Quasi-Experimental Designs

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Non-random Assignments

- Random assignment not always possible
- Alternative approaches serve as approximations
- Quasi – same except for randomization
- Basic presumption: groups are non-equivalent
  - ★ Result: internal validity threatened by a full range of threats
- Three classes of designs
  - ★ Non-equivalent group designs
  - ★ Interrupted time-series designs
  - ★ Correlational designs

Non-equivalent Group Designs

- Most widely used in quasi experiments
- Pre/post measures on treatment/control
- Problem: expect subjects in different groups to differ because assignment not controlled
  - ★ Must make assumptions about variables
- Alternatives
  - ★ Randomization after assignment into treatment and control if sample mandated
  - ★ Match groups as closely as possible
  - ★ Non-volunteers as wait-list; compare against volunteers
  - ★ Compare different amount of treatments

Interrupted Time Series

- Effects of treatments are inferred
  - ★ Compare outcome measures at different time intervals
    - ➢ A single data point for each point in time
  - ★ Before and after treatment is introduced
    - ➢ A clear dividing line at the beginning of treatment
  - ★ Four considerations
    - ➢ Need a sufficient number of data points
    - ➢ Same units thru-out equally spaced
    - ➢ Sensitive to the particular effects being studied
    - ➢ Measurements should not fluctuate

Box-Jenkins Procedure

- Auto-regressive integrated moving average
- Aim: identify underlying model of serial effects
  - ★ Abrupt change at point of treatment
  - ★ Gradual constant changes in levels
  - ★ Abrupt change but lasting only a short while – a pulse
- Assumptions
  - ★ The series of observations must be stationary
    - ➢ Fluctuate around the mean rather than drift
    - ➢ Secular trend handled by differencing
      - ✓ 2 3 4 5 6 -> 1 1 1 1 1
  - ★ Autocorrelation
    - ➢ Dependence or independence of observations o each other
    - ➢ Regular: adjacent observations on one another
    - ➢ Seasonal: observations separated by a period

Single Case, Small N

- N=1, single case
  - Widely used to evaluate effects of behavioral control treatments
  - Widely use in SWE
  - Problematic to call these experimental – randomization not a consideration at all
- Argument
  - Subjects serve as own controls
    - Behavior monitored as treatment effects replicated over time
    - Changes in patterns of performance are basis for inferences about treatment

Single Case, Small N

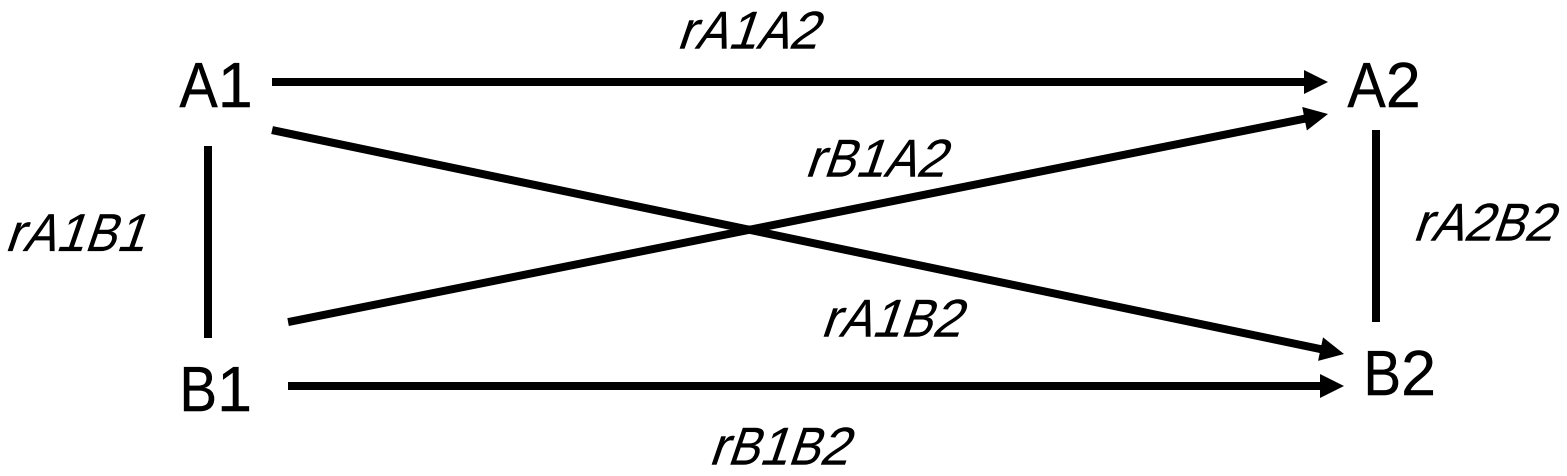
- Start by establishing a behavioral baseline:
  - the continuous, continuing performance of a single individual
- Found niche for effects of clinical, counseling and educational interventions
- Prototype procedure: A B A (variant of AB)
  - A is pretreatment phase
  - B denotes introduction of independent variable
  - A treatment is withdrawn at the end and behavior measured
- Variants – non unambiguous wrt internal validity
  - A B BC B
    - to tease out effects of BC and B alone
  - A B A B
    - To emphasize positive effects of treatment variable
- Seldom report elaborate statistical analyses, but use good graphical representations

Cross-Lagged Panels

- Frequent in past, now employed with skeptical advocacy
- Cross-lagged:
  - a time series design
  - some data treated as temporarily lagged values of the outcome variable
- Panel: another name for longitudinal
  - Two motivations
    - Increase precision by measuring each subject in all conditions
    - Examine individuals change response over time

Cross-Lagged Panels

- **Assumption:** ***longitudinal measurements of same two variables (A,B) would provide information about causal relationship between them***
- **Hence: a method for choosing between competing causal hypotheses**



Cross-Lagged Panels

- 3 sets of paired correlations
  - ★ Test-retest: rA1A2, rB1B2
    - ➢ Indicates reliability of A and B over time
  - ★ Synchronous: rA1B1, rA2B2
    - ➢ Reliability of relationship between A and B over time
  - ★ Cross-lagged: rA1B2, rB1A2
    - ➢ Relationship between two sets of data points
    - ➢ Is A a stronger cause of B than B of A
    - ➢ Yes if rA1B2 is higher than rB1A2
      - ✓ Eg, rA1B2=.585 and rB1A2=.405

Cross-Lagged Panels

- Interpretability considered maximum when r values remain the same at each period
- However, seldom stationary
  - ★ Temporal erosion
  - ★ Attenuation leaves us with a residual effect
- Seldom reliable and clear cut
  - ★ seldom a clear inference

Path Analysis

- Eg, violence in TV and aggression
  - Boys
  - Time periods 1960 and 1970
  - A1 and A2 – preference for violent TV
  - B1 and B2 – peer-rated aggression
  - rA1A2=.05, rB1B2=.38
  - rA1B1=.21, rA2B2=-.05
  - rA1B2=.31, rB1A2=.01
  - Measures of aggression: who starts fights, takes others' things
  - Predictors of aggression: three favorite TV shows
  - Data indicates some not very reliable relationships
    - AB positive in 1960, negative in 1970
    - Test-retest only .05 for TV, .38 for aggression
    - Statistically a significant relationship between violent TV in 1960 and aggressive behavior in 1970 (.31)
    - Alternative causal pattern quite negligible (.01)

Cross-Lagged Panels

- Plausible inferences
  - Not possible to demonstrate a particular hypothesis is true
  - Possible to reject untenable hypotheses and narrow down rival explanations
- A1 -> B2 – 5 plausible hypotheses
  - 1: A1 -> B1, A1 -> B2
    - Preferring to watch violent TV is a direct cause of aggressive behavior
    - rA1B1=.21, rA1B2=.31 is consistent with this
    - Low test-retest might be explained by different overtly violent activities in teens
  - 2: A1 ->B1, B1 -> B2
    - Preference for violent TV stimulates children to be aggressive and carries over into teen years
    - Ruled out: correlation between A1B2 much higher than rA1B1 x rB1B2

Cross-Lagged Panels

- ★ 3: *B1 -> A1, A1 -> B2*
  - Aggressive children prefer violent TV
  - Ruled out for reasons similar to above
  - *rB1B2* much higher than product
- ★ 4: *B1 -> A1, B1 -> B2*
  - Aggressive children are more likely to watch violent TV and to become aggressive teenagers
  - Not so easily rejected
  - Did a partial correlation
    - ✓ Removed other influences:
      - *A1* and *B2* controlling for *B1*
    - ✓ very close to original - .25 vs .31
  - Hence, implausible as complete causal explanation

Cross-Lagged Panels

- ★ 5: *B1 -> A2, B1 -> B2*
  - ➢ Early aggression causes both a weaker preference for violent TV as a teenager and a penchant to continue to be aggressive
  - ➢ Rejected: needed cross correlation for this basis of rejection
    - ✓ *rB1A2*=.01 was very close to comparison base
- ❖ Thus ruled out 2-5, leaving 1
  - ★ Watching violent TV was a direct causal link to aggressive behavior in some viewers

Cohort Designs - Utility

- A wider set of longitudinal
  - Pure: one cohort followed over time
  - Mixed – several cohorts followed
- Age, time and cohort effects
  - Eg, believed that IQ increase to a maximum at age 30 and then declined
  - Confounded age and cohort effects
    - Cohort: different life experiences etc
  - Diachronic designs: changes in successive periods of time
  - Useful in uncovering relationships that remain shrouded in synchronic designs

Cohort Designs - Limitations

- Example of age and no religious affiliation of women in The Netherlands
  - ★ Clearly cross-sectional conclusions cannot be correct
  - ★ With full cohort data can do other analyses
    - ➢ Avoid fallacy of period centrism
      - ✓ One time period generalizable to another
    - ➢ Age effect: due to natural aging process
    - ➢ Time of measurement effect: impact of events on time that occur at points of measurement
    - ➢ Cohort effect: represents past history

Cohort Designs - Limitations

- Comparison where age, time and cohort effects are the major variables
  - ★ Simple cross-sectional
    - ➢ Limitation: confounds age of subject with age of cohort
  - ★ Simple longitudinal
    - ➢ Limitation: does not control for effects of history
      - ✓ Different results might be obtained using a different period of time
  - ★ Cohort sequential
    - ➢ Takes into account age and cohort. But not the time of measurement fully
  - ★ Time sequential
    - ➢ Does not take into account cohort
  - ★ Cross-sectional
    - ➢ Does not take age fully into account
- Each has limitations
  - ★ Hence best to employ a variety of methods