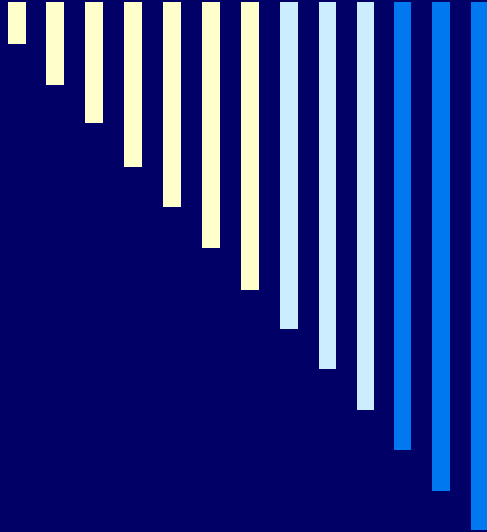



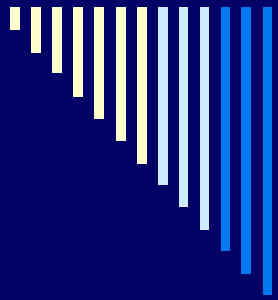
Idiographic Methods: Important Alternative Research Methods for the Behavioral Sciences

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**Overview of Symposium
19th Annual Meeting of the for Prevention Research
Washington DC May 31-June 3, 2011**

*This paper was partially supported by Grant CA11919 from NCI and Grant
DA020112 from NIDA.*



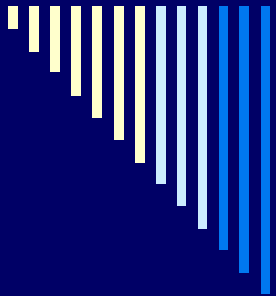
Discussant

Colleen Redding

**Cancer Prevention Research
Center**

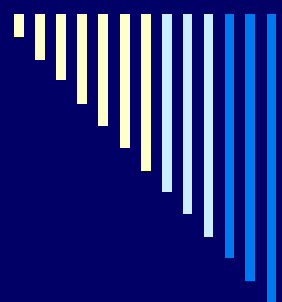
Psychology Department

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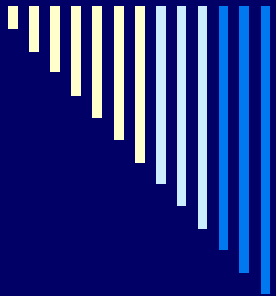
Idiographic Methods

- Idiographic methods focus on time-dependent variation within a single individual or unit (intra-subject variability)**
- Nomothetic methods focus on group-level relationships (inter-subject variability)**
- Idiographic methods are widely used in other disciplines, such as engineering, business, and economics but only recently are being employed in the behavioral sciences**



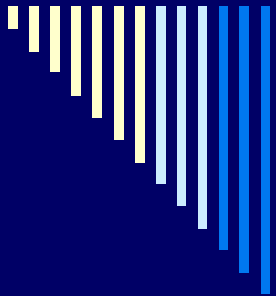
Advantages of Idiographic Methods

- Address different research questions & may provide more insight into the data**
- May be employed in applied settings, e.g., businesses, schools, clinics and hospitals**
- Ideal for investigating patterns of change over time**



Advantages of Idiographic Methods (continued)

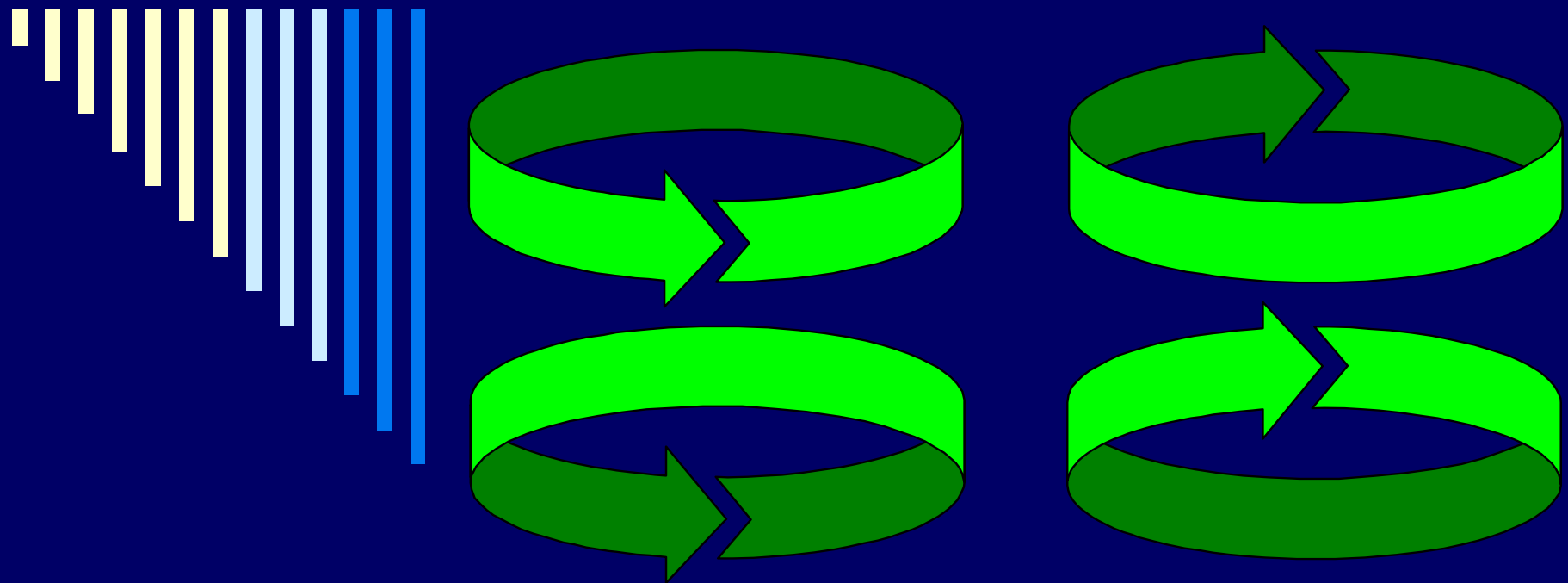
- Can be used to determine the generating function for a construct**
- Can address the relationship between variables over time**
- Can potentially produce larger effect sizes at the individual level**



Ergodic Theorems

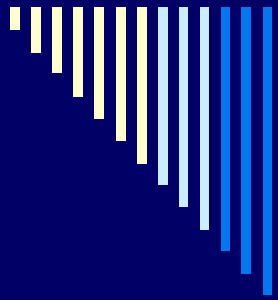
- **Equivalent results will occur only if the two conditions specified by the Ergodic Theorems are met:**
 - **(1) Each individual trajectory has to obey the same dynamic laws**
 - **(2) Each individual trajectory must have equal mean levels and serial dependencies.**
- **These theorems appear unlikely to be met in practice but we have seldom had data adequate to test them**
- **Available examples do not provide support**

Comparing Idiographic and Nomothetic: Example from Harm Reduction Study



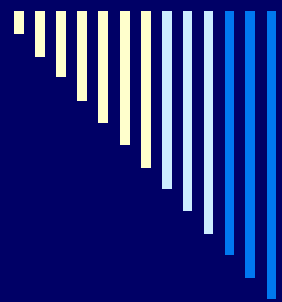
Reference:

Hoeppner, BB, Goodwin, MS, Velicer, WF, Mooney, ME, & Hatsukami, DK. (2008). Detecting Longitudinal Patterns of Daily Smoking Following Drastic Cigarette Reduction. *Addictive Behaviors*, 33, 623-639.



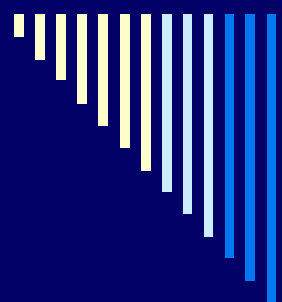
Introduction

- ❑ **Original study focused on Harm Reduction in Smoking**
- ❑ **Harm Reduction Goal: Produce and sustain decreased smoking rates**
- ❑ **Primary Outcome Measure: Number of Cigarettes Smoked per day**
- ❑ **Group level analysis conclusion: Losses were successfully produced and were sustained**



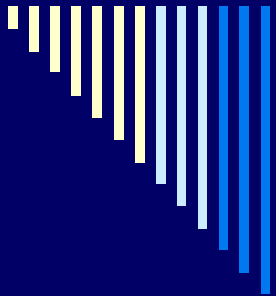
Primary Analysis: Identifying Individual Trajectories

- Primary Analysis: Pattern of change for 57 Individual Studies (Time Series Analysis)**
- Level & slope fit for each participant**
- Secondary analysis: Comparisons across the 57 studies (Cluster Analysis)**



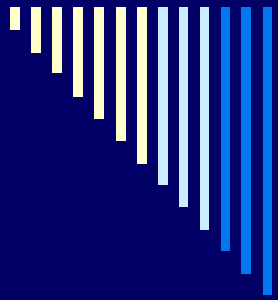
Time Series Analysis Results

- **Average daily smoking rate = 7.85)**
- **51.6% first order autoregressive parameters were significant (average $r_1=0.55$, range = $-.47$ to 1.09)**
- **16.7% second order autoregressive parameters were significant (average $r_2=.03$, range = $-.54$ to $.73$)**
- **Linear trends were significant for more than half of the sample (60.0%)**



Secondary Analysis: Grouping Trajectories into Similar Patterns

- Dynamic Cluster Analysis: Input is same variable measured on multiple occasions**
- Input was standardized residuals from time series analyses**
- Clustering Method: Squared Euclidean Distances and Ward's Method**
- Ward's Method emphasizes “shape”**
- Three cluster solution was selected**
- Clusters are called “dynatypes”**

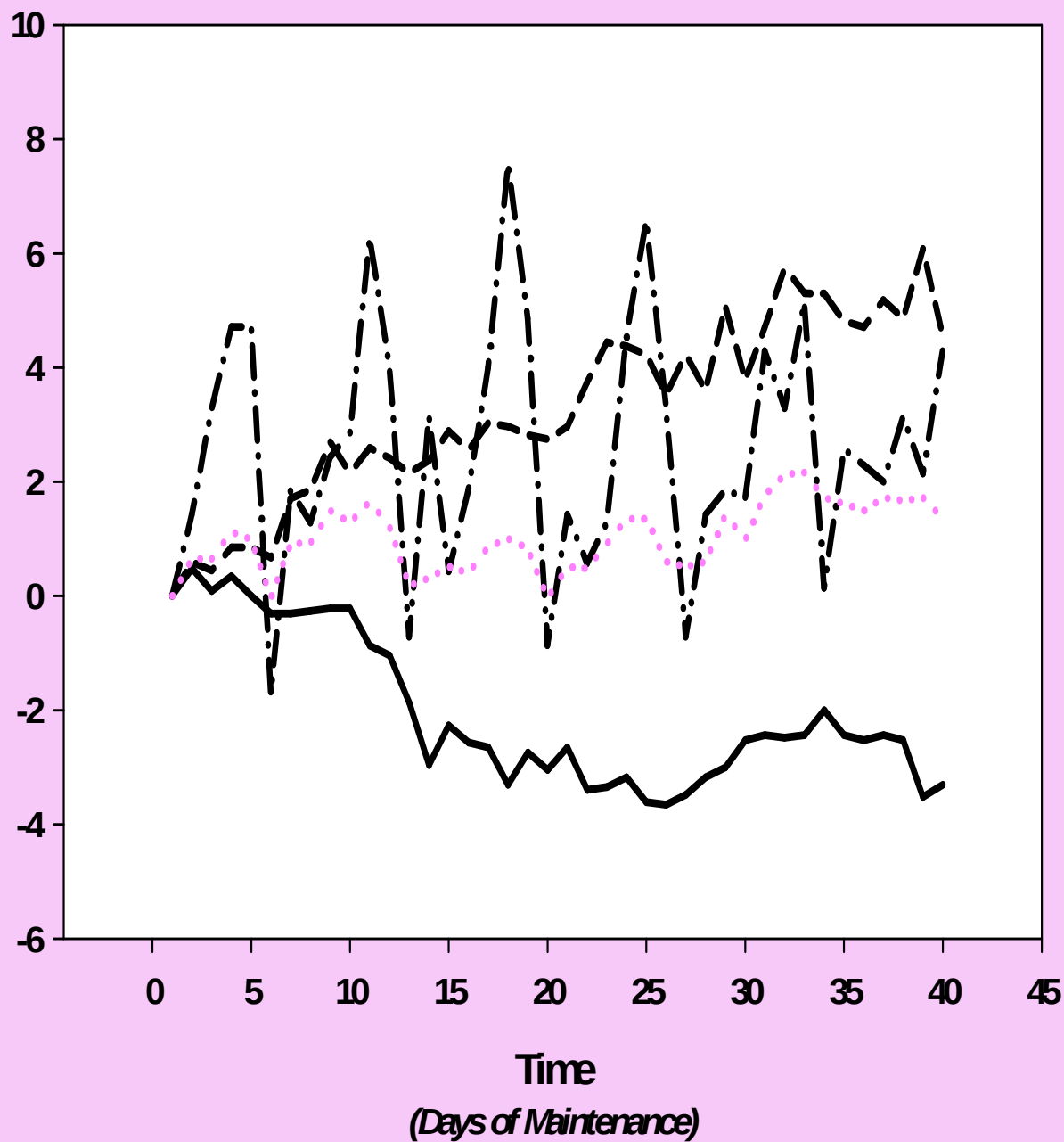


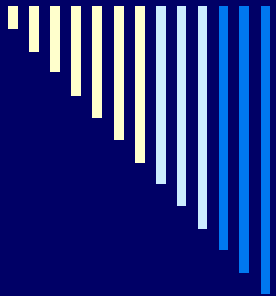
Results

Three Dynatypes were plotted to facilitate interpretation (Figure 1)

- “Decreasing” maintenance smoking pattern (40.4%)**
- “Constant” maintenance smoking pattern (12.3%)**
- “Increasing” maintenance smoking pattern (47.3%)**

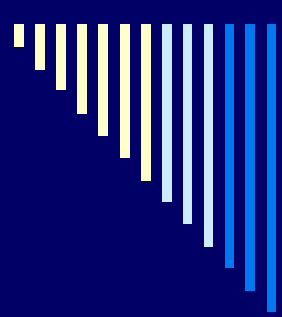
Average Number of Cigarettes Smoked per Day
Relative to Maintenance Starting Point





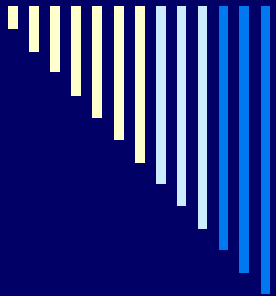
Interpretation

- ❑ **Decreasing is ideal—smoker on path to abstinence, only real success**
- ❑ **Increasing is bad—benefit of harm reduction was temporary**
- ❑ **Constant rate—fits goal of harm reduction, still smoking but will produce improved longevity**



New Research Question: Can Dynatype Membership be Predicted?

- Tested dynatype differences at baseline using demographic, psychological, physiological, and smoking history characteristics**
 - No significant differences**
- Tested dynatype differences using self-reported motivation and self-efficacy variables**
 - Significant differences found**



Ergodic Theorem Results

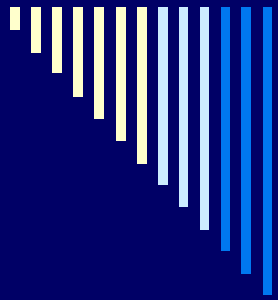
Theorem 1. Does the trajectory of each subject has to obey same dynamic laws

Answer: No

(Autocorrelations varied widely indicating different generating functions)

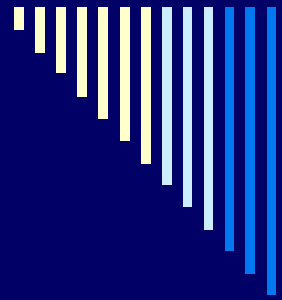
Theorem 2. Does each trajectory have the same statistical characteristics (i.e., equal mean level and serial dependencies)

Answer: No

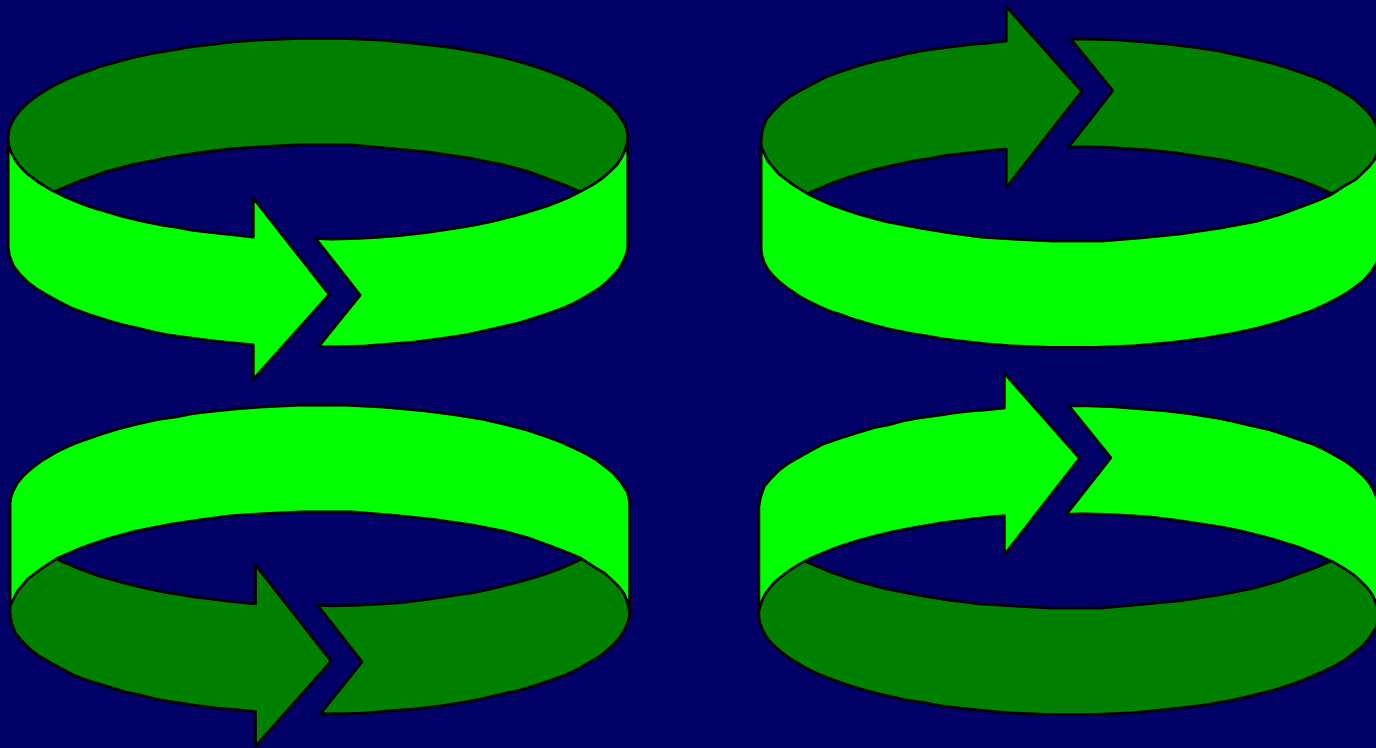


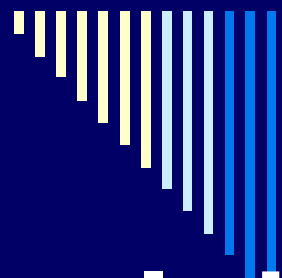
Conclusions

- ☐ **Group analysis indicated misleading constant pattern**
- ☐ **Ergodic conditions not met**
- ☐ **Identifying which smokers will belong to different dynatypes is critical new research question**
- ☐ **Can intervention influence dynatype membership?**



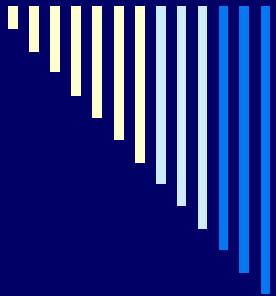
Overview of Idiographic Research Issues





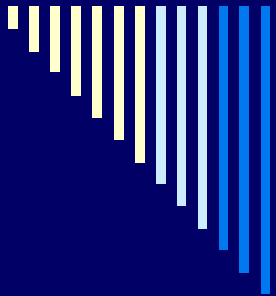
Challenge I: Generalization

- Inductive approach: Individual to general**
- Individual or subgroup level may be most appropriate for most idiographic research questions**
- Subgroups should meet test of Ergodic theorems**
- Generalization across time is most appropriate type of generalization**



Alternative Generalization: Across Occasions

- Focus of idiographic is time**
- Generalization should be across time instead of across subjects**
- Autism example: Will the same set of reactions occur in future trials**
- Will same reactions occur to other exemplars of stressors**
- Will same reactions occur in different settings**



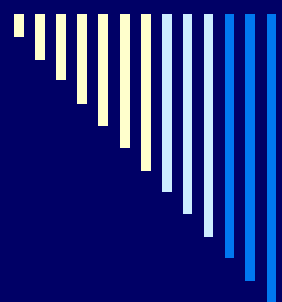
Challenge II: Missing Data

- ❑ Missing Data inevitable in longitudinal studies
- ❑ Solutions: Automate data collection (telemetrics)
- ❑ Statistical methods for missing data (*ad hoc* procedures inaccurate)
 - Multiple Imputation
 - Maximum likelihood estimation

References:

Velicer, W.F., & Colby, S.M. (2005). *Educational and Psychological Measurement*, 65, 596-615.

Velicer, W. F., & Colby, S. M. (2005). In Maydeu-Olivares, A. & McArdle, J. J. (Eds.), *Contemporary Psychometrics. A Festschrift to Roderick P. McDonald* (pp. 509-535). Hillsdale, NJ: Lawrence Erlbaum.

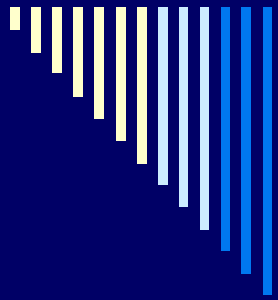


Challenge III: Identifying Generating Functions

- Examine autocorrelation structure to determine appropriate generating function**
- Function can guide choice of intervention**
- Underdeveloped area of research**

Reference:

Velicer, W.F., Richmond, R., Greeley, J., Seft, W., & Redding, C.R. (1992). A time series²² investigation of three nicotine regulation models. *Addictive Behaviors*, 17, 325-345.



Challenge IV: Develop Appropriate Measures

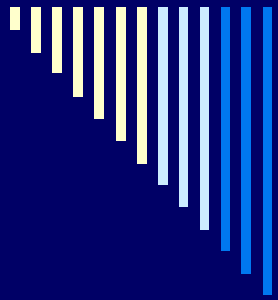
□ Problems with traditional measures

- Recall bias**
- Measure Reactivity**
- Measure pollution**

□ Solution: Telemetrics

Reference:

Goodwin, MS, Velicer, WF, & Intille, SS. (2008). Telemetric monitoring in the behavior sciences. *Behavior Research Methods*, 40, 328-341.



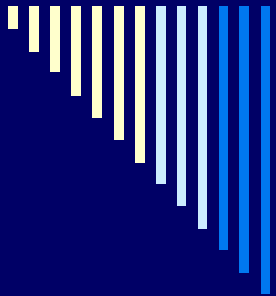
Challenge V: Ergodic Theorem Conditions

- Example presented here suggest that ergodic conditions unlikely to be met**
- Challenges assumptions of group level methods (i.e., additive constant)**
- May account for low effect sizes in behavioral research**
- Focus on individual rather than group critical for interventions development**

References:

Choe, GH (2005). *Computational ergodic theory*. Berlin: Springer.

~~Molenaar, P.C.M. (2008). Consequences of the ergodic theorems for classical test theory, factor analysis, and the analysis of developmental processes. In: S.M. Hofer & D.F. Alwin (Eds.),~~
Handbook of cognitive aging. Thousand Oaks: Sage, 90-104.



Symposium Overview

- Paper I (Babbin et al.) applies idiographic methods to important issue of adherence for intervening in the area of sleep apnea**
- Paper II (Goodwin) describes the application of idiographic methods to telemetric data from the area of autism**
- Paper III (Molenaar) presents an example of a multivariate idiographic analysis for Type 1 diabetes patients**