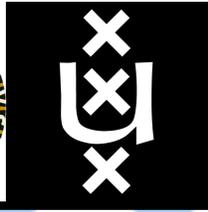# I am Blue All Day = I am Blue Tomorrow?
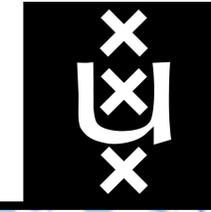
Simulating the Correlation Between Momentary and Day-to-Day Inertia

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Introduction

Emotional inertia represents the speed with which an individual returns to his or her baseline level of emotion after a deviation has taken place. Individuals who have high inertia within days –individuals who have trouble returning to their baseline level of emotion– are expected to also experience a high inertia between days. **The goal of this internship was to simulate a positive correlation between momentary and day-to-day inertia in a Bayesian framework and test whether or not this correlation can be estimated accurately.**

Simulation

Momentary inertia is operationalized as the autocorrelation between a time point and its previous time point and day-to-day inertia as the autocorrelation between a day and the previous day. We simulated 100 datasets each with 79 participants, 21 days and 15 measurements per day. Convergence of the model was reached with 1.000.000 iterations. Parameter estimates had preset values to test the accuracy of the model. We tested the accuracy of the model by determining the mean estimate, the deviation from the simulated estimate θ, the width of the 95% credible intervals (CIs) and how many times θ and zero fall within the interval.

Model Formulation

Equation 1 displays the model used to estimate emotional inertia. An example of emotional inertia is displayed in **Figure 1**. It displays a mean emotion score (μ_i: black dashed line), a mean emotion score per day (black solid line), momentary inertia (ϕ_i; grey dashed line) and day-to-day inertia (β_i; grey solid line).

Multilevel Equation

Model used to estimate emotional inertia.

$$\text{Level 1}: y_{mdi} = \mu_{di} + \phi_i(y_{m-1,di} - \mu_{di}) + e_{mdi}$$

$$\text{Level 2}: \mu_{di} = \mu_i + \beta_i(\mu_{d-1,i} - \mu_i) + r_{0di}$$

$$\text{Level 3}: \mu_i = \gamma_{000} + u_{00i}$$

$$\beta_i = \gamma_{010} + u_{01i}$$

$$\phi_i = \gamma_{100} + u_{10i}$$

Equation 1

Deviation from the Mean

Parameter	θ	Mean estimate	Deviation from θ
μ_i	5.00	4.927	0.071
β_i	0.30	0.030	-0.003
ϕ_i	0.30	0.298	0.002
$Cor(\beta_i, \phi_i)$	0.40	0.241	0.159

Table 1. Simulation results concerning the mean.

95% Credible Intervals

Parameter	Mean Boundaries	Mean Width	Percentage Including θ	Percentage Including 0
μ_i	4.101 - 5.255	1.154	92%	-
β_i	0.220 - 0.382	0.162	96%	-
ϕ_i	0.284 - 0.342	0.058	93%	-
$Cor(\beta_i, \phi_i)$	-0.564 - 0.817	1.381	99%	95%

Table 2. Simulation results concerning the 95% Credible Intervals (95% CI)

Bayesian Multilevel Model

Figure 1 shows an example of an individual with a high momentary inertia, a high day-to-day inertia and a positive correlation between them.
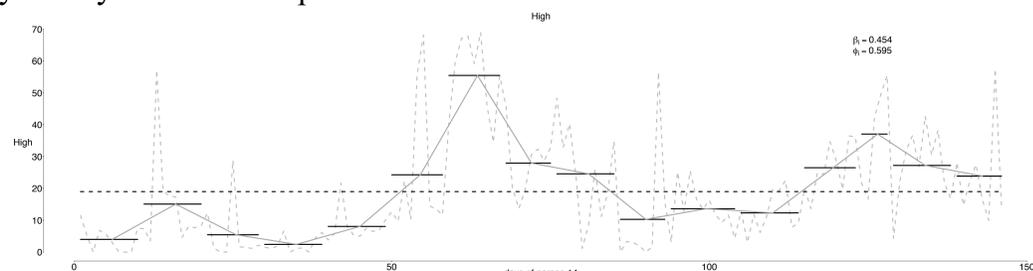

Figure 1

Conclusions

Results indicate that parameters μ_i, β_i, and ϕ_i are estimated accurately; their mean estimates are close to the true value θ, the 95% CIs are small (with the exception of μ_i) and most of the simulated 95% CIs contained the true value. Different results are found for the correlation between momentary inertia (ϕ_i) and day-to-day inertia (β_i). The mean estimates deviates relatively high from the true value θ and its 95% CI is wide in comparison to the individual parameters. Furthermore, most of the simulated credible intervals contained zero. **Although a correlation between momentary inertia and day-to-day inertia was simulated, the 95% CIs signify that this correlation does not exist.**