Methods for Studying Child Development

The Scientific Method
Contexts for Gathering Data about Children
Correlation and Causation
Designs for Examining Development
Ethical Issues in Child-Development Research
Why know about research methods?

- If you don’t know how experiments work, you can’t decide which ones are good or bad.
How would you discover:

- If watching violence on TV caused children to be more aggressive?
- If infants prefer attractive faces over unattractive faces?
- How popularity in children changes from 4 to 10 years of age?
- If infants’ level of happiness with their parents is related to time spent in child-care?
Scientific Method

An approach to testing beliefs that involves:

1. Choosing a question
2. Formulating a hypothesis (i.e., an educated guess)
3. Testing the hypothesis
4. Drawing a conclusion

Example:
Importance of Appropriate Measurement

- Relevance to Hypotheses
- Reliability
- Validity
Reliability

- The degree to which independent measurements of a given behavior are consistent
  - **Interrater reliability**: The amount of agreement in the observations of different raters who witness the same behavior
  - **Test-retest reliability**: Attained when measures of performance are similar on two or more occasions
Validity

- The degree to which a test or experiment measures what it is intended to measure
  - **Internal validity**: degree to which effects observed in experiment can be attributed to variables the researcher intentionally manipulated
    - Example?
  - **External validity**: degree to which results can be generalized beyond the particulars of the research
    - Example?
Contexts for Gathering Data about Children

- Interviews
- Naturalistic Observation
- Structured Observation
Interviews

- **Structured interview:** A research procedure in which all participants are asked to answer the same questions

- **Clinical interview:** A procedure in which questions are adjusted in accord with the answers the interviewee provides

1. +: a lot of data, quick
2. -: answers to interview questions
Naturalistic Observation

- Used when the primary goal of research is to describe how children behave in their usual environments

**Limitations**

1. Natural contexts vary on many dimensions
2. Many behaviors occur only occasionally in everyday environments
Structured Observation

- Present an identical situation to a number of children and recording their behavior
- Strength: Enables direct comparisons across children

**Limitation**
- Not about children’s subjective experiences
- Not behavior in a natural situation
What kind of measurement?

1. Event sampling: Observe all behavior in one time period
   - For example, 6 children over 30 mins

2. Time sampling: Observe behavior of individual children for a set period
   - For example, 6 children for 5 minutes each

But:
But: Observer bias? Has an effect by being there.
## Contexts for Gathering Data

<table>
<thead>
<tr>
<th>Data-Gathering Situation</th>
<th>Key Features</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview</td>
<td>Children answer questions asked either in person or on a questionnaire.</td>
<td>Can reveal children’s subjective experience.</td>
<td>Reports are often biased to reflect favorably on interviewee.</td>
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<td>Structured interviews are inexpensive means for collecting in-depth data about individuals.</td>
<td>Memory of interviewee often inaccurate and incomplete.</td>
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<td></td>
<td>Clinical interviews allow flexibility for following up unexpected comments.</td>
<td>Prediction of future behaviors often is inaccurate.</td>
</tr>
<tr>
<td>Naturalistic observation</td>
<td>Activities of children in everyday settings are observed.</td>
<td>Useful for describing behavior in everyday settings.</td>
<td>Difficult to know which aspects of situation are most influential.</td>
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<td>Helps illuminate social interaction processes.</td>
<td>Limited value for studying infrequent behaviors.</td>
</tr>
<tr>
<td>Structured observation</td>
<td>Children are brought to laboratory and presented prearranged tasks.</td>
<td>Ensures that all children’s behaviors are observed in same context.</td>
<td>Context is less natural than in naturalistic observation.</td>
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<td>Allows controlled comparison of children’s behavior in different situations.</td>
<td>Reveals less about subjective experience than interviews.</td>
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</tbody>
</table>
Psychophysical methods

Measure relationship between physiological processes and behavior.

Which Central Nervous System (CNS) structures contribute to development and individual differences?

1. **Autonomic Nervous System (ANS) activity**: Regulates involuntary actions of body.
   
   E.g., Heart rate, blood pressure, respiration, pupil dilation.

   Heart rate is sensitive to psychological state.

   - Baby staring blankly = stable heart rate.
Brain functioning:

- **Electroencephalogram (EEG)**: records electrical activity across brain.

- **Event-related potentials (ERPs)**: unique electrical wave pattern when exposed to previously seen stimulus.

- **Functional magnetic resonance imaging (fMRI)**: Changes in blood flow in brain are detected magnetically.

**But**: Very descriptive.

**But**: Changes in heart rate from study itself, not stimulus?
Behavioral methods for infants

- Preferential Looking
  - Requires a spontaneous preference on the part of the infant
  - Example: Visual Acuity
Behavioral methods for infants

- Visual Scanning and Eye Movements
  - Where the infant is looking
  - How fast the infant looks

Johnson et al. (2004)
Different Experimental Designs

Extremely important to know:

• applicable in any course you take with experimental design (including the hard sciences)
Correlational Designs

- The primary goal is to determine how variables are related to one another.
- A **correlation** is the association between two variables.
  - The direction and strength of a correlation is measured by a statistic called the correlation coefficient.
Correlational Designs

Do not alter experiences…just measure two (or more) things.

- Thus, two (or more) dependent variables (DV):
  - E.g. Does mothers’ interaction with children affect intelligence?
Correlations

(a) $r = 1.00$

(b) $r = 0.68$

(c) $r = -1.00$

(d) $r = -0.58$

(e) $r = 0.00$
Spike watches more violent television programming than anyone and is highly aggressive with playmates.

Hillary watches a moderate amount of televised violence and is moderately aggressive with playmates.

George watches little violence on TV and is not very aggressive with playmates.
Correlation ≠ Causation!

- **Direction-of-causation problem**
  - It is not possible to tell from a correlation which variable is the cause and which is the effect

- **Third-variable problem**
  - A correlation between two variables may arise from both being influenced by some third variable
Experimental Designs

- Allow inferences about causes and effects
- Rely on random assignment, a procedure in which each child has an equal chance of being assigned to any group within an experiment
Experimental Designs

- **How does change in one variable change another (measured) variable?**
  - Children in the experimental group receive an experience of interest, the independent variable.
  - Those in the control group do not receive this experience.
  - The dependent variable is a behavior that is hypothesized to be affected by the independent variable.
Example of laboratory experiment (Cummings et al., 1985).

Children put in a “home life” scene and presented with:

<table>
<thead>
<tr>
<th>Scene</th>
<th>Group 1 (2-year-olds)</th>
<th>Group 2 (2-year-olds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two adults friendly</td>
<td>Two adults argue</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Affect</th>
<th>Group 1 (2-year-olds)</th>
<th>Group 2 (2-year-olds)</th>
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</thead>
<tbody>
<tr>
<td>Little or no distress</td>
<td>Increased distress (freezing, crying)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Group 1 (2-year-olds)</th>
<th>Group 2 (2-year-olds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>?</td>
<td></td>
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</tbody>
</table>

BUT: Beware of CONFOUNDS!
# Correlational vs. Experimental Designs

<table>
<thead>
<tr>
<th>Design</th>
<th>Key Features</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td><strong>Correlational</strong></td>
<td>Comparison of existing groups of children or examination of relations among each child’s scores on different variables</td>
<td>Only way to compare many groups of interest (boys-girls, rich-poor, etc.)</td>
<td>Third-variable problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only way to establish relations among many variables of interest (IQ and achievement; popularity and happiness, etc.)</td>
<td>Direction-of-causation problem</td>
</tr>
<tr>
<td><strong>Experimental</strong></td>
<td>Random assignment of children to groups and experimental control of procedures presented to each group</td>
<td>Allows causal inferences because design rules out direction-of-causation and third-variable problems</td>
<td>Need for experimental control often leads to artificial experimental situations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Naturalistic experiments can demonstrate cause-effect connections in natural settings</td>
<td>Cannot be used to study many differences and variables of interest, such as age, sex, and temperament</td>
</tr>
</tbody>
</table>
Designs for Examining Development

- Cross-Sectional
- Longitudinal
- Microgenetic
Cross-sectional vs. Longitudinal

- **Longitudinal designs:**
  Used when the same children are studied twice or more over a substantial period of time

Same child

7 months  2 years  4 years
Cross-sectional vs. Longitudinal

7-up:
Followed the lives of fourteen British children since 1964

56-up was released last year
Cross-sectional vs. Longitudinal

Advantages:
1. Can identify common patterns of development
2. Individual differences in path to maturity.

Problems:
1. Practical problems:
2. Biased sampling, selective attrition: who is in a longitudinal study?
3. Cohort effects: e.g., Children of the depression
4. May become “test-wise” or have practice effects.
Cross-sectional vs. Longitudinal

- **Cross-sectional designs:** Children of different ages are compared on a given behavior or characteristic over a short period of time

  - Different children
    - 7 months
    - 2 years
    - 4 years
Cross-sectional vs. Longitudinal

Advantages:

1. Avoids many problems of longitudinal designs.
2. No selective attrition or practice effects.
3. Good for studying age-related trends.

Problems:

1. : Think about sibling relationships over time.
2. Cohort effects.
Microgenetic Designs

- Used to provide an in-depth depiction of processes that produce change
- Children on the verge of an important developmental change are given experience believed to produce change
- They are studied intensely while their behavior is in transition
# Comparison of Designs

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<tr>
<th>Design</th>
<th>Key Features</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Cross-sectional</td>
<td>Children of different ages are studied at a single time</td>
<td>Yields useful data about differences among age groups</td>
<td>Uninformative about stability of individual differences over time</td>
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<td>Quick and easy to administer</td>
<td>Uninformative about similarities and differences in individual children’s patterns of change</td>
</tr>
<tr>
<td>Longitudinal</td>
<td>Children are examined repeatedly over a prolonged period of time</td>
<td>Indicates the degree of stability of individual differences over long periods</td>
<td>Difficult to keep all participants in study</td>
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<td>Reveals individual children’s patterns of change over long periods</td>
<td>Repeatedly testing children can threaten external validity of study</td>
</tr>
<tr>
<td>Microgenetic</td>
<td>Children are observed intensively over a relatively short time period while a change is occurring</td>
<td>Intensive observation of changes while they are occurring can reveal process of change</td>
<td>Does not provide information about typical patterns of change over long periods</td>
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<td>Reveals individual change patterns over short periods in considerable detail</td>
<td>Does not reveal individual change patterns over long periods</td>
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Studying Child Development

A primer on methods

How would you discover:

• If watching violence on TV caused children to be more aggressive?

• If infants prefer attractive faces over unattractive faces?

• How popularity in children changes from 4 to 10 years of age?

• If infants’ level of happiness with their parents is related to time spent in child-care?
Ethical Issues in Research

Researchers have a vital responsibility to anticipate potential risks that the children in their studies may encounter, to minimize such risks, and to make sure that the benefits of the research outweigh the potential harm.
<table>
<thead>
<tr>
<th>Research Right</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection from harm</td>
<td>Protected from physical or psychological harm. When in doubt, ask others.</td>
</tr>
<tr>
<td>Informed consent</td>
<td></td>
</tr>
<tr>
<td>Privacy</td>
<td>Right to conceal identity.</td>
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<tr>
<td>Knowledge of results</td>
<td></td>
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<tr>
<td>Beneficial treatments</td>
<td>If experimental treatment is beneficial, control group has right to alternative beneficial treatment.</td>
</tr>
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</table>