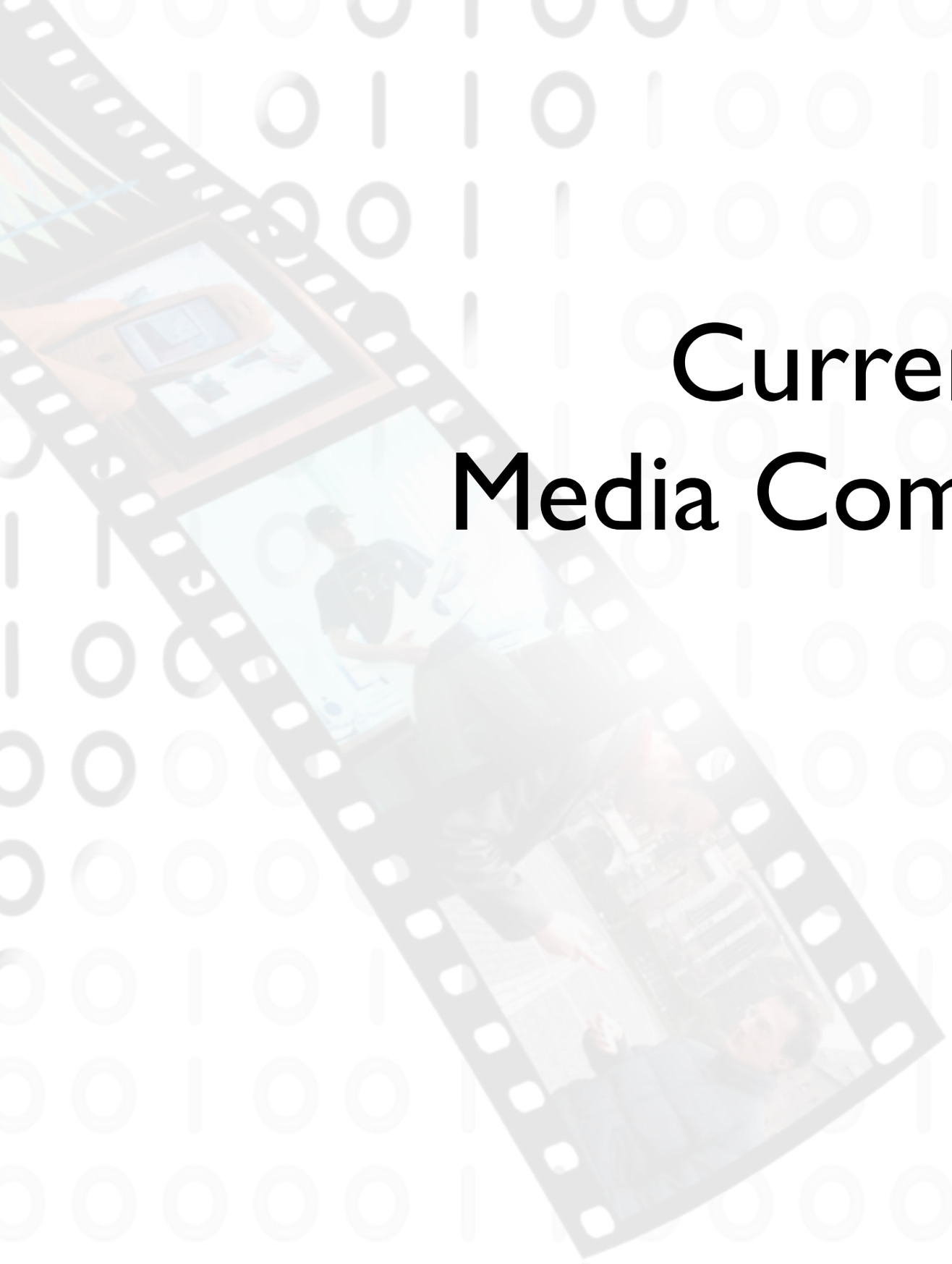


Current Topics in Media Computing and HCI

Prof. Dr. Jan Borchers
Media Computing Group
RWTH Aachen University

Summer Semester 2013

http://hci.rwth-aachen.de/cthci

Current Topics in Media Computing and HCI

- Audience
  - M.Sc. Computer Science
  - M.Sc. Media Informatics
  - M.Sc. Software Systems Engineering
  - B.Sc. Computer Science (extra credit / carry-over)
  - B.Sc. / M.A. Technical Communication (with focus on CS/HCI research)
- Prerequisite: DIS I
  - In class, assignments, and exams we assume that you know DIS I

Goals

- Understand ways to do research in HCI
- Practice how to retrieve and evaluate information from the literature
  ⇒ Preparation for thesis and future research work
- Learn about up-to-date developments in Human–Computer Interaction and interactive multimedia from new books and recent conference/journal articles

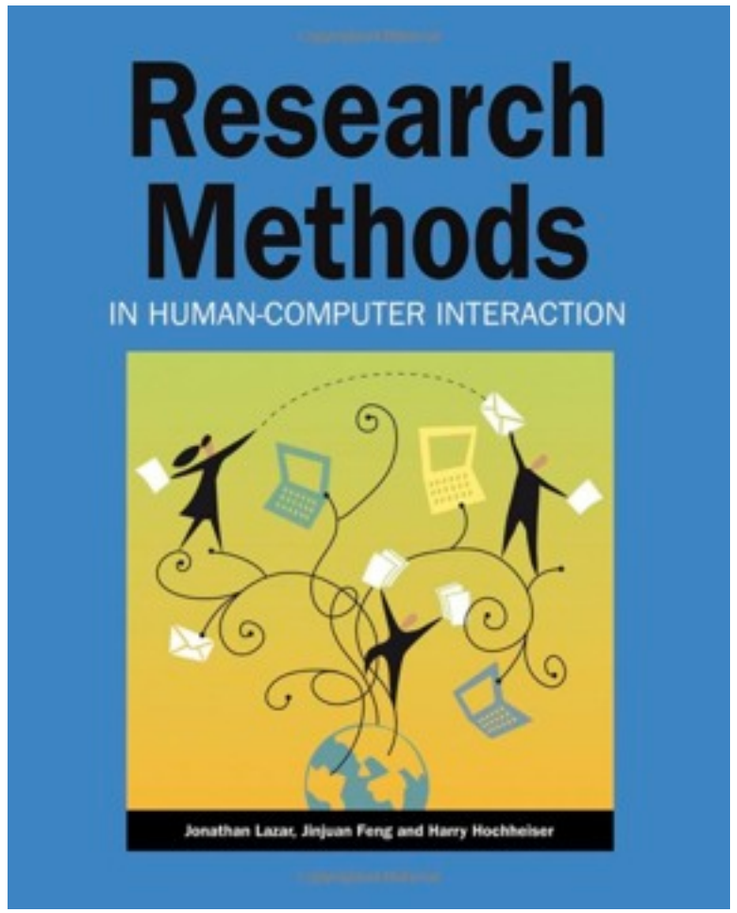
Literature Sources

- Recent (usually last 2 years) conference papers
  - CHI, UIST, TEI, ITS, DIS, NIME, MM, Ubicomp,…
- Recent journal articles
  - TOCHI, Interactions,…

Literature Sources

- Recent books
  - Research Methods in HCI

    Lazar et al. (2010)
  - Recommended reading for more details about evaluation methods — especially if you are going to do your thesis at our chair!



Topics for 2013

- Part I: Research literacy (2 weeks)
  - Understanding HCI research and publication process
  - Sample topic: text entry
- Part II: Recent topics (8 weeks)
  - Midair input
  - Crowdsourcing and human computation
  - Personal fabrication and personal design
  - Claytronics
  - Coding and integrated development environment
  - Interactive surfaces and tangible UIs
  - HCI design patterns

Administrative

- Format: V2/Ü3 (6 ECTS)
- Lecture: Tuesday, 10:00–11:30
  - Presentation & discussion of research topics
  - Small group in-class exercises
- Lab: Wednesday, 13:00–14:30 Attendance is compulsory!
  - Weekly reading assignments (individual)
  - Moderate and summarize in mock PC meetings (in groups)
  - Four paper review assignments (in groups)
- Final Grade
  - 30% midterm & 40% final
  - PC meetings: 5% moderation, 5% summarizing
  - 5% × 4 paper reviews

Learning Resource

- Public website:
  http://hci.rwth-aachen.de/cthci
  - L²P course room: slides, literature, assignments
  - Lecture recordings on iTunes U

    RSS links available on L2P
  - Research papers: ACM Digital Library

    Free access from inside RWTH network

CTHCI Team

- Prof. Dr. Jan Borchers
- Chat Wacharamanotham, M.Sc.
  - chat@cs.rwth-aachen.de
- Topic presenters

Plagiarism

www.interaction-design.org/encyclopedia/gestalt_principles_of_for...

The law of similarity captures the idea that elements will be grouped perceptually if they are similar to each other. In the "preferences window" of

“ Law of Similarity

The law of similarity captures the idea that elements will be grouped perceptually if they are similar to each other. For instance in the following dialog we tend to devide the given files into two groups: ”

[1]

Law of Similarity –

The law of similarity states that objects will be grouped perceptually if they are similar to each other. In other words the repetition in the forms persuades the human mind to group it

[1]

[1] http://www.interaction-design.org/encyclopedia/gestalt_principles_of_form_perception.html

Cite and quote instead of plagiarizing!

Consequences of Plagiarism in this Class

- Plagiarism will result in an immediate 5.0 for this class.
- Repeated plagiarism will also lead to banning from all other i10 classes.
- Sign the declaration of compliance and hand it in after the lab.

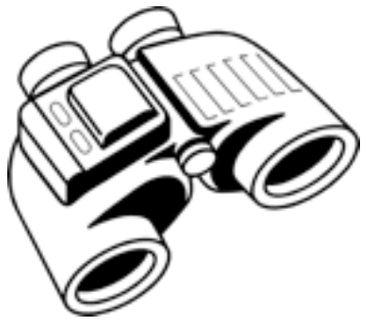
HCI Research Literacy 1

Different approaches to HCI research

Three Approaches to HCI Research

Test

Empirical science



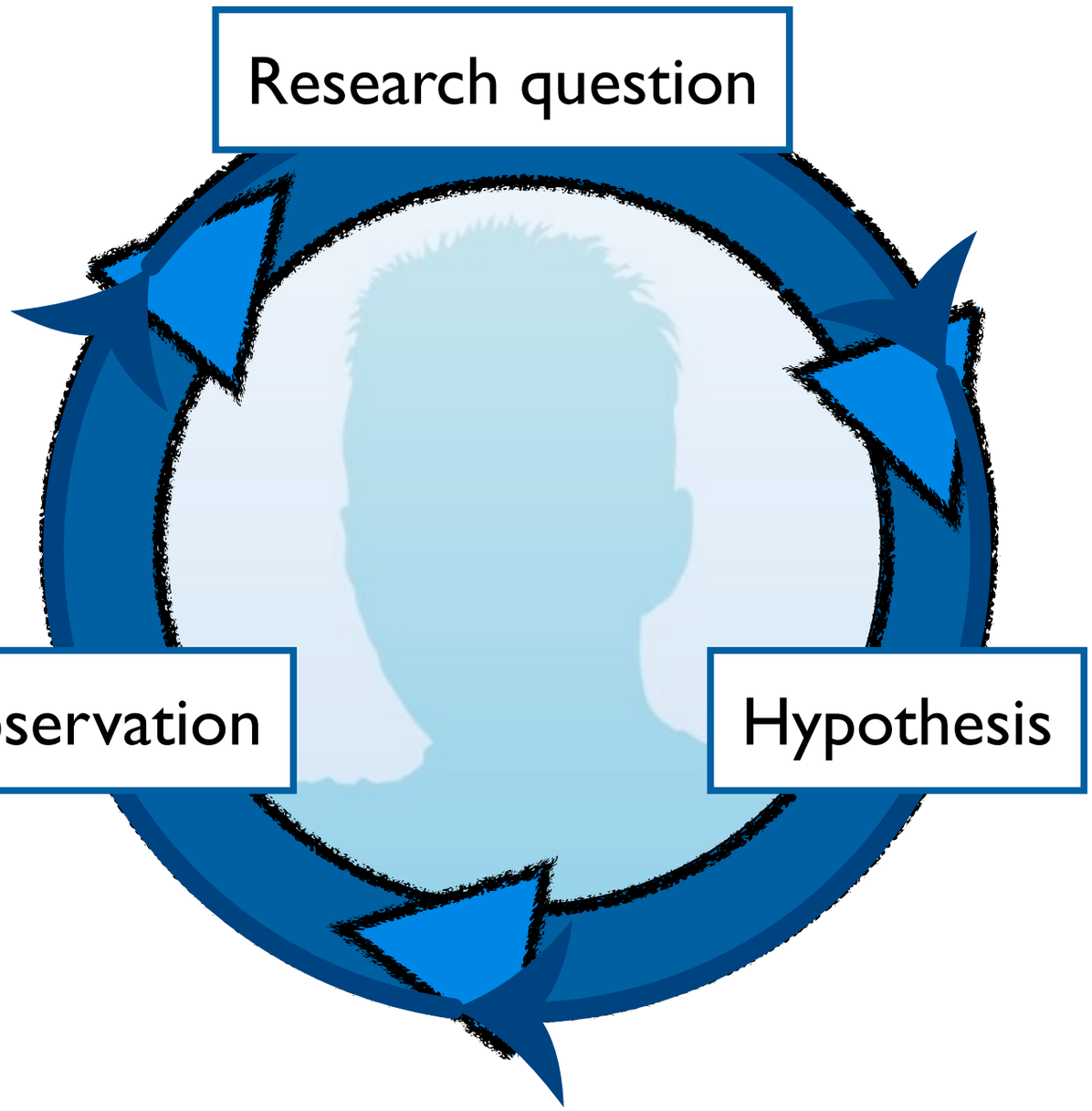
Look

Ethnography

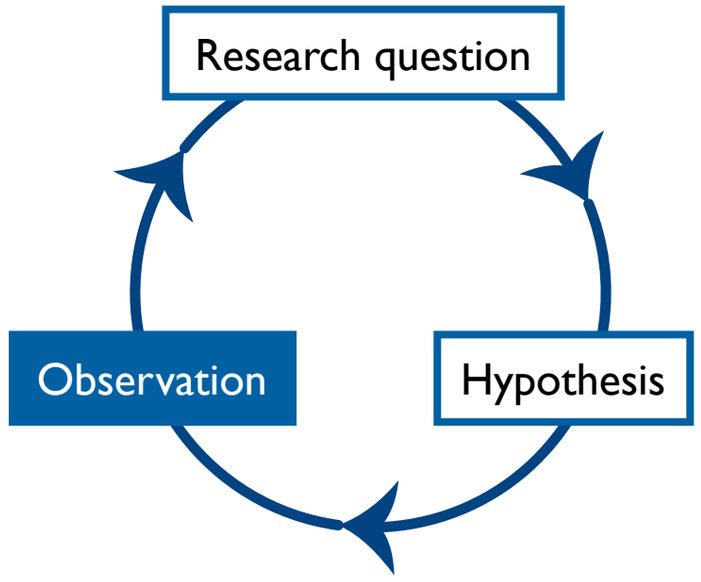
Make

Engineering and design

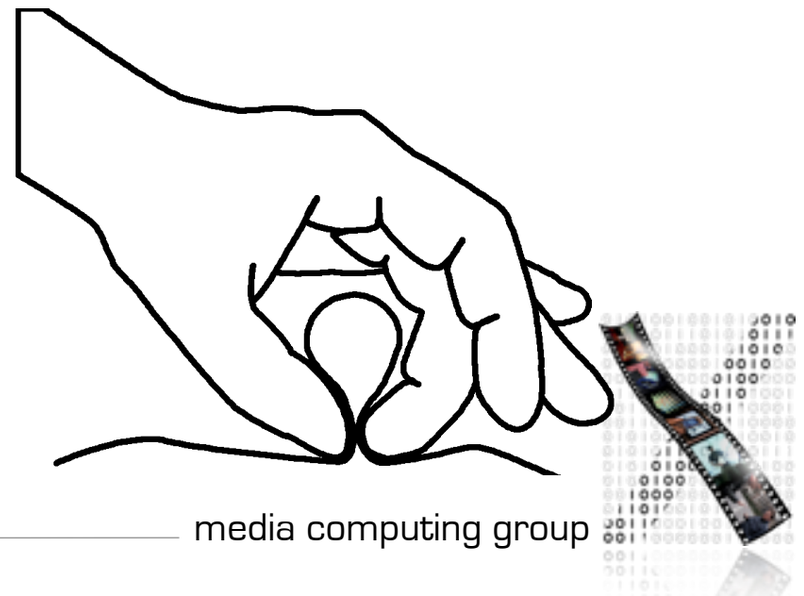
Empirical Approach



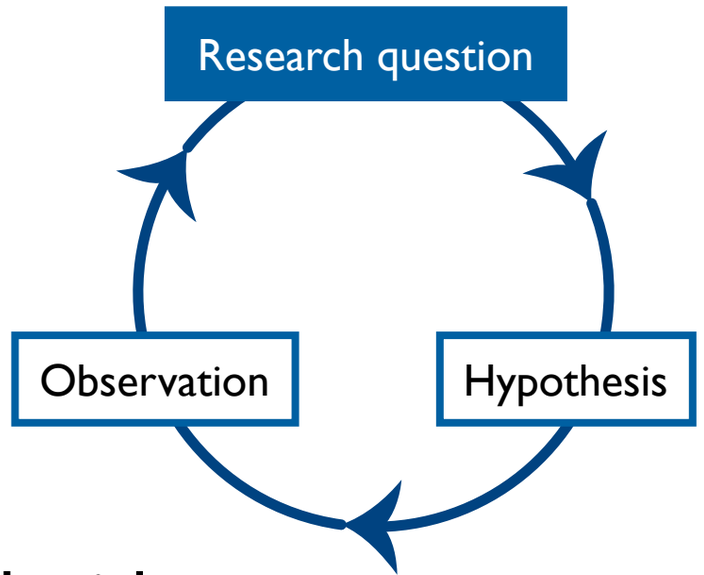
Initial Observation



- Begin with casual or informal observation
- Usually comes from personal experience that catches your attention or raises questions in your mind
- Example: "Cloth has an affordance of pinching. Could this be useful for interaction design?"



Research Question



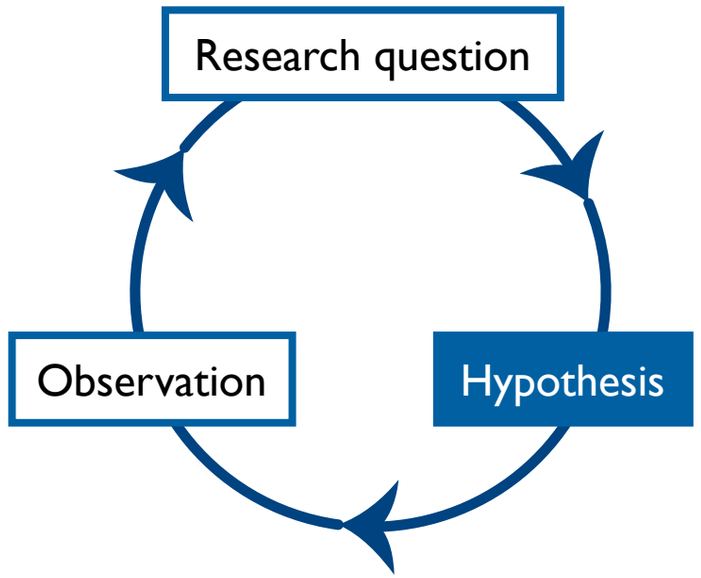
- Identify variables and hypothesis that are associated with your observation

- Variables: characteristics or conditions that change or have different values for different individuals

- Research question: a statement that describes or explains a relationship between or among variables
  - A proposal to be tested

- Example: "For pinching cloth, different areas of the body would differ in preference and the way people pinch"

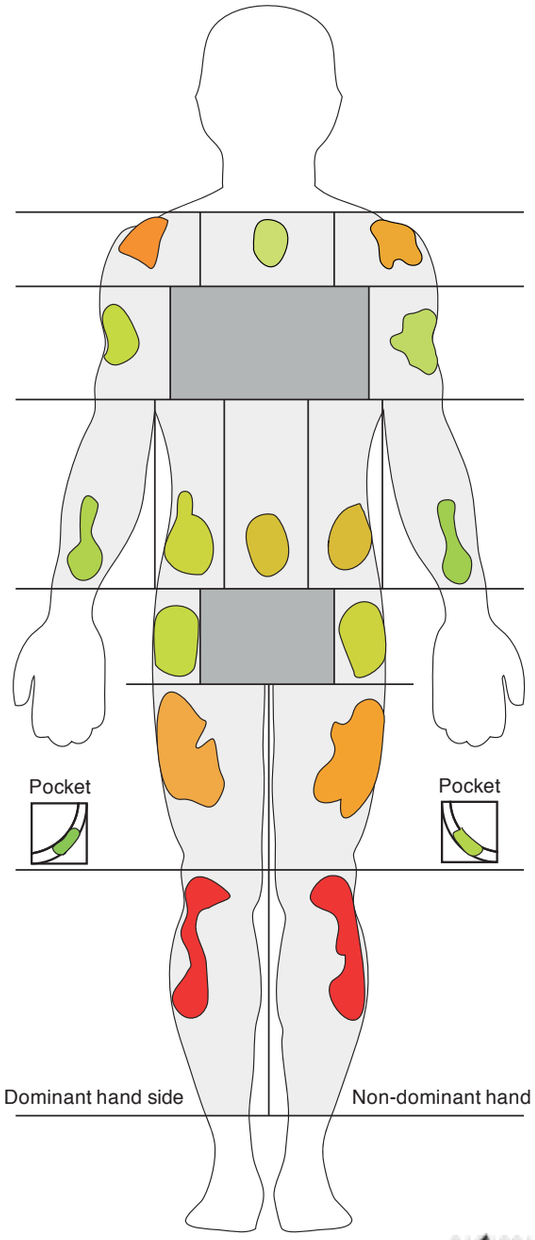
Hypothesis



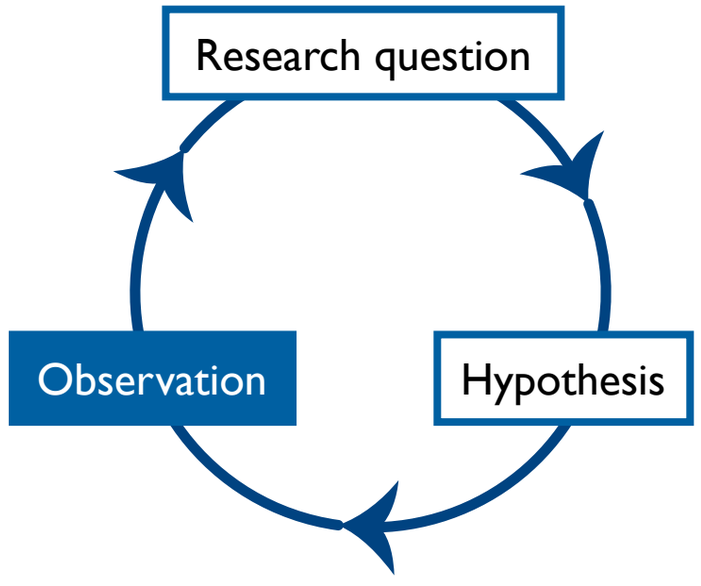
- Concrete and testable statements derived from the research question
- Operational definition: a specific set of operations for measuring external, observable behavior
- In-class exercise: try giving an operational definition for the variables highlighted below
  - "There would be a difference in user's preference among different areas on the body for pinching cloth."

Research Example: Pinstripe

- Karrer et al., CHI '11
- Recall the prediction:
  - "There would be a difference in user's preference among different areas on the body for cloth pinching."
- Method:
  - Identify 16 different body area
  - Ask the participants to perform the pinching gesture in these areas
  - Collect convenience rating in 5-point Likert scale



Planned Observation



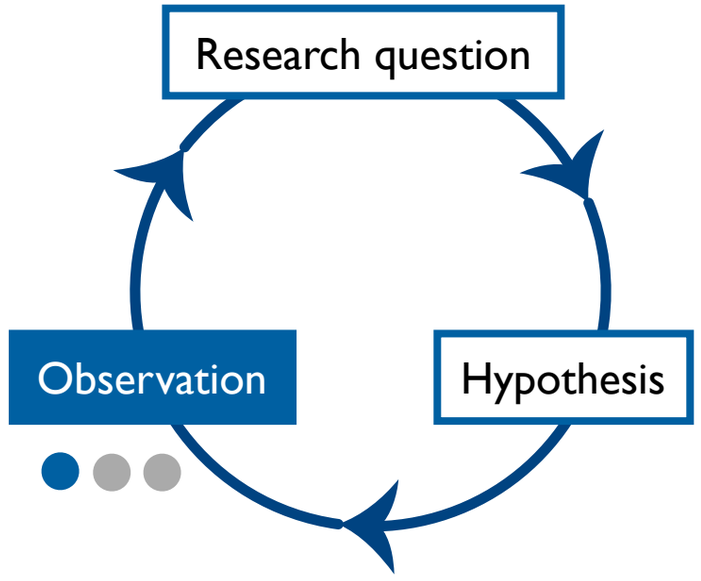
- Collect data to support, refute, or refine the original hypothesis
- Three strategies
  - Descriptive research: X happens

    Focus on the current state of each individual variable
  - Relational research: X and Y happen together

    Measure two or more variables that exist naturally from each participant
  - Experimental research: X causes Y

    Manipulate one or more variables and observe their effects to other variables

Descriptive Research



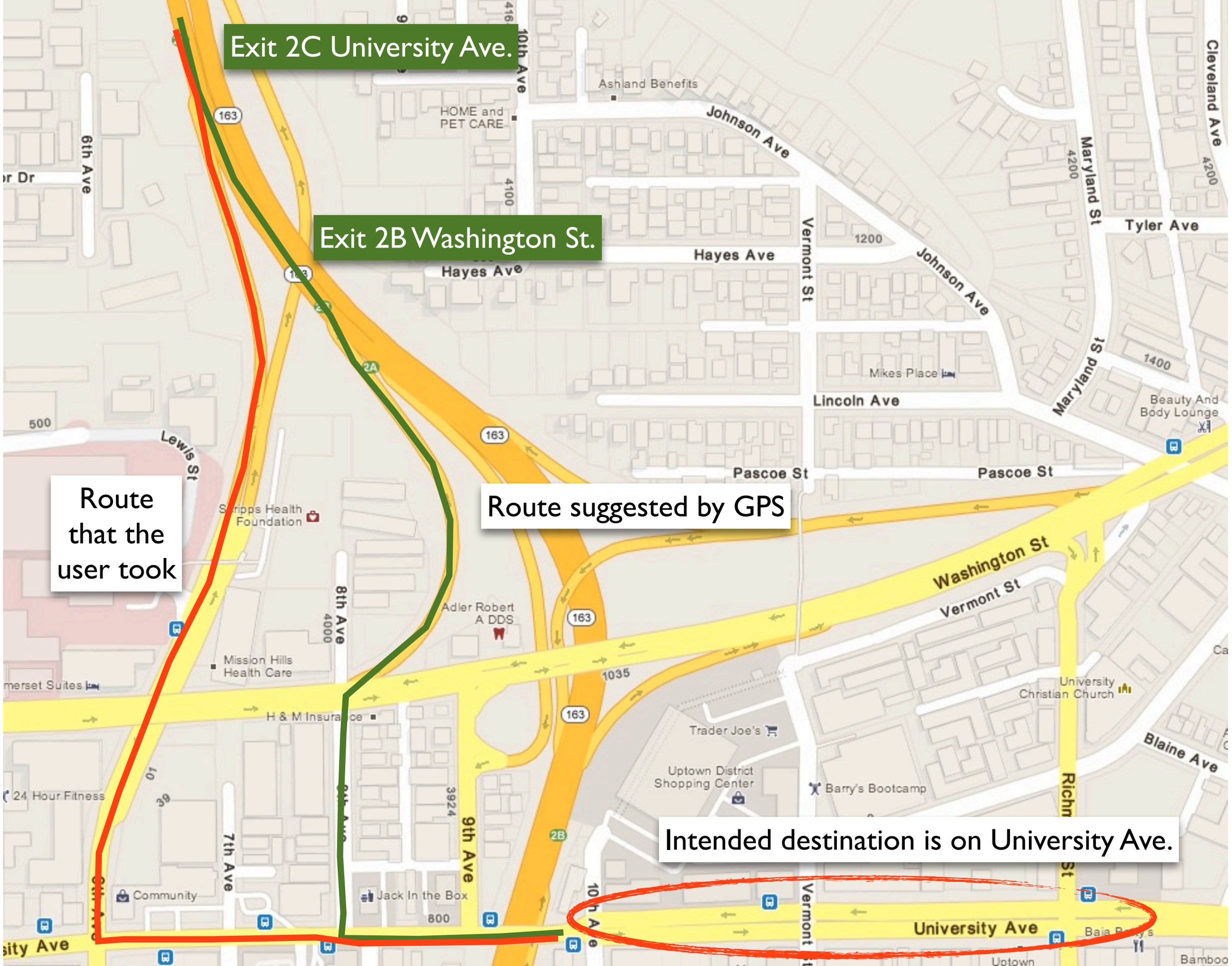
- Describe a naturally-occurring phenomenon
- Measure and report individual variables without claiming relationships
- Natural phenomena can occur when using a new technology as well
- Methods: observation, survey, case study

Research Example: Natural Troubles of Driving with GPS

- Brown (Sweden) and Laurier (Edinburgh), Best paper CHI '12
- Goal: To understand users' interaction with GPS navigation system in non-controlled setting
- 14 drivers, 2 video cameras, field notes
  - 9 hours of video ⇒ 75 clips ⇒ 37 detailed transcriptions
  - Analyzed the data to find common patterns/themes and construct theories that explain them

The normal natural troubles of driving with GPS

Available at: http://dl.acm.org/citation.cfm?id=2208285



Exit 2C University Ave.
Exit 2B Washington St.
Route that the user took
Route suggested by GPS
Intended destination is on University Ave.
Ashland Benefits
HOME and PET CARE
Johnson Ave
Hayes Ave
Vermont St
Lincoln Ave
Pascoe St
Washington St
Maryland St
Tyler Ave
Cleveland Ave
Mikes Place
Beauty And Body Lounge
Lewis St
Scripps Health Foundation
Adler Robert A DDS
Mission Hills Health Care
H & M Insurance
Trader Joe's
Uptown District Shopping Center
Barry's Bootcamp
University Christian Church
Blaine Ave
24 Hour Fitness
Community
Jack In the Box
University Ave
6th Ave
7th Ave
8th Ave
9th Ave
10th Ave

163 SOUTH
Downtown
Washington
Street
1/2 MILE
6th Ave
University Ave
EXIT 2C
EXIT ONLY

Exit 2C University Ave.
Exit 2B

GPS still recommends
to take 2B, even when
the car is in “Exit only” lane

Exit 2C University Ave.

The normal natural troubles of driving with GPS

Available at: http://dl.acm.org/citation.cfm?id=2208285

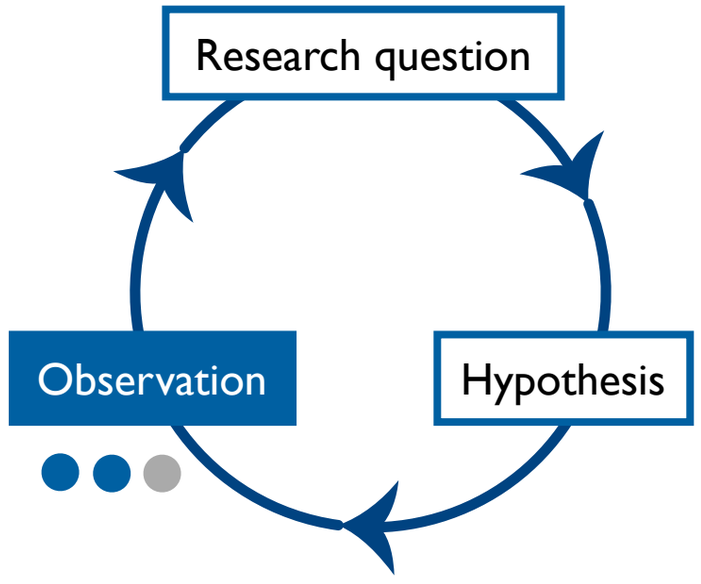
Natural Troubles of Driving with GPS

- Contribution & benefits:
  - "Presents a video analysis study of driving using GPS navigation systems in natural settings. The paper argues for [understanding] driving with [a] GPS as an active process and not as 'docile driving'."

- Conclusion
  - Designer should take into account the "intelligent driver"

    E.g., less persistent instructions when the user decided to deviate from them
  - Normal natural trouble: "GPS is used in the way that was not foreseen. The driver must take instructions and the map and fit them with the situation."

Relational Research



- Measure a set of variables for each participant
- Examine to identify patterns of relationship
  - Changes in one variable are consistently and predictably accompanied by changes in another variable
- Measure the strength of the relationship

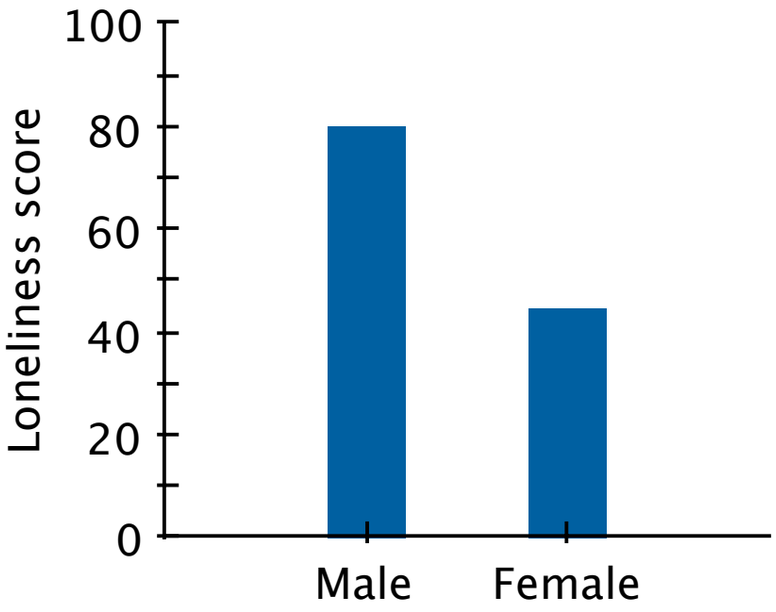
Research Example: Social Network Activity and Social Well-Being

- Burke (CMU), Marlow, and Lento (Facebook). Best paper CHI '10
  - "An empirical analysis of the relationship between direct and passive communication on Facebook and social well-being, including loneliness, bridging, and bonding social capital."

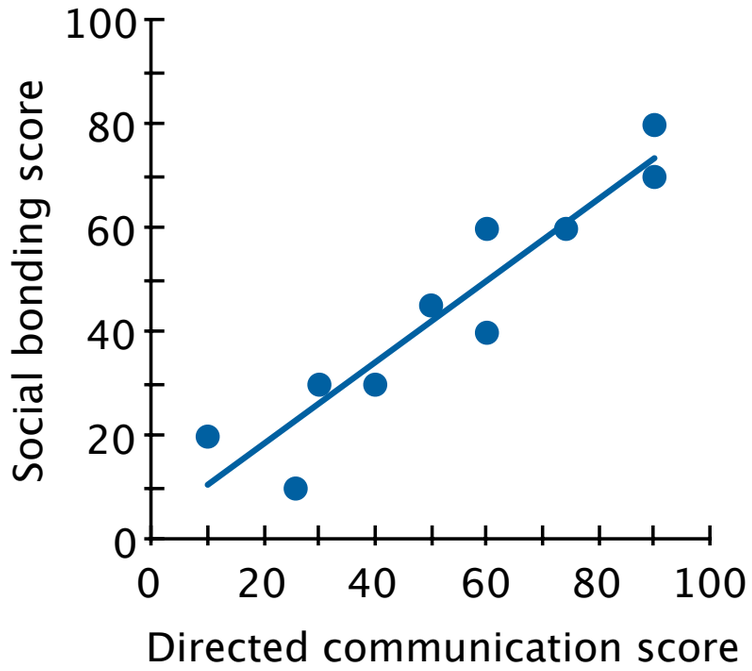
- Survey in Likert scale (N=1193)
  - Bonding, e.g., "There are several people I trust to help solve my problems"
  - Bridging, e.g., "I come in contact with new people all the time"
  - Loneliness, e.g., "I often feel close to people"

- Analyze the past two months Facebook activity data, e.g.,
  - Friend count (actual)
  - Directed communication: comments, likes
  - Passive consumption of broadcasted items, e.g., status update

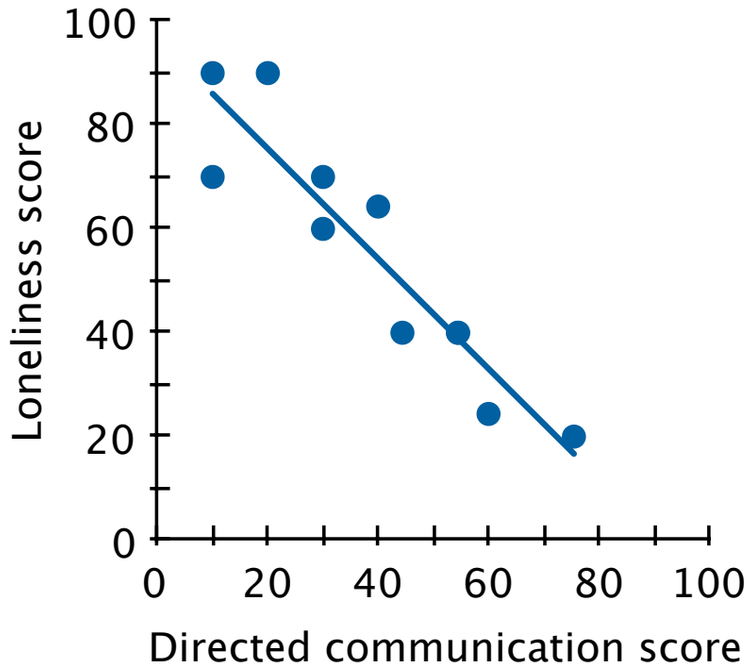
Patterns in the Relationship between Variables



General relationship



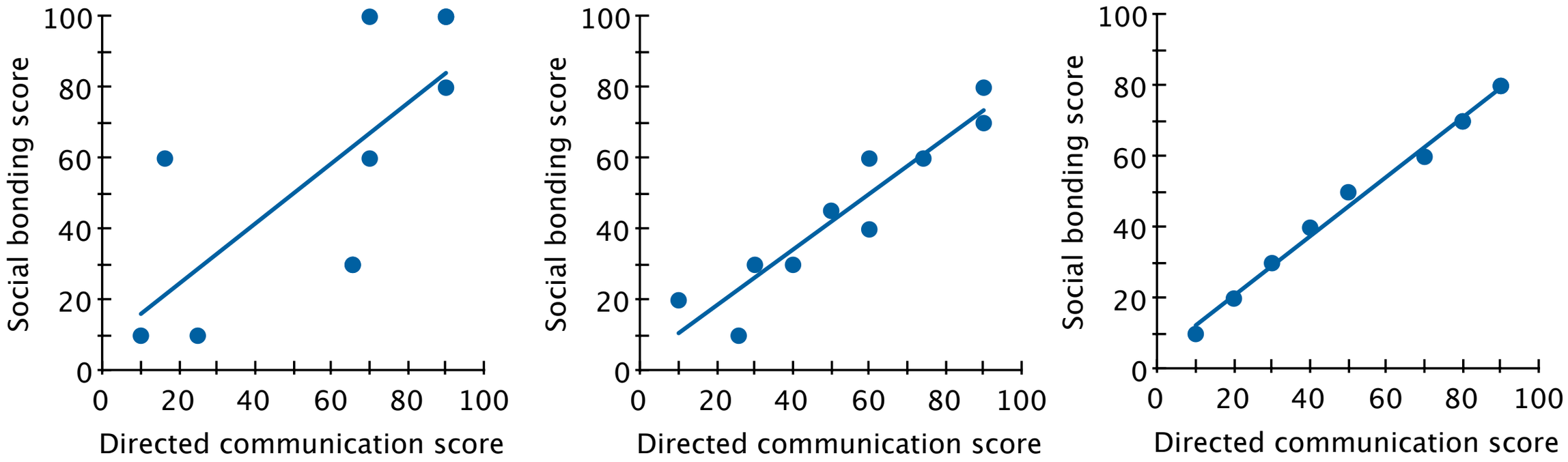
Positive relationship



Negative relationship

Simulated data for instructional purpose, based on the result from [Burke et al., CHI '10]

Strength of the Relationship between Variables



Weak ⟷ Strong

Simulated data for instructional purpose

Limitations of Relational Research

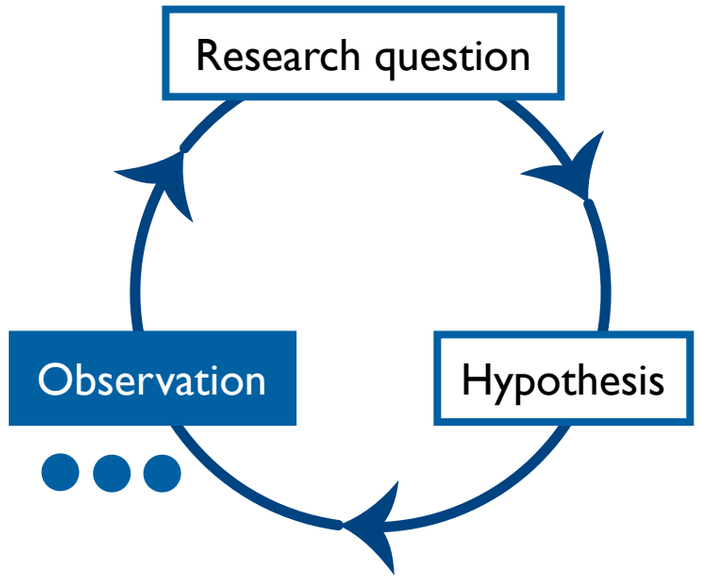
- Correlation does not imply causation
  - E.g., loneliness ⇒ consumption
    or consumption ⇒ loneliness?
    or third variable ⇒ consumption and loneliness?

- Third variable problem: unidentified variable controls the correlated variables

- Shallow data from large number of people instead of deep data
  - Can be improved by follow-up interviews, follow-up surveys

- Participant sampling method limits the conclusion
  - Method: advertisement on Facebook
  - Participants: only English-speaking users, but compensated by many countries of origin

Experimental Research



- Purpose: To infer cause-and-effect relationship
- Controlling independent variable
- Observe the change in the dependent variables
- In-class exercise: recall the following experimental designs
  - Between-group vs. within-group
  - Benefits and drawbacks
- More details in lecture 2 and 3

In-class Exercise: Mobile Phone Text Input Example

- Research question: On a mobile phone, is typing faster using *physical keys* compared to using a touchscreen and your *fingers* or a *stylus*?

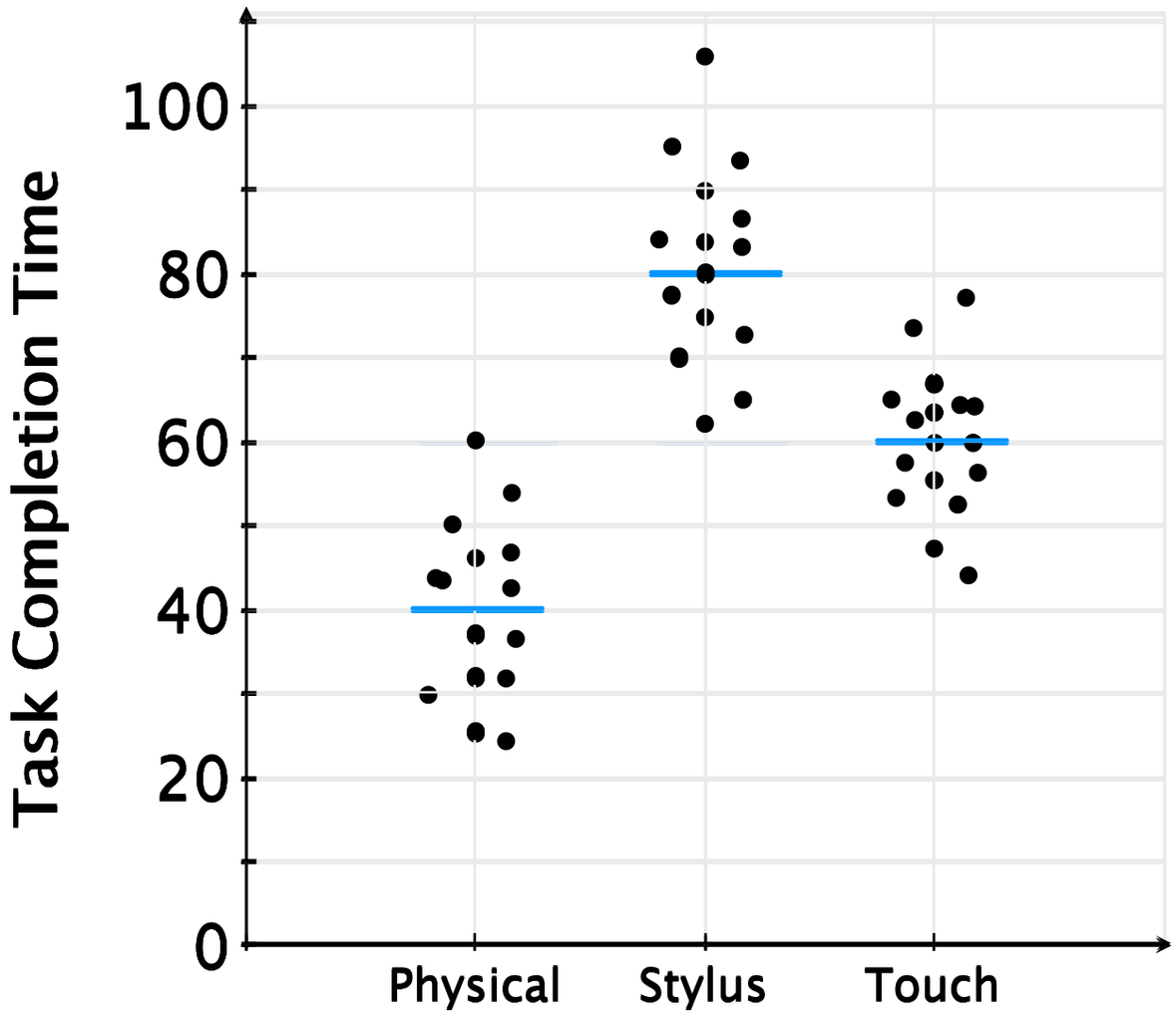
- IV: keyboard types: {physical, stylus, touch}

- DV: time in seconds for typing a specified sentence.
  - Begin: when the user presses the first key
  - End: when the user presses Enter

- Design: between-groups
  - Each keyboard is tested by 20 participants
  - Each participant types the sentence only one time (one trial)

Variance of Real Data

- Data from experiments is noisy
- Effect: Variance caused by the different levels of our IV
- Confound: Variance caused by uncontrolled factors ("confounding variables")



Research Example: Mid-air Pan-and-Zoom on Wall-sized Displays

- Nancel et al. (Paris), Best paper CHI '11
- Contributions & Benefits:
  - "Design and evaluation of multiscale navigation techniques for very large displays based on three key factors: number of hands involved, type of movement, type of feedback."

Mid-air pan-and-zoom on wall-sized displays

Available at: http://dl.acm.org/citation.cfm?id=1978969