Real-time Assessment:

Ecological Momentary Assessment

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Goals

- Intellectual streams leading to real-time assessment
- Fundementals of Real-time assessment
- What it's like
- What we can expect to learn from the application of Real-time assessment
- Foreshadow next two days
  - Look for: Presenter

“Streams”

- Memory processes in self-reports
- Context effects
  - Immediate impact of environment
- Interest in understanding within-day phenomena
  - Diurnal rhythms
  - Finer resolution of temporal associations
    - Stress, coping, outcomes
    - Treatments and pain
    - Acute effects of naturally-occurring event or experimental interventions
  - Time allocation
    - How people spend their time

Fundementals of Real-Time Assessments

- Ambulatory Monitoring
  - Usually physiological measures
    - Cardiovascular (EKG,BP,HR); respiration; glucose; GSR; activity; peak-flow devices; multi-modal monitors
    - Rationale for sampling not always clear
- Experience Sampling
  - Focus on subjective experience
  - Usually random sampling
- Ecological Momentary Assessment
  - Includes self-report and physiological
  - Three formal characteristics:
    - Immediacy; Sampling framework; Ecological validity

Fundementals of Real-Time Assessments

1. Immediate Assessment
   - To eliminate or reduce memory bias

- However….
  - Often immediate
  - Last 5 minutes
  - Last 30 minutes
  - Since the last “beep”
    - For complete coverage
    - Event-driven
  - Last 24 hours
  - Conceptual decision based on evaluation of memory bias

Fundementals of Real-Time Assessments

2. Sampling Framework

3. Ecological Validity

Selected General Readings

- DeVries, 1991
  - Focus on psychopathology
- Stone, Kessler, & Haythorthwaite, 1991
  - “How-to issues” in daily diaries
- Stone & Shiffman, 1994
  - Defined EMA
- Delespaul, 1995
  - Detailed description of ESM
- Affleck, Zautra, Tennen, & Ameli, 1999
  - Daily process designs for clinical psychology
- Reis & Gable, 2000
  - Review of diary studies
- Tennen & Affleck, 2002
  - Daily processes in social and clinical psychology
- Stone & Shiffman, 2002
  - “Guidelines” for real-time write-ups
- Bolger, 2003
  - Review of daily diary field
- Special journal issues
  - *Journal of Personality*
  - *Annals of Behavioral Medicine*
  - *Health Psychology*

Popular, convenient

- A specialized form of real-time assessment
- Many studies
- But……
  - Self-selected context
  - Single portion of day
  - 24-hour; recall bias may be a problem for many measures

What's it like?
Modality of data collection

- Sampling Shiffman
  - End-of-day → lengthy
  - Throughout-the-day → brief
- Paper-and-pencil Hufford
  - Common
    - Compliance
    - Readability
- Electronic diary
  - Palmtop computers
  - Time-date stamp
  - Branching
- Signaling devices
  - Ambulatory monitors
  - Pagers
  - Watches
  - Electronic diaries
- Alternatives
  - IVR
  - Web-based
  - Audio-monitoring

What's it like?
Content

- Situational characteristics
  - Where are you?
  - What are you doing?
  - Who are you with?
- Affective state
  - Mood assessment
  - Depression, anxiety, fatigue
- Targeted content
  - Symptoms
  - Behaviors
  - Subjective states
  - Physiological variables
  - Cognitive performance
- Often standardized from one study to the next

What's it like? Practicalities

- How often?
  - 1 to 60 times per day
  - 1 to 100s of days
- How many questions?
  - 1 to 30
  - But branching possible with electronic diaries & IVR
- What sorts of schedules?
  - Random Shiffman
  - Event-driven
  - Combined
- Can people do it? Hufford
  - YES
  - All kinds
- How do they feel about doing it?
  - Fine, most of the time
- Does doing it affect their answers? Hufford
  - Probably not
- Are there problems?
  - Some Jamner

What do we learn from Real-time studies?

- Reliable between-person estimates
- Estimates of within-person variability and change, and individual differences in them
- Causal analysis of within-person associations and, individual differences in them

Bolger et al., 2003

Reliable Estimates

- Clinical trial of a new medication; RCT
- Changes in pain levels at baseline and follow-up is primary outcome
- Choice:
  - Recall of pain for the last month
  - Daily monitoring of pain for the last month
- Why Real-time?
  - Validity
  - Reliability

Reliable Estimates

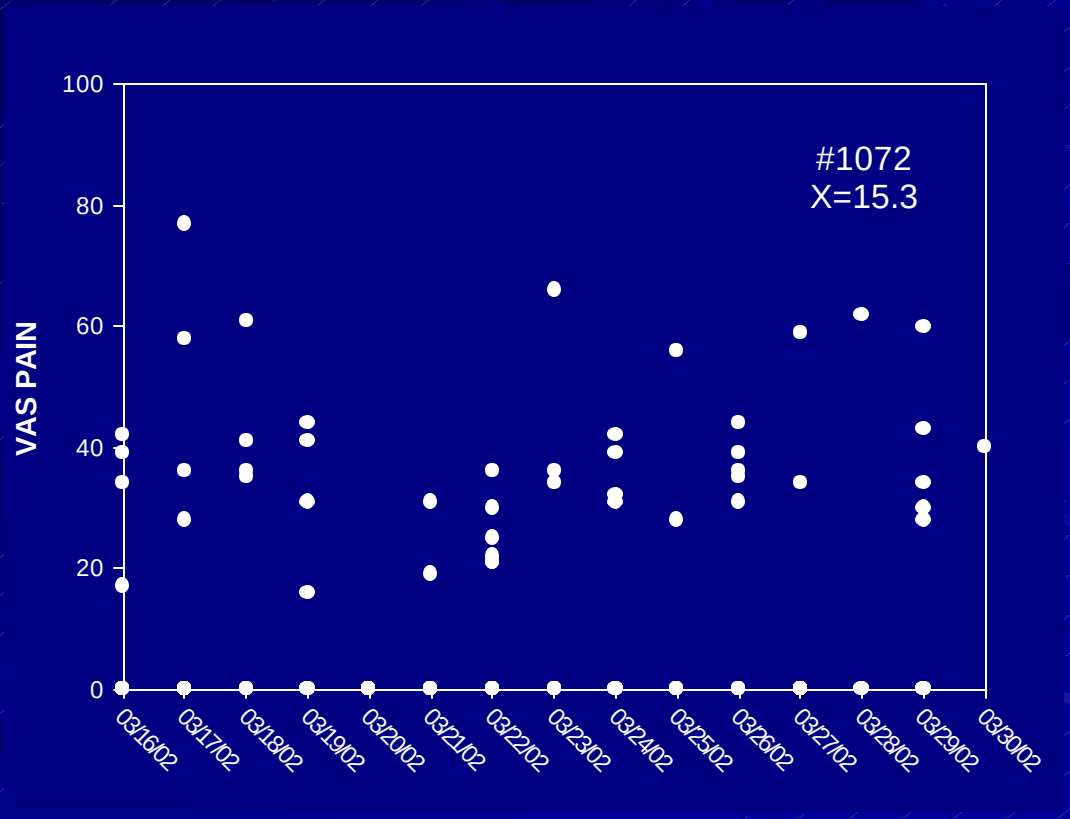
- *Paradoxically,* measures based on recall data may be less variable
  - Recall processes may lead to consistent reporting and lower variability
- *Furthermore,* increased validity of real-time measures may not always strengthen effects based on recall data
  - Biasing of recall outcomes may overestimate treatment effects, e.g., side-effects and semantic memory

Within-person variability and change

- Multiple observations enable fine-grained resolution of phenomena
  - We actually don't know very much about people's everyday lives or their symptoms
- Conditional associations
  - Day of week
  - Time of day
  - Micro environment

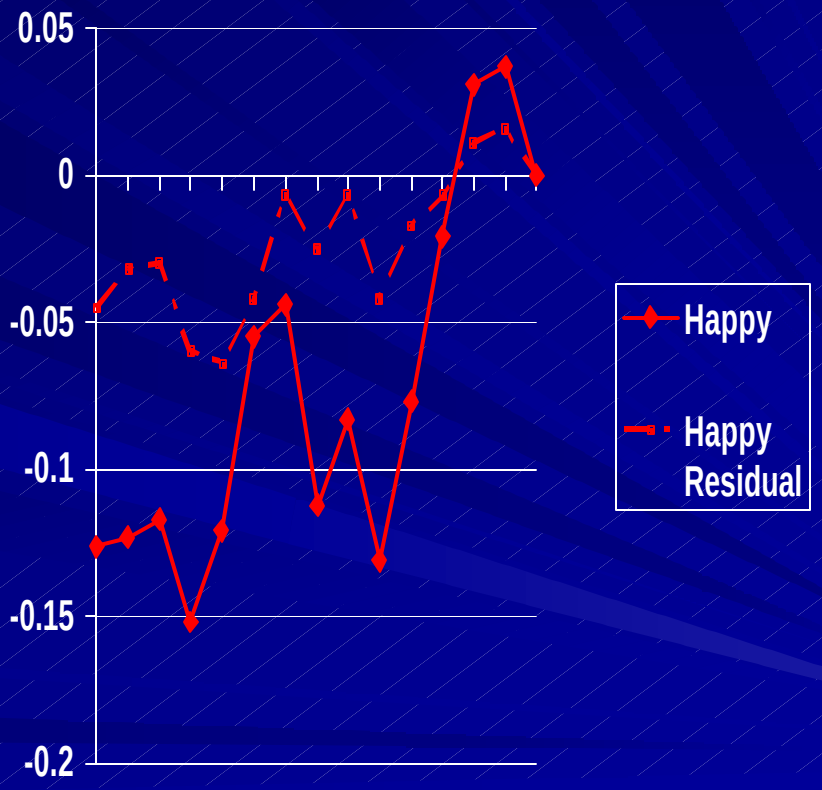
Within-person variability and change

- Multiple observations enable fine-grained resolution of phenomena
- We often believe things are stable when they are not



Within-person variability and change

- Diurnal patterns of affect
  - Detecting
  - Understand environmental contributions



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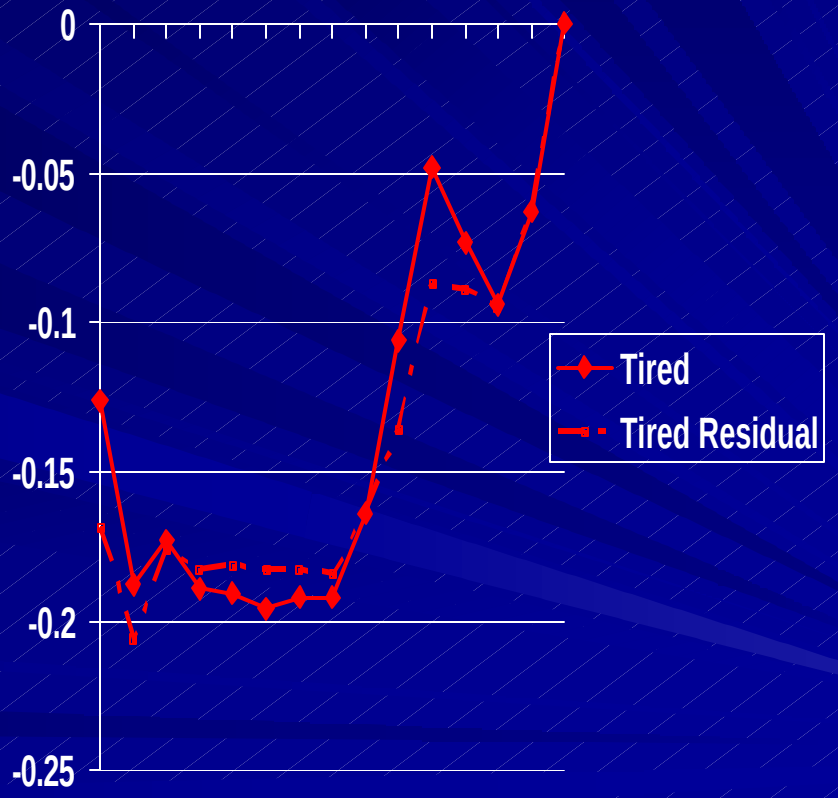
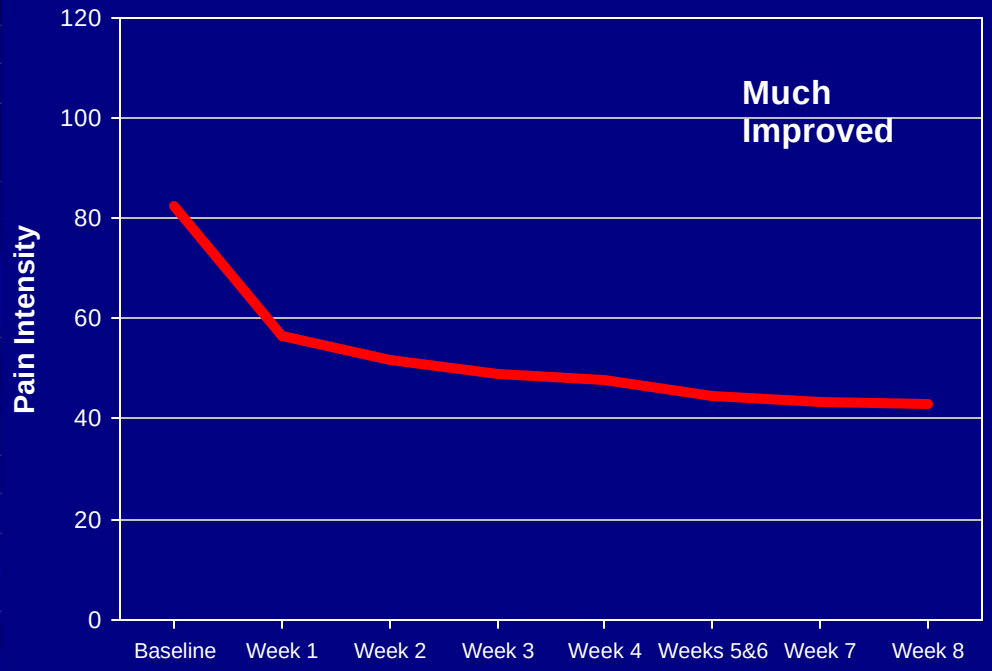


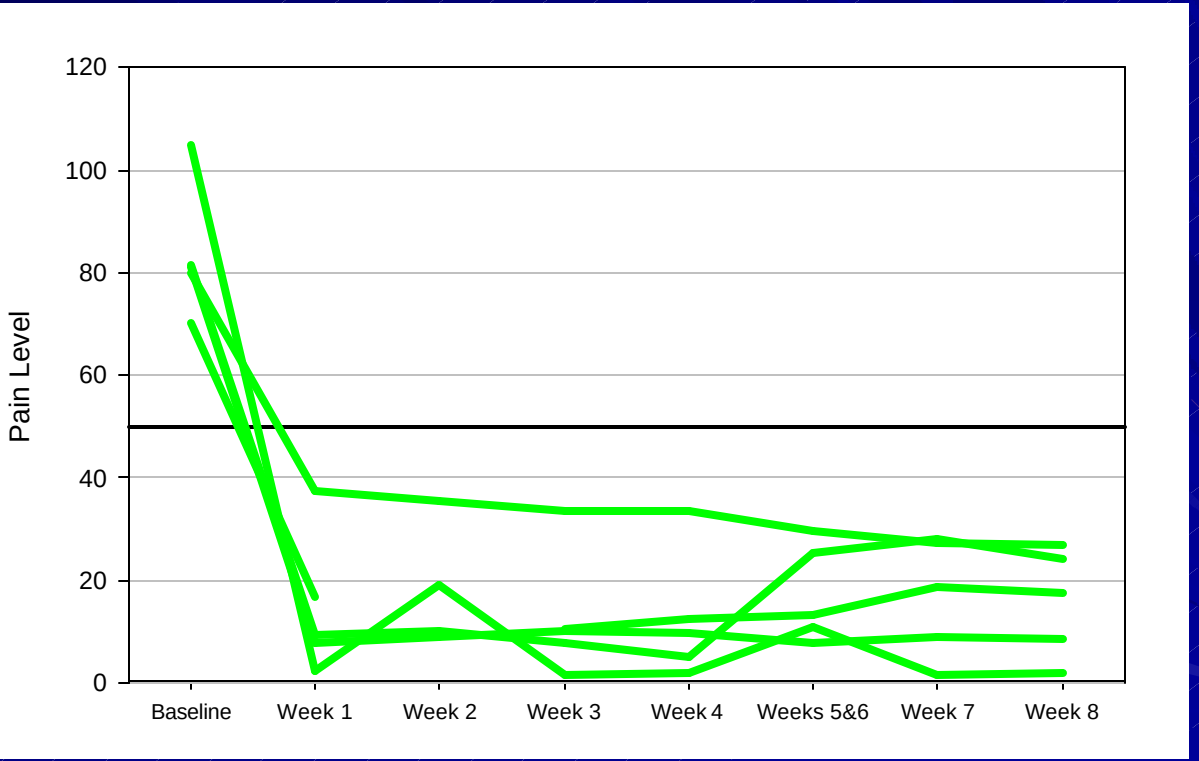
Within-person variability and change

- Expanding our understanding of important phenomena that we already think we understand
  - Example: the meaning of Global Impression of Change measures in clinical trials



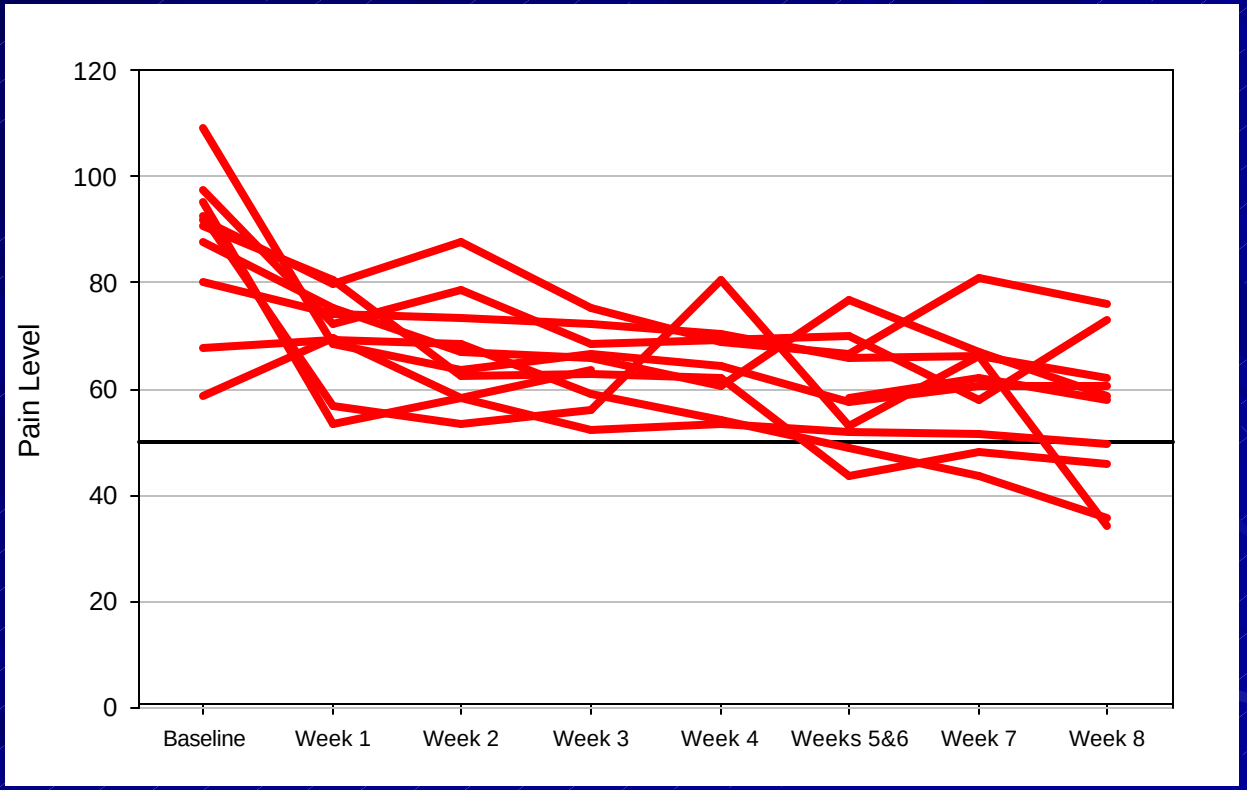
Within-person variability and change

- Real-time data add a new dimension to our understanding
- Diary ratings aggregated by week
- Some of the participants



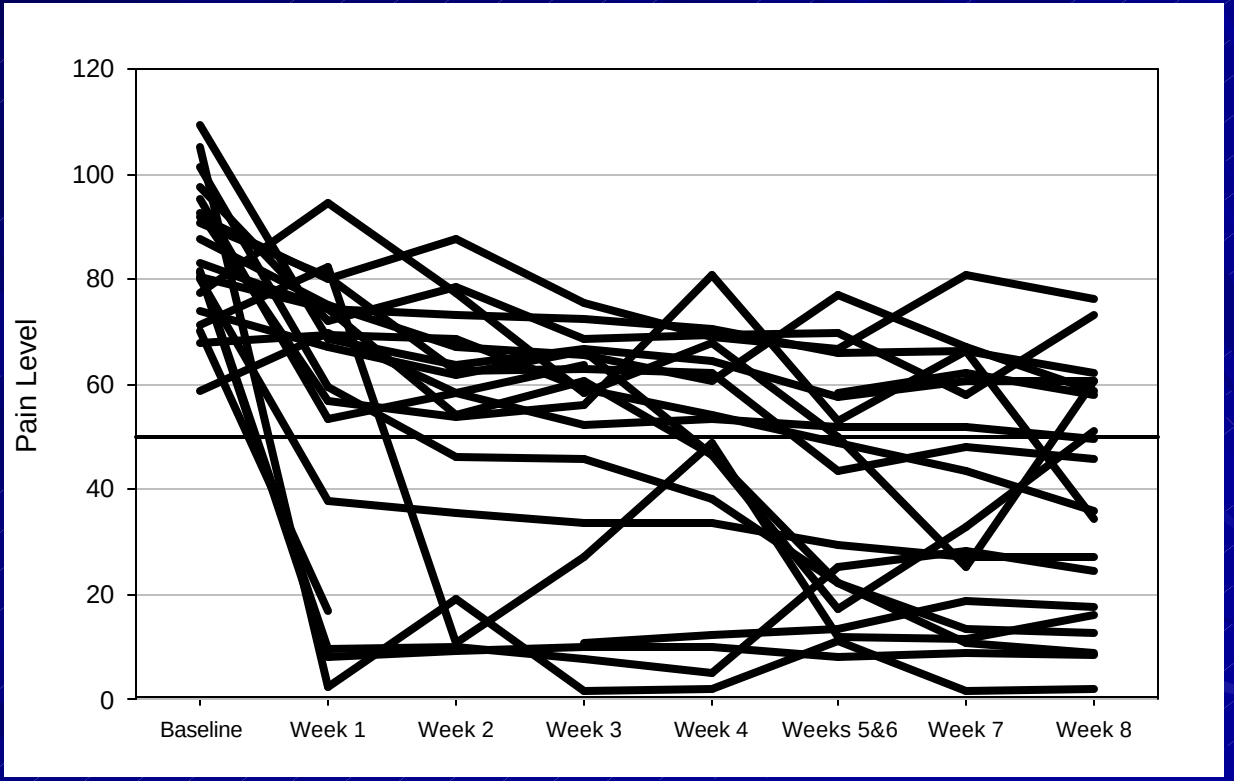
Within-person variability and change

- But here are some other participants



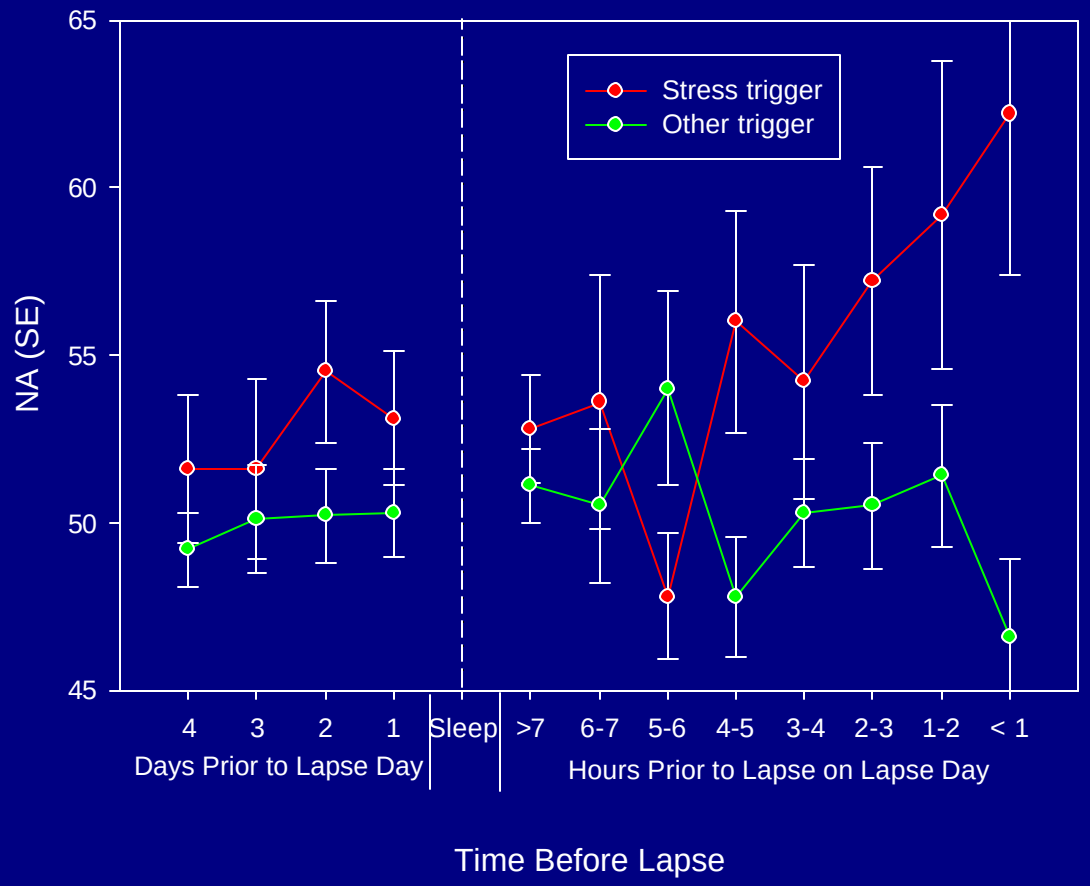
Within-person variability and change

- All participants
- Real-time data has expanded our understanding of the change process
  - Some change a lot, quickly
  - Others change a little



Causal Associations

- Exploit clear temporal association to derive “near-” causal explanations
- Usually observational in nature
- But they could be experimental



Causal Associations
Selected Reactivity Examples

- Reactivity of genetically vulnerable individuals (schizophrenic parent) to within-day stressors
  - Vulnerable individuals more reactive to negative events
    - Myin-Germeys, Archives of General Psychiatry, 2002
- Reactivity of HPA-axis to within-day stressors
  - Salivettes to collect saliva for bioassay
  - Higher cortisol when stressed
    - Psychosomatic Medicine, 1995

Summary

- Real-time data collection is a useful tool that enables novel study designs providing a detailed record of phenomena in real-life settings
- It is not for everyone and every situation
  - Many questions do not require this level of detail
  - Many questions are not challenged by self-report bias
  - Costs, burdens, and expertise are considerations
- It is an evolving methodology
  - New technologies will shape the future of real-time data collection
  - Unresolved concerns – to be addressed throughout conference