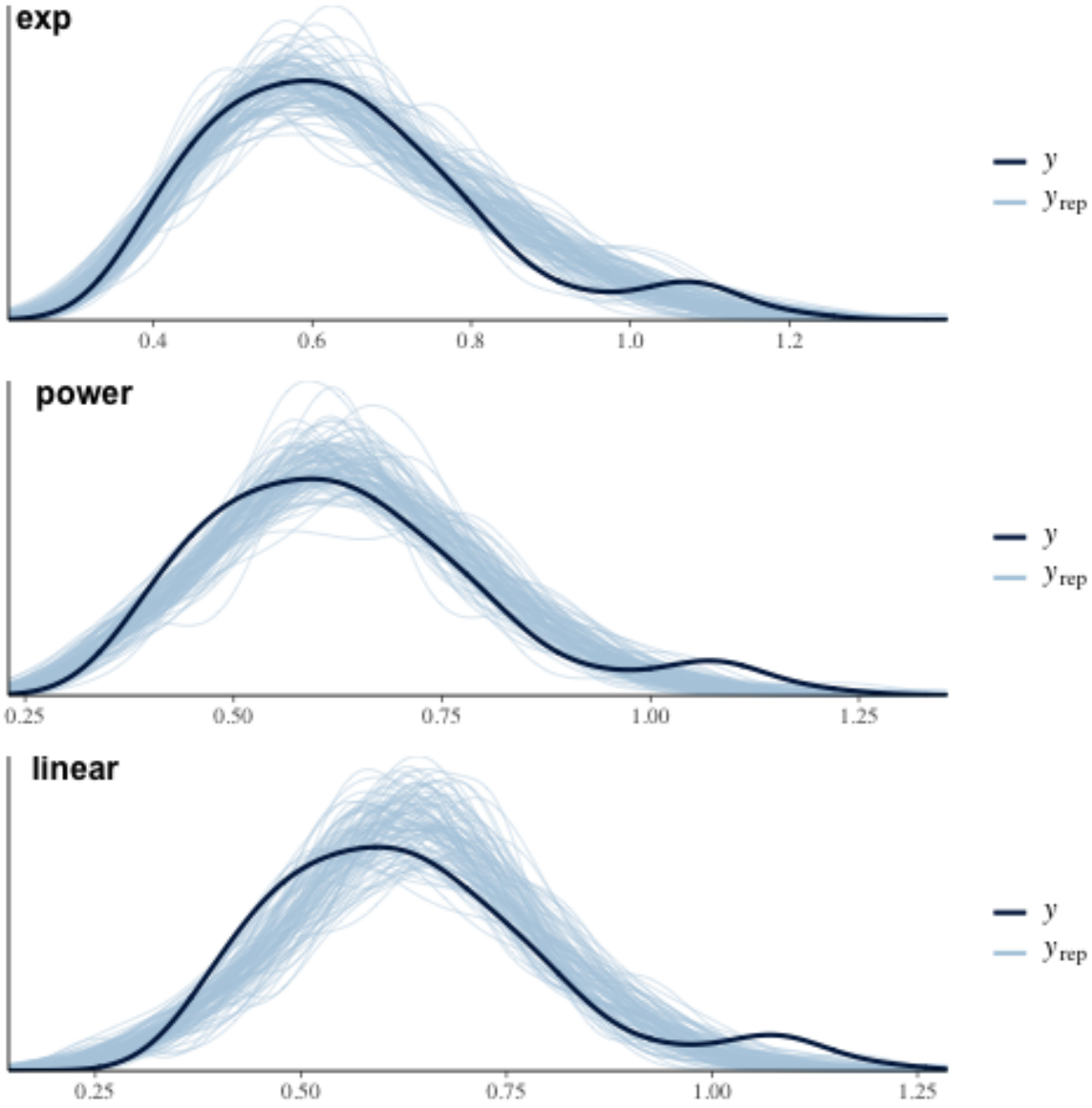


RT comp

```
fit.meanRT_comp.exp <- brm(bf(param/1000 ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'meanRT_comp'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'meanRT_comp_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'meanRT_comp_exp'
       )
fit.meanRT_comp.puissance <- brm(bf(param/1000 ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'meanRT_comp'),
       prior = prior,
```

```
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'meanRT_comp_puissance.stan',
        save_pars = save_pars(all = TRUE),
        file = 'meanRT_comp_puissance'
        )
fit.meanRT_comp.linear <- brm(param/1000 ~  age,
        data = data %>% filter(type == 'meanRT_comp'),
        prior = c(set_prior("normal(0,1)", class = "b")),
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'meanRT_comp_linear.stan',
        save_pars = save_pars(all = TRUE),
        file = 'meanRT_comp_linear'
        )

loo.meanRT_comp.exp <-  loo(fit.meanRT_comp.exp, moment_match = TRUE)
loo.meanRT_comp.puissance <-  loo(fit.meanRT_comp.puissance, moment_match = TRUE)
loo.meanRT_comp.linear <-  loo(fit.meanRT_comp.linear, moment_match = TRUE)
loo.meanRT_comp <- loo_compare(loo.meanRT_comp.exp, loo.meanRT_comp.puissance, loo.meanRT_comp.linear
```

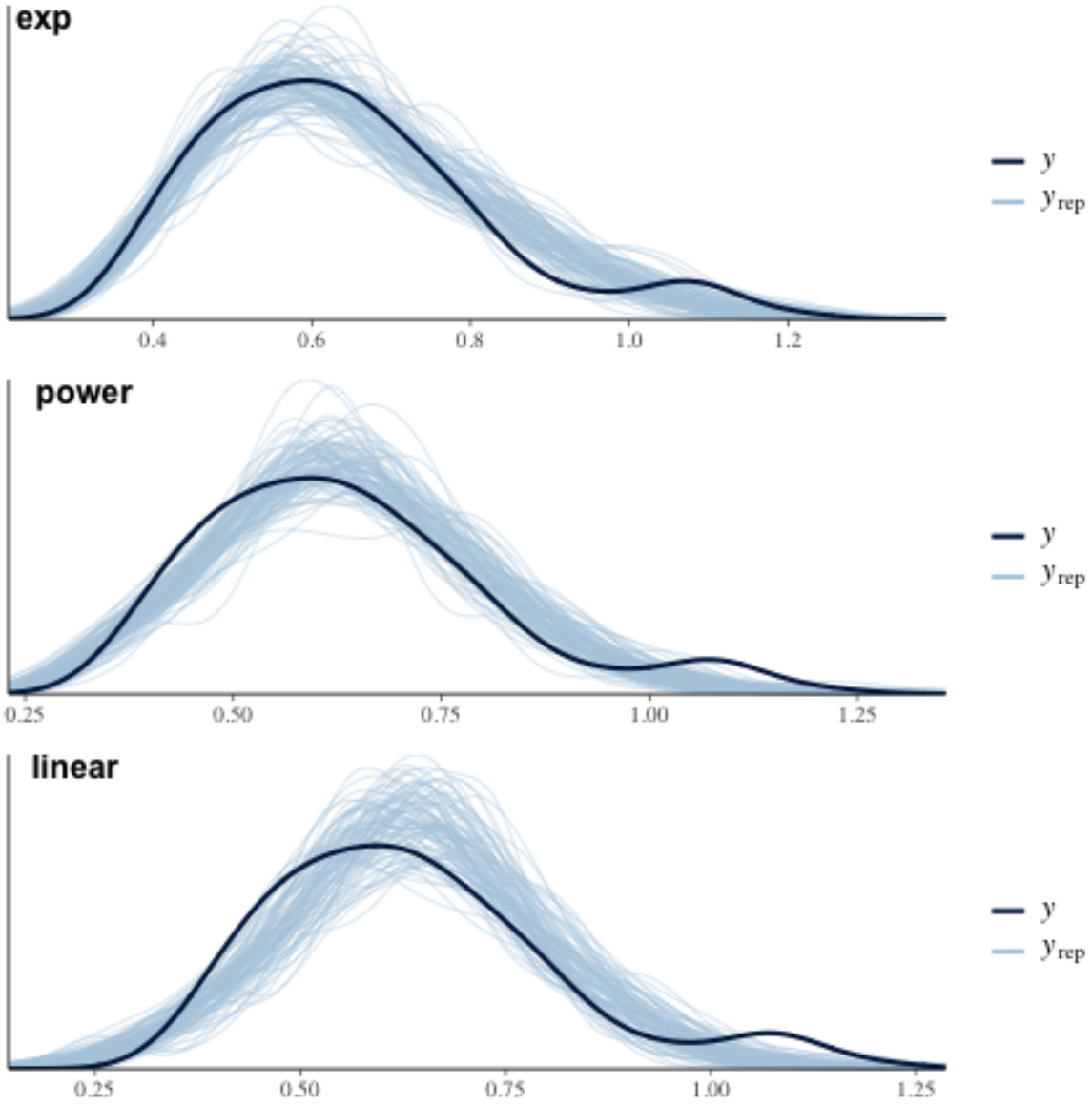


RT incomp

```
fit.meanRT_incomp.exp <- brm(bf(param/1000 ~  b1  * exp(-b2 * age) + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'meanRT_incomp'),
       prior = prior,
       family = Gamma(link = 'identity'),
       cores = 4, chains = 4,
       control = list(adapt_delta = .95,  max_treedepth = 12),
       iter = 8000,  warmup = 4000, seed = 123,
       save_model = 'meanRT_incomp_exp.stan',
       save_pars = save_pars(all = TRUE),
       file = 'meanRT_incomp_exp'
       )
fit.meanRT_incomp.puissance <- brm(bf(param/1000 ~ b1  * age ^(-b2)  + b3,
      b1 ~ 1, b2 ~ 1, b3 ~ 1, nl = TRUE),
       data = data %>% filter(type == 'meanRT_incomp'),
       prior = prior,
```

```
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'meanRT_incomp_puissance.stan',
        save_pars = save_pars(all = TRUE),
        file = 'meanRT_incomp_puissance'
        )
fit.meanRT_incomp.linear <- brm(param/1000 ~  age,
        data = data %>% filter(type == 'meanRT_incomp'),
        prior = c(set_prior("normal(0,1)", class = "b")),
        family = Gamma(link = 'identity'),
        cores = 4, chains = 4,
        control = list(adapt_delta = .95,  max_treedepth = 12),
        iter = 8000,  warmup = 4000, seed = 123,
        save_model = 'meanRT_incomp_linear.stan',
        save_pars = save_pars(all = TRUE),
        file = 'meanRT_incomp_linear'
        )

loo.meanRT_incomp.exp <-  loo(fit.meanRT_incomp.exp, moment_match = TRUE)
loo.meanRT_incomp.puissance <-  loo(fit.meanRT_incomp.puissance, moment_match = TRUE)
loo.meanRT_incomp.linear <-  loo(fit.meanRT_incomp.linear, moment_match = TRUE)
loo.meanRT_incomp <- loo_compare(loo.meanRT_incomp.exp, loo.meanRT_incomp.puissance, loo.meanRT_incom
```



Summary

Models

There are two groups of parameters :

- v, ter, RTcomp, RTincomp : power and exp models are equivalent, and dominate linear model
- a, tau, $\max_{\text{ampl}}$: all models are equivalent...

```
loo.v
loo.a
loo.ter
loo.tau
loo.max_ampl
loo.meanRT_comp
loo.meanRT_incomp
```

a, tau, max_{ampl}

Because all models are roughly equivalent, we analyse the simplest one (ie, linear). We observe that the models are really not good.

```
fixef(fit.a.linear)
```

```
             Estimate    Est.Error         Q2.5         Q97.5
Intercept  0.08281029 0.0034643369  0.076090827  0.0896605958
age       -0.00127973 0.0002008196 -0.001654081 -0.0008639675
```

```
fixef(fit.tau.linear)
```

```
              Estimate    Est.Error         Q2.5        Q97.5
Intercept  0.147799942 0.0183910957  0.112579933  0.185145759
age       -0.002520769 0.0009922689 -0.004180671 -0.000277288
```

```
fixef(fit.max_ampl.linear)
```

```
               Estimate    Est.Error          Q2.5        Q97.5
Intercept  0.0256772069 0.0022249525  0.0212890302 2.997045e-02
age       -0.0002986053 0.0001419562 -0.0005459726 1.042404e-05
```

V, ter, TR_{comp}, $\text{TR}_{\text{incomp}}$