

MODELING DYNAMICS AND PREDICTORS OF DAILY CHANGES IN PSYCHOLOGICAL WELL-BEING

Zita Oravecz

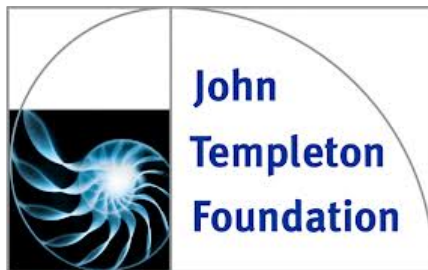
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Thank you for the collaborators

- Saeideh Heshmati (Penn State)
- Timothy Brick (Penn State)
- Sarah Pressman (UCI)
- Joachim Vandekerckhove (UCI)
- William Batchelder (UCI)

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A FIVE-ELEMENT MODEL OF WELL-BEING



- Martin Seligman (2011) proposed a theoretical model of psychological well-being, referred to as PERMA
- Hedonic and eudaimonic elements that contribute to human flourishing

A FIVE-ELEMENT MODEL OF WELL-BEING



Do the PERMA elements change on the short time scale? Do they fluctuate over the course of days?

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- Measure well-being elements multiple times while people are living their everyday life

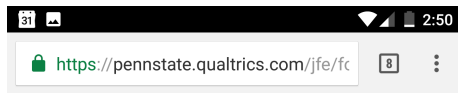
A FIVE-ELEMENT MODEL OF WELL-BEING



Do the PERMA elements change on the short time scale? Do they fluctuate over the course of days?

- Measure well-being elements multiple times while people are living their everyday life
- Model the observed data in terms of baseline, intraindividual variation, and short-term adaptation

An Ecological Momentary Assessment study of well-being



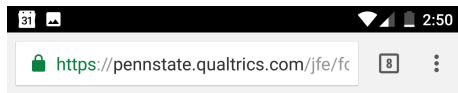
Please take a moment to respond to the following questions. Please make sure you hold your phone with one hand and respond to the questions with the other.



- Prompt participants (semi-randomly) to report on their well-being throughout the day

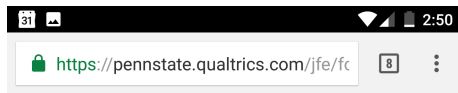


An Ecological Momentary Assessment study of well-being



- Prompt participants (semi-randomly) to report on their well-being throughout the day
- In-the-moment evaluations of well-being while participants live their everyday life

An Ecological Momentary Assessment study of well-being

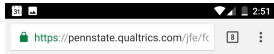


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- Prompt participants (semi-randomly) to report on their well-being throughout the day
- In-the-moment evaluations of well-being while participants live their everyday life
- Intro and exit surveys

An Ecological Momentary Assessment study of well-being



I know what makes my life meaningful.

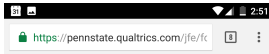
Strongly disagree

Strongly agree



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I am pleased with how things are turning out in my life.

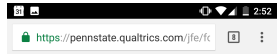
Strongly disagree

Strongly agree



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How pleasant do you feel right now?

Not at all

Extremely



How awake/active do you feel right now?

Not at all

Extremely

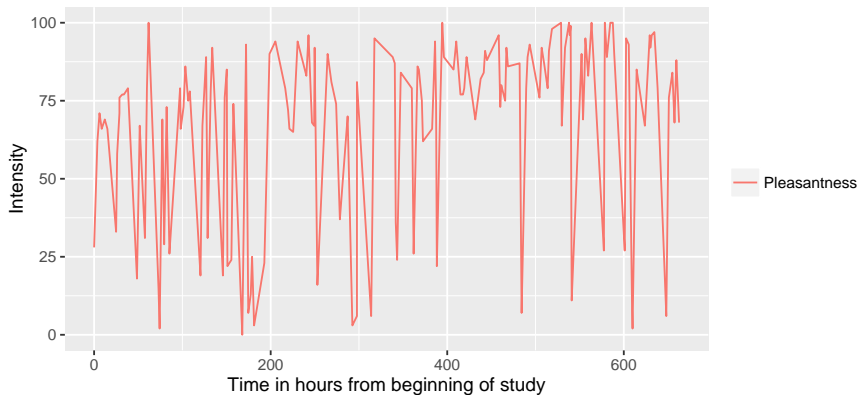


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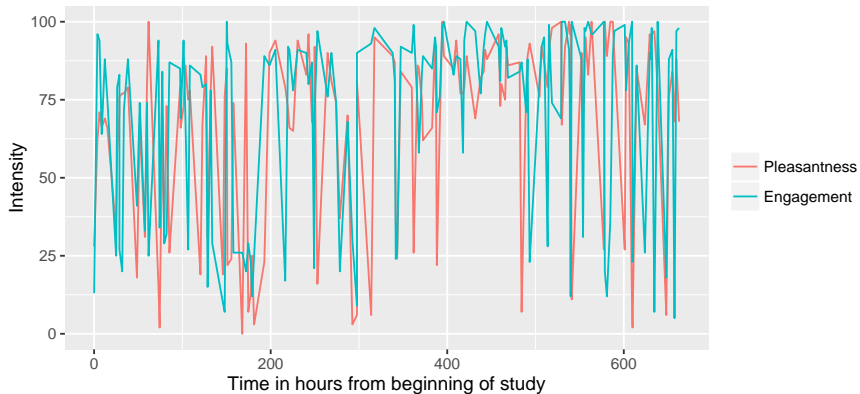
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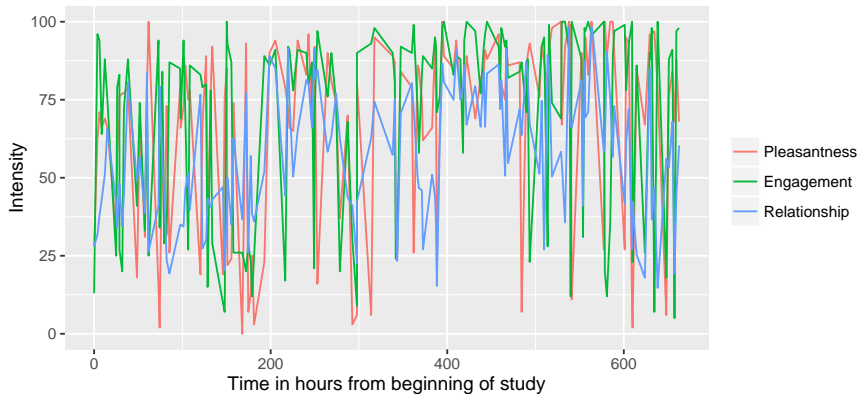
Data from a participant with lots of variation



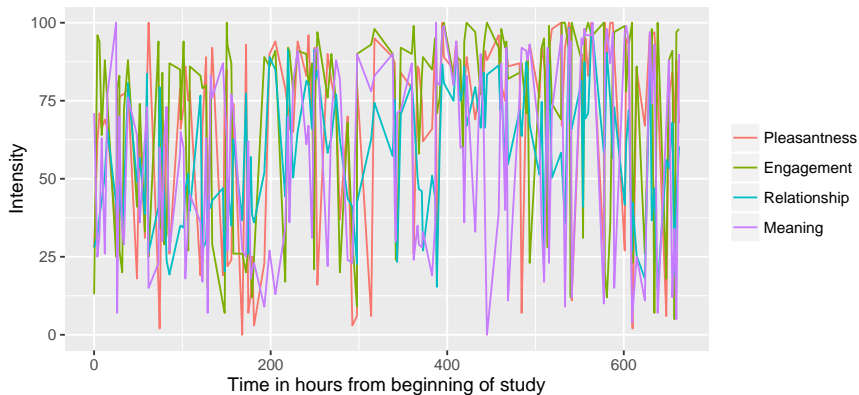
Data from a participant with lots of variation



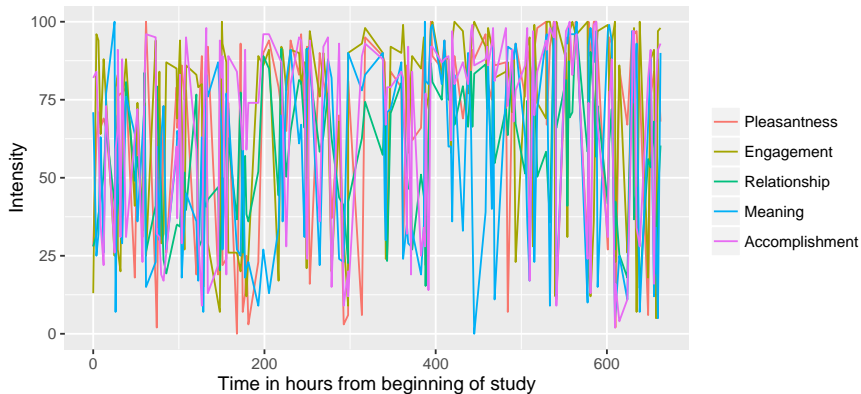
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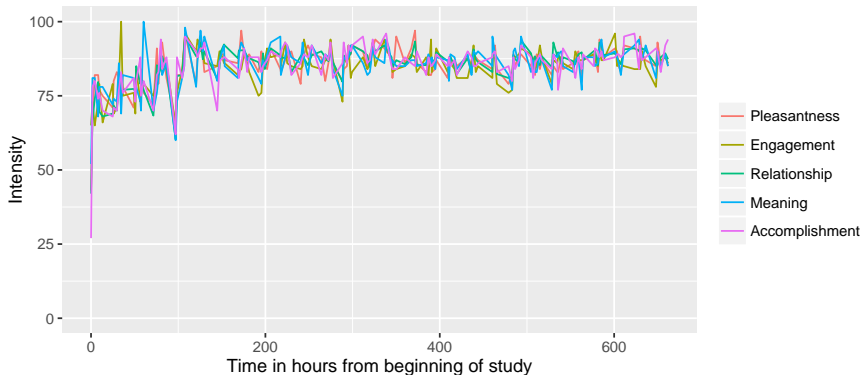
Data from a participant with lots of variation



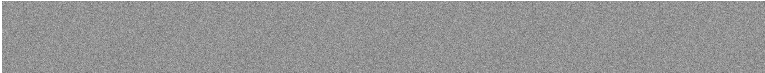
Data from a participant with lots of variation



Data from a participant with not much variation

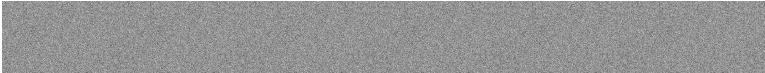


Research questions



When measuring well-being in EMA settings, do we capture intra-individual variation or measurement error?

Research questions



When measuring well-being in EMA settings, do we capture intra-individual variation or measurement error?

Do individual differences in well-being dynamics systematically relate to person characteristics?

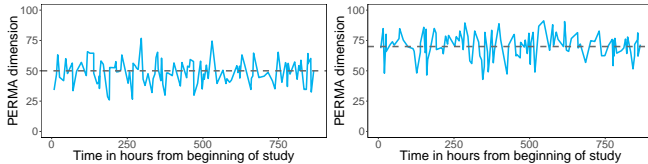


A PROCESS MODEL OF CHANGES IN WELL-BEING

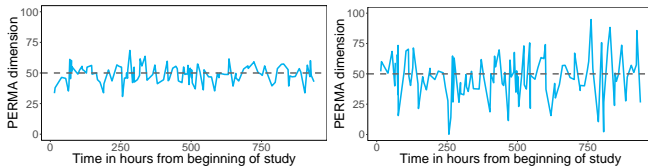


Parameters of a dynamical process model

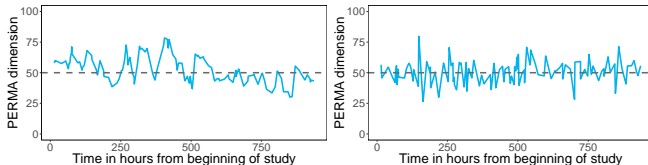
Baseline:



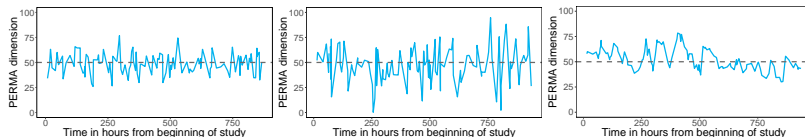
Intraindividual variation:



Short-term adaptation (opposite of inertia):



State space extension to the process model



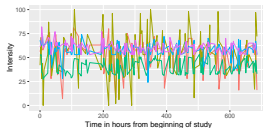
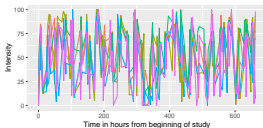
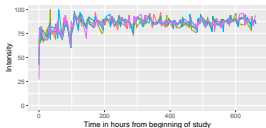
Goal: separate measurement error from intraindiviual variation

$$\begin{cases} d\theta(t) = \beta(\mu - \theta(t))dt + \sigma dW(t) & (1) \\ Y(t) = \theta(t) + \epsilon(t) & (2) \end{cases}$$

Eq. 1: **transition equation**: changes over time on the latent level

Eq. 2: **observation equation**: mapping of the latent position on the observed variable

Individual differences and trait variables

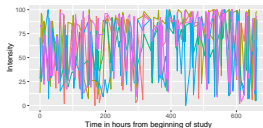
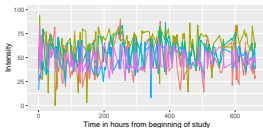
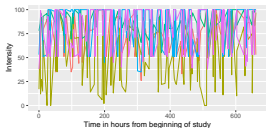


All dynamical model parameters are person-specific and regressed on a set of covariates, for example:

Person-specific pleasantness baseline:

$$\mu_{1,p} \sim N(\mathbf{x}_p \boldsymbol{\alpha}_{\mu_1}, \sigma_{\mu_1}^2)$$

$$\mathbf{x}_p \boldsymbol{\alpha}_{\mu_1} = \alpha_{\mu_1 0} + \alpha_{\mu_1 1} x_{p, \text{gender}} + \alpha_{\mu_1 2} x_{p, \text{relStatus}} \dots + \alpha_{\mu_1 3} x_{p, \text{health}}$$



FITTING THE PROCESS MODEL TO WELL-BEING DATA

Fitting a Bayesian multilevel OU model to data

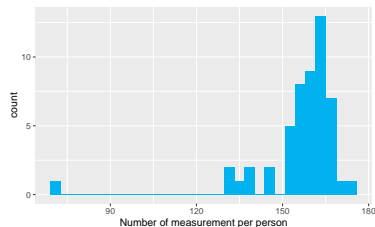
Parameter estimation is implemented in the [Bayesian](#) framework.

Fitting a Bayesian multilevel OU model to data

Parameter estimation is implemented in the [Bayesian](#) framework.

Data

- 52 people, reporting for 4 weeks, 6 times a day

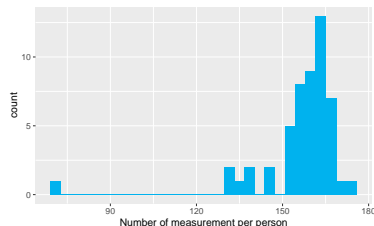


Fitting a Bayesian multilevel OU model to data

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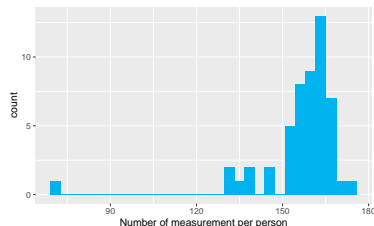


Fitting a Bayesian multilevel OU model to data

Parameter estimation is implemented in the [Bayesian](#) framework.

Data

- 52 people, reporting for 4 weeks, 6 times a day
- Covariates:
 - age
 - gender
 - being in a relationship
 - SF-36 general health subscale (1-100)

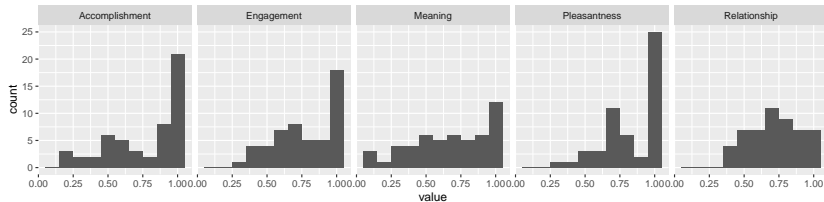


RESULTS



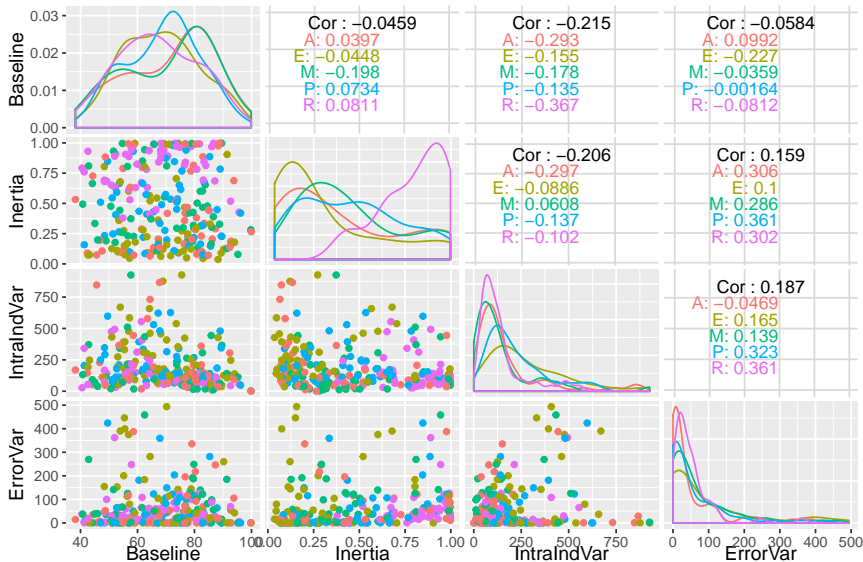
Error variance or intraindividual variance?

Ratio of intraindividual variance (γ_p) to total variation



Although the magnitude of intraindividual variation (as opposed to measurement error) changes across dimensions and persons, we are explaining large part of the variation by the latent process model.

Person-specific parameter estimates

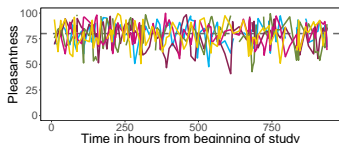
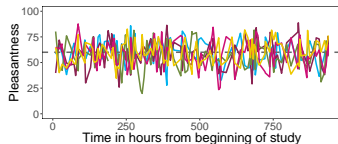


Individual differences and covariates

Regression coefficients with 95 % HDI not containing zero

Baseline

- higher if being in a relationship
 - Pleasantness: ~ 13
 - Engagement: ~ 15
 - Relationship: ~ 17
 - Meaning: ~ 16
 - Accomplishment: ~ 14



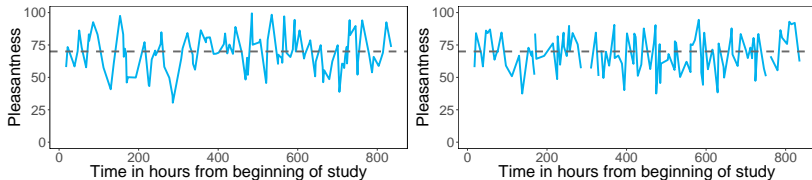
- lower with age ($M \approx 30$, $SD \approx 10$): Pleasantness and Relationship baselines both lower by $\sim .4$ per year

Individual differences and covariates

Regression coefficients with 95 % HDI not containing zero

Inertia

Pleasantness dimension: very low for people in relationships – they adapt to their baseline more quickly



(≈ 0.7 lower autocorrelation after an hour if in a relationship)

SUMMARY

Summary

- Process models can help highlighting on well-being dynamics
- PERMA elements of well-being seem to change over time
- Limitations
 - Theoretically these elements are independent, but they covary strongly therefore multivariate model is needed
 - Computationally heavy



Summary

- Process models can help highlighting on well-being dynamics
- PERMA elements of well-being seem to change over time
- Limitations
 - Theoretically these elements are independent, but they covary strongly therefore multivariate model is needed
 - Computationally heavy
- In progress
 - Modeling long-term changes together with short-term variation
 - Relation to physiological measures



THANK YOU FOR YOUR ATTENTION!
