

Intensive Longitudinal Data Measurement Manifesto

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"The heart of science is measurement."

~ Erik Brynjolfsson

Measurement in Psychology is hard.

A strong measurement tradition:

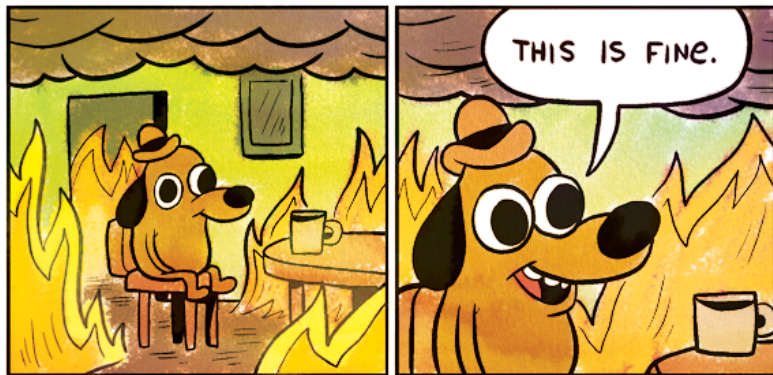
- ▶ Theories: Classical Test Theory, Latent Trait Theory
- ▶ Statistical Tools: Reliability measures, validity measures, latent variable models.

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 - Results based on differences between persons can't be generalized to intra-individual differences.

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- ▶ Measurement tradition in social sciences targeted at interindividual differences.
- ▶ Measuring within-person processes differs in important ways from measuring differences between persons.
 - Results based on differences between persons can't be generalized to intra-individual differences.
 - Many traditional (statistical) tools are not suitable for ILD.

For example: Classical Approaches to Reliability

Context: Measuring stable traits to investigate between person differences in these traits.

- ▶ Test-Retest Reliability
- ▶ Parallel Test Reliability
- ▶ Internal Consistency Reliability (Cronbach's Alpha, Latent variable models)

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In all classic reliability measures **within-person fluctuations are considered measurement error.**

ILD Measurement: Starting from scratch

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- ▶ Lack statistical tools to help evaluate our measurements



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Intensive Longitudinal Data researchers have had to rely on...

- ▶ Face validity.
- ▶ Pilots: trial, and error.
- ▶ Qualitative evaluations of measurements.
- ▶ Doing studies on measurement.

ILD Measurement: Starting from scratch

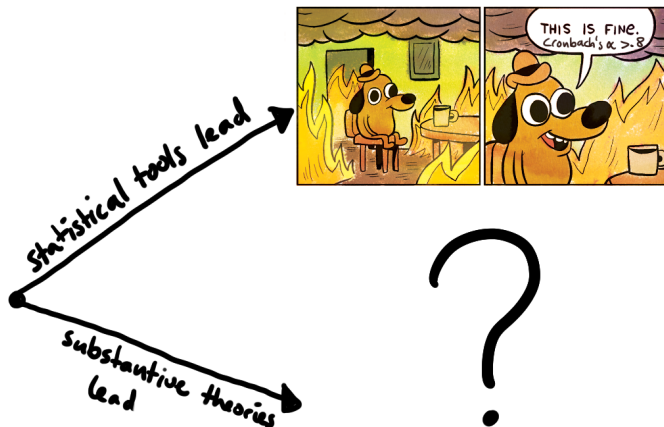
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In ILD, a shift seems to be happening towards developing (measurement) theory.

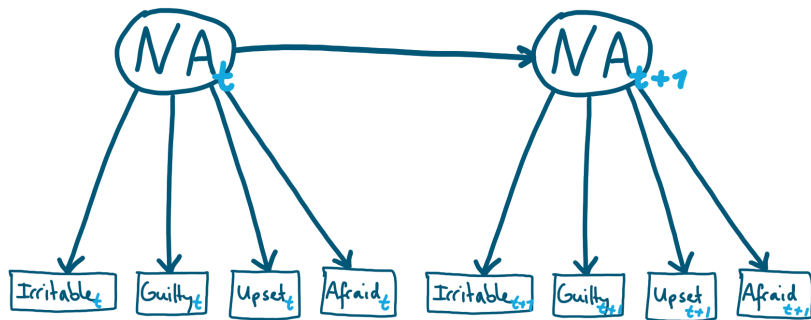
Substantive Theory should lead

- ▶ The usefulness of any statistical tool hinges on research goals, and (what we know about) reality.
- ▶ Substantive research on measurement is happening
- ▶ Statistical tools are being developed



Substantive Theory Should lead

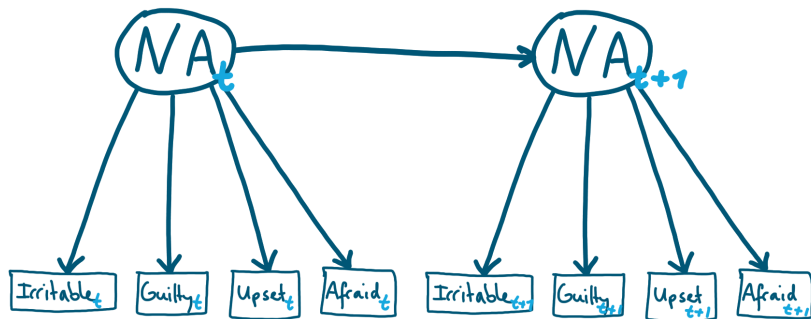
Example: Factor modeling is a tool that may or may not be useful



- Are they really exchangeable, parallel items, that measure the same thing?

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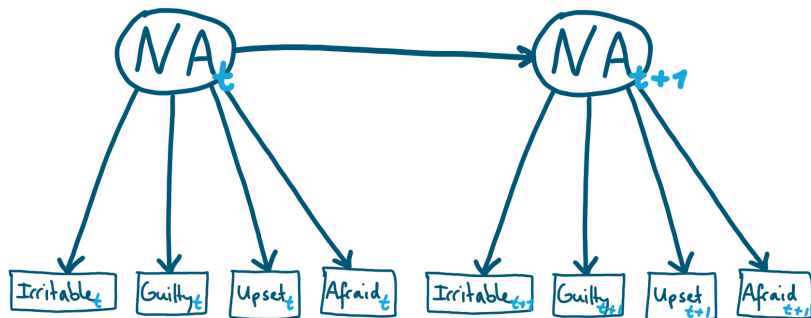
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- ▶ Are they really exchangeable, parallel items, that measure the same thing?
- ▶ Do we really expect these items to all usually increase and decrease together at each occasion?

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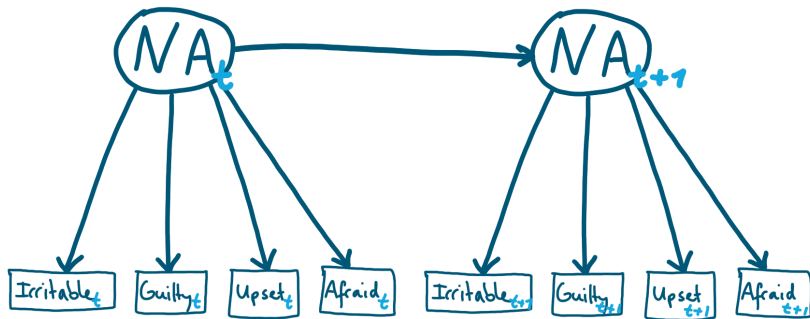
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- ▶ Are they really exchangeable, parallel items, that measure the same thing?
- ▶ Do we really expect these items to all usually increase and decrease together at each occasion?
- ▶ Is that the case for all persons?

Substantive Theory Should lead

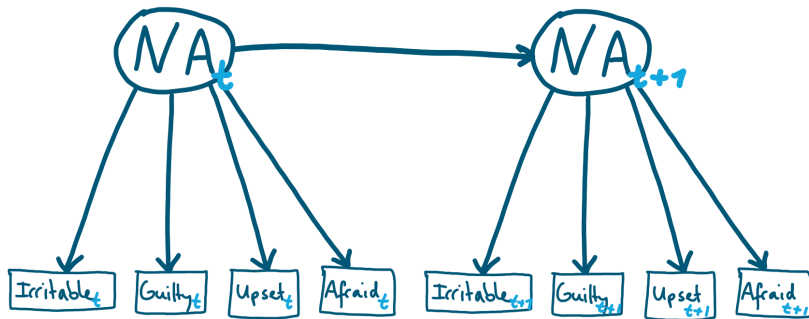
factor modeling as a tool to account for measurement error



- Could we intervene directly on the latent variable for any particular person?

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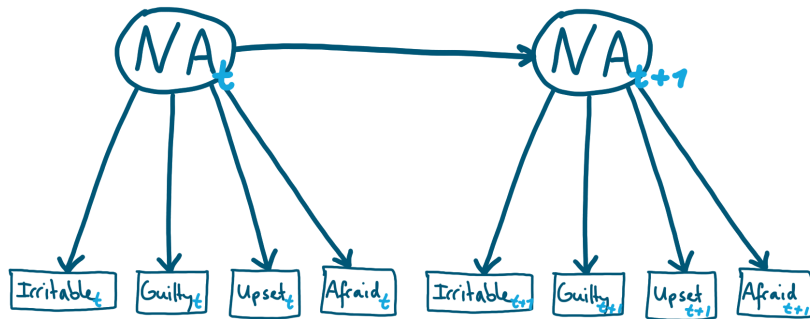
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- ▶ Is the latent variable something real that acts within a person?

Substantive Theory Should lead

factor modeling as a tool to account for measurement error



- ▶ Could we intervene directly on the latent variable for any particular person?
- ▶ Is the latent variable something real that acts within a person?
- ▶ How do changes in the latent variable result exactly in the observed scores?

Are our measurements good enough?

To do what?

- ▶ Predict?
- ▶ Intervene?
- ▶ Understand?
- ▶ What do we want to learn based on my measurements?

Are our measurements good enough?

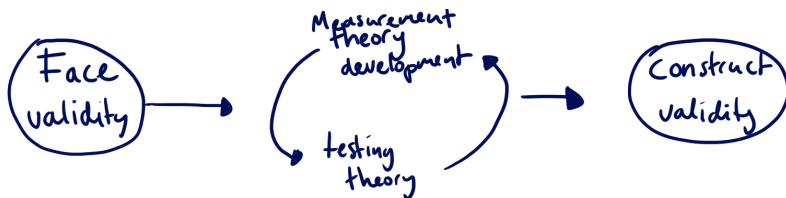
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Potential research questions on measurement

- ▶ What kind of construct is it? Could I intervene on it? Can it affect other variables/how? Is it uni-dimensional? Is it universal?
- ▶ At what timescale does what I want to measure operate and vary?
- ▶ At what timescale do I want/can I intervene?
- ▶ Is my measurement procedure going to affect what I want to measure?
- ▶ ...

Moving on from face validity



What (I believe) will help:

- ▶ Clearer - formalized - substantive (measurement) theories,
- ▶ that (also) consider measurement.
- ▶ More (parts of) studies dedicated to measurement.

Moving on from face validity

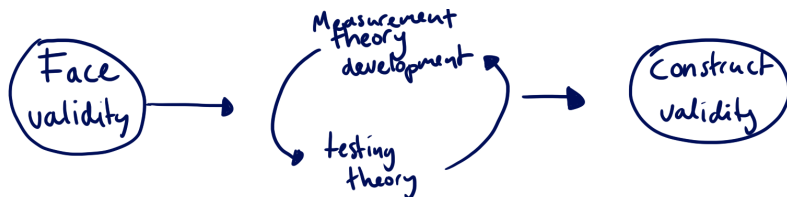


Formalize and publish substantive (measurement) theories

Interesting reads:

- ▶ Borsboom, D., van der Maas, H. L., Dalege, J., Kievit, R. A., Haig, B. D. (2021). Theory construction methodology: A practical framework for building theories in psychology.
- ▶ Haslbeck, J., Ryan, O., Robinaugh, D., Waldorp, L., Borsboom, D. (2019). Modeling psychopathology: From data models to formal theories.
- ▶ Robinaugh, D. J., Haslbeck, J. M., Ryan, O., Fried, E. I., Waldorp, L. J. (2020). Invisible hands and fine calipers: A call to use formal theory as a toolkit for theory construction.
- ▶ All papers in Psychological Inquiry, Volume 31, Issue 4 (2020)

Moving on from face validity



Don't stop doing studies on measurement; Share your knowledge

- ▶ Write and publish papers dedicated to measurement
- ▶ Take more room to discuss measurement in papers
- ▶ Contribute to the ESM Item Repository:
esमितemrepositoryinfo.com

Exciting things are happening

Please share refs/links to your papers on ILD measurement with me, email to: ILDMM@nkschuurman.com.

I will collect them on my website, www.nkschuurman.com.

Other SAA measurement symposia

- ▶ Assessment Methods; Parallel to this session.
- ▶ Putting intensive longitudinal research into context: Implications for measurement and modeling; Friday at 18:15.