

Observing Behaviour

Computational Social Intelligence - Lecture 05

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Research Council



This lecture is based on the following text (available on Moodle):

- [Chapter 3](#) of "Measuring Behaviour" P.Martin & P.Bateson, Cambridge University Press (2007);
- Vinciarelli, Chatziioannou & Esposito, "When the Words are not Everything: The Use of Laughter, Fillers, Back-Channel, Silence and Overlapping Speech in Phone Calls", [Frontiers in ICT, 2:4, 2015.](#)

Outline

- The 11 Steps of Behaviour Analysis
- An Example: Mobile Phone Conversations
- Conclusions

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- An Example: Mobile Phone Conversations
- Conclusions

1. Ask a question.

“Before any scientific problem is investigated, some sort of question will have been formulated [...] may initially be a broad one [...] Such a question is not a hypothesis.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

2. Make Preliminary Observations.

“A period of preliminary observation is generally invaluable in deciding what measurements to make and should be regarded as crucial part of any study.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

3. Identify the Behavioural Variables that Need to be Measured.

“The form of the research and the variables that are to be measured should then be chosen as to provide the best account of what you have observed.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

4. Choose Suitable Recording Methods.

“No observer can record behaviour without selecting some features [...] and ignoring others. The selection [...] reflects the questions you asked at the beginning of the study.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

5. Collect and Analyse the Data.

“[...] plan in advance how much data you will need to collect in order to obtain a clear conclusion [...] Use the appropriate statistical tools to for analysing the data.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

6. Formulate Precise Hypotheses.

“A clear hypothesis invites a direct test [...] hypotheses may be tested by observing natural variation in a population as well as by performing experiments.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

7. Make Predictions from the Hypotheses.

“A clear hypothesis should, by a process of straightforward reasoning, give rise to one or more specific predictions that can be tested empirically.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

8.Design the Tests.

“The variables that are to be measured should then be chosen so as to provide the best test of the different predictions made by competing hypotheses.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

9.Run Tests of your Hypotheses.

“Use the same measurement procedures throughout and try, if possible, to collect data ‘blind’ so that you **do not** unconsciously select data that fit your hypothesis.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

10. Analyse the Results of your Tests.

“Employ the appropriate statistical tools, both for presenting and exploring the data, and for testing the hypotheses.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

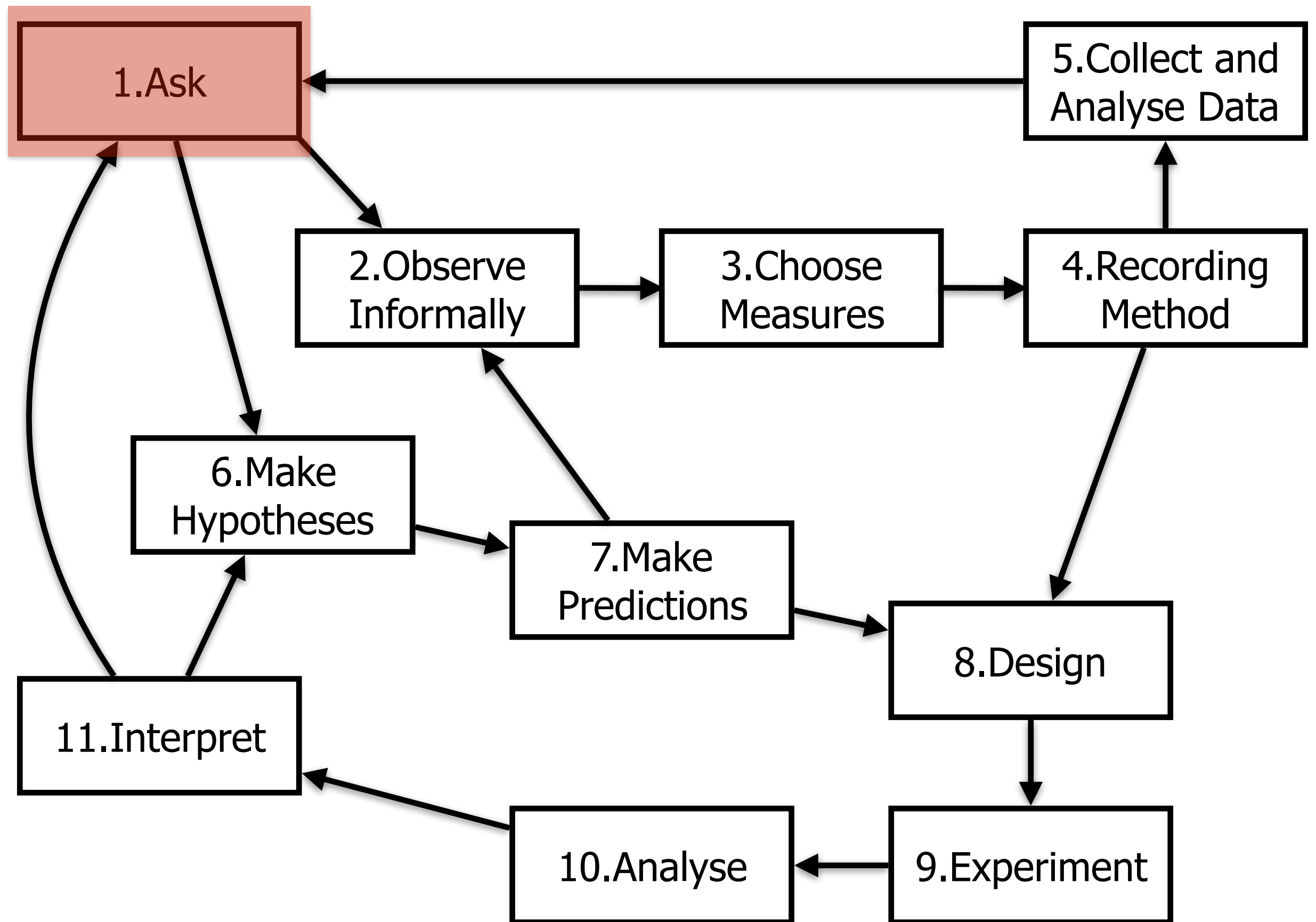
11. Consider Alternative Interpretations of the Evidence.

“Do not draw more conclusions than the data support, but do try to formulate a list of questions and ideas suggested by the data that could form the basis of future research.”

Martin & Bateson, “Measuring Behaviour”,
Cambridge University Press, 2007 (Chapter 3)

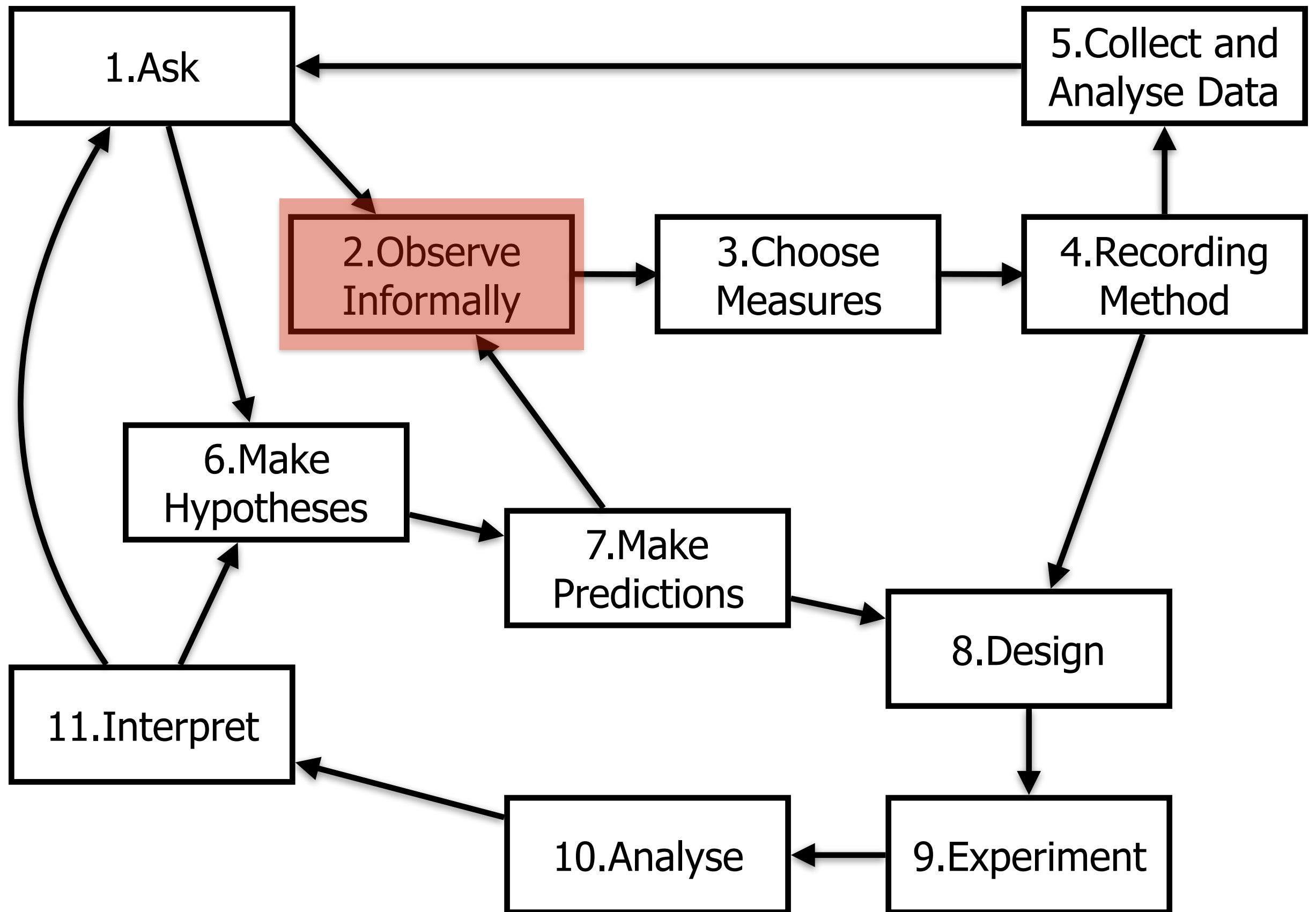
Outline

- The 11 Steps of Behaviour Analysis
- **An Example: Mobile Phone Conversations**
- Conclusions



1. Ask a question.

Is there a relationship between the use of nonverbal communication and major social dimensions (gender and role)?

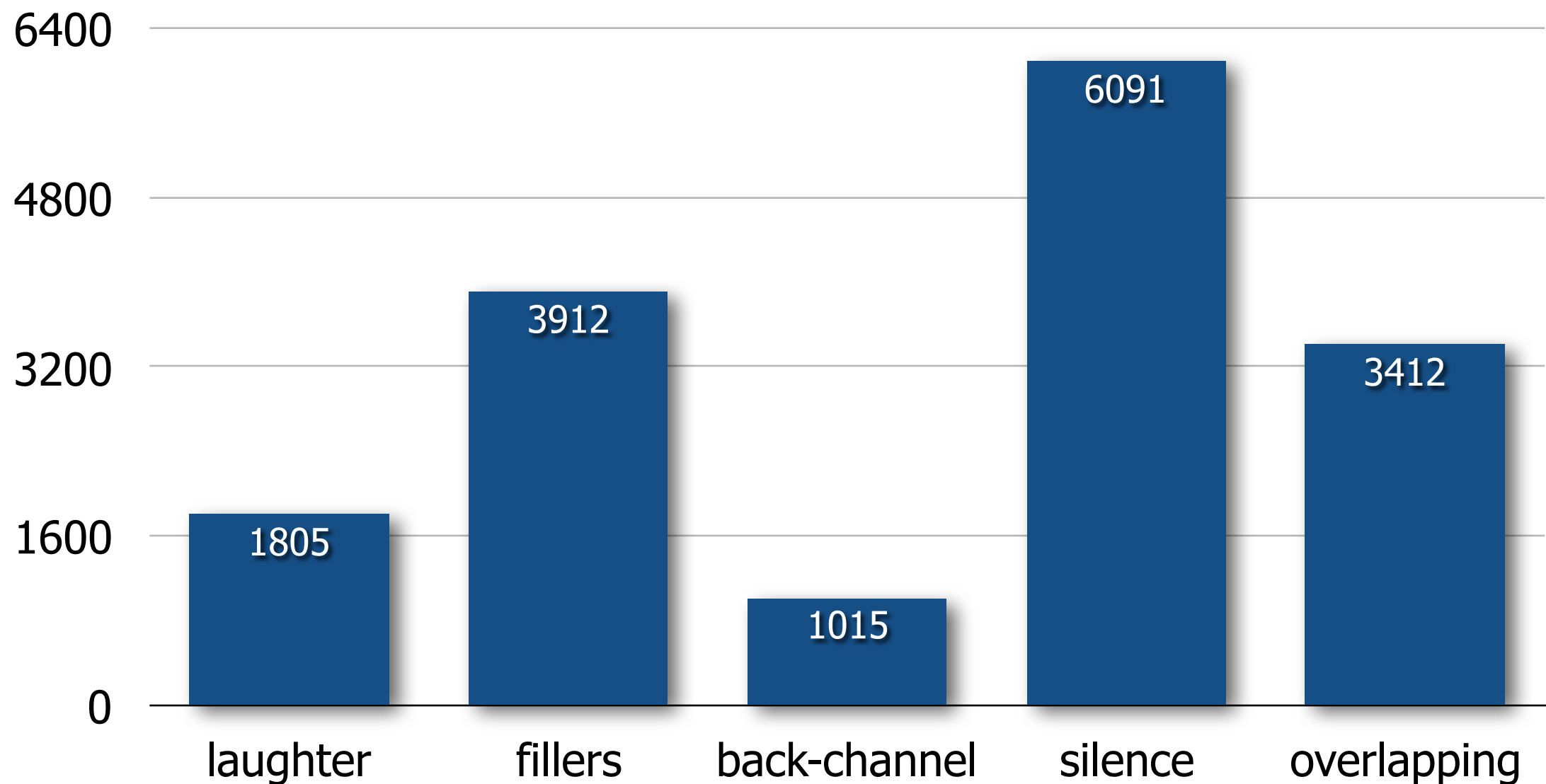


2. Make Preliminary Observations

Number of Calls	60
Number of Subjects	120
Total Length	11h : 48m : 24s
Average Length	11m : 48s
Audio Sampling Frequency	44kHz
Gyroscopes Sampling	68Hz
Psychometric Questionnaires	2
Total Annotated Cues	16,235

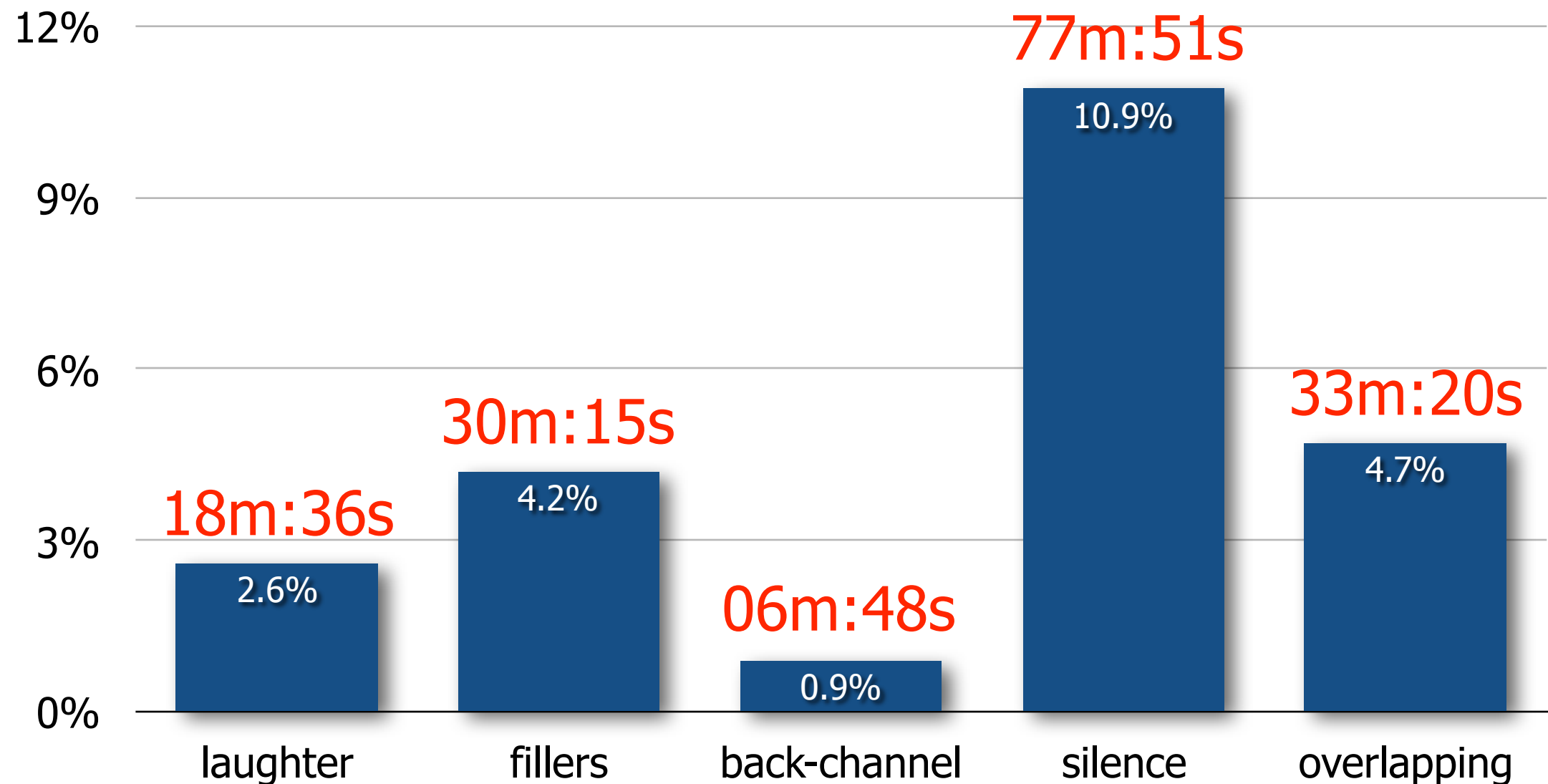
The SSPNet Mobile Phone Corpus

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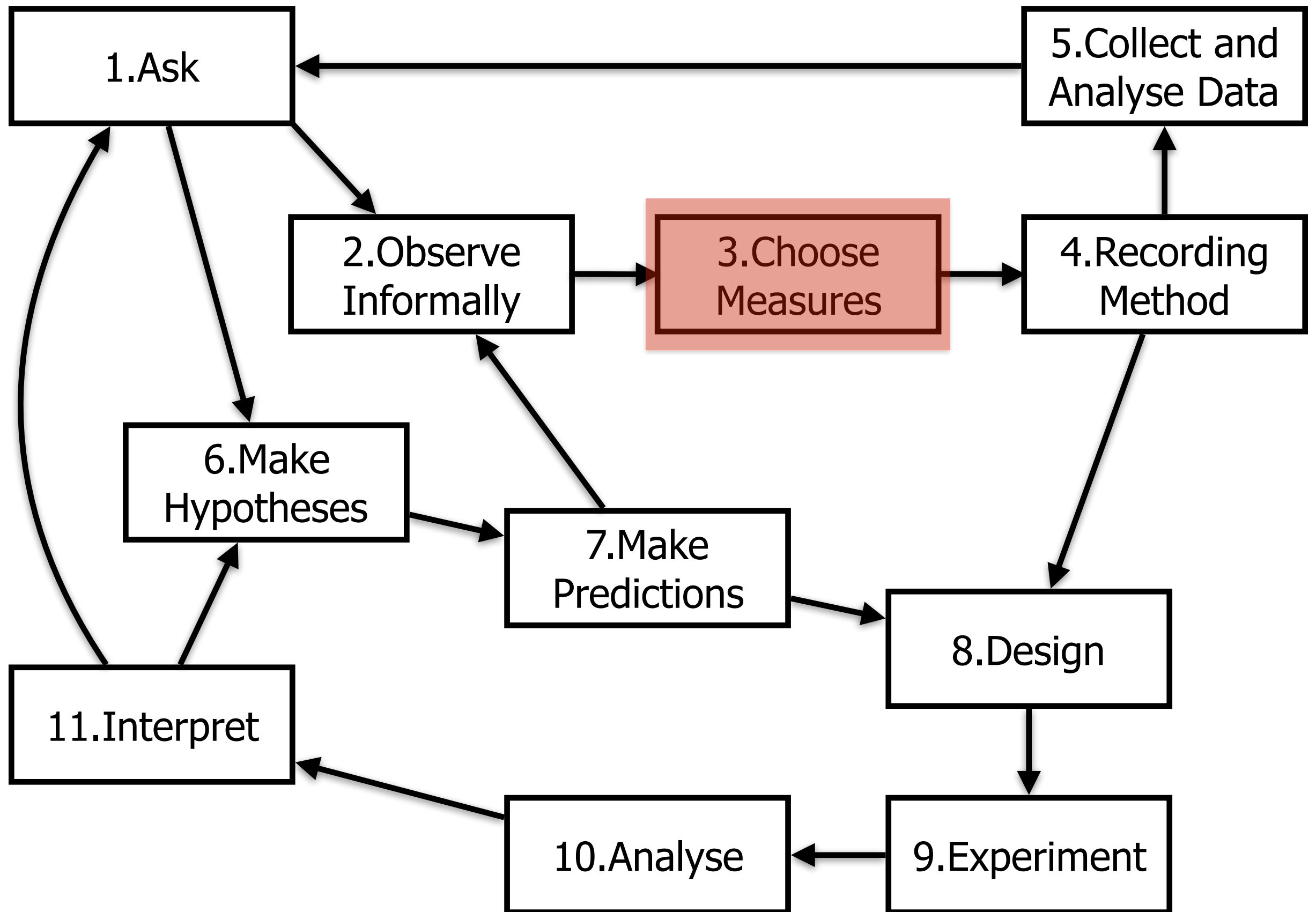


Vinciarelli, Chatziioannou & Esposito, "When Words are Not Everything: the use of laughter, fillers, back-channel, silence, and overlapping speech in phone calls", *Frontiers in ICT*, 2(4), 2015.

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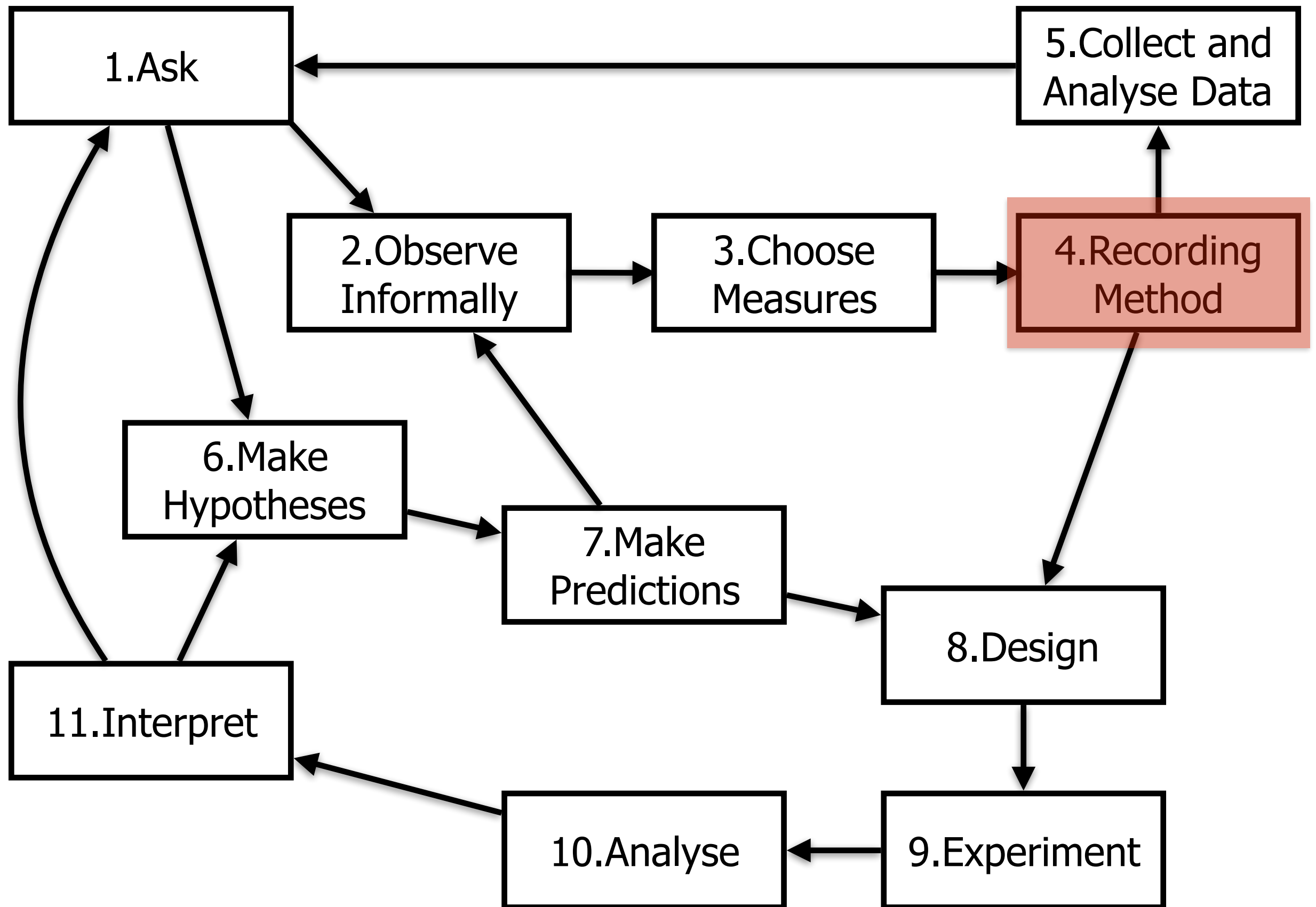


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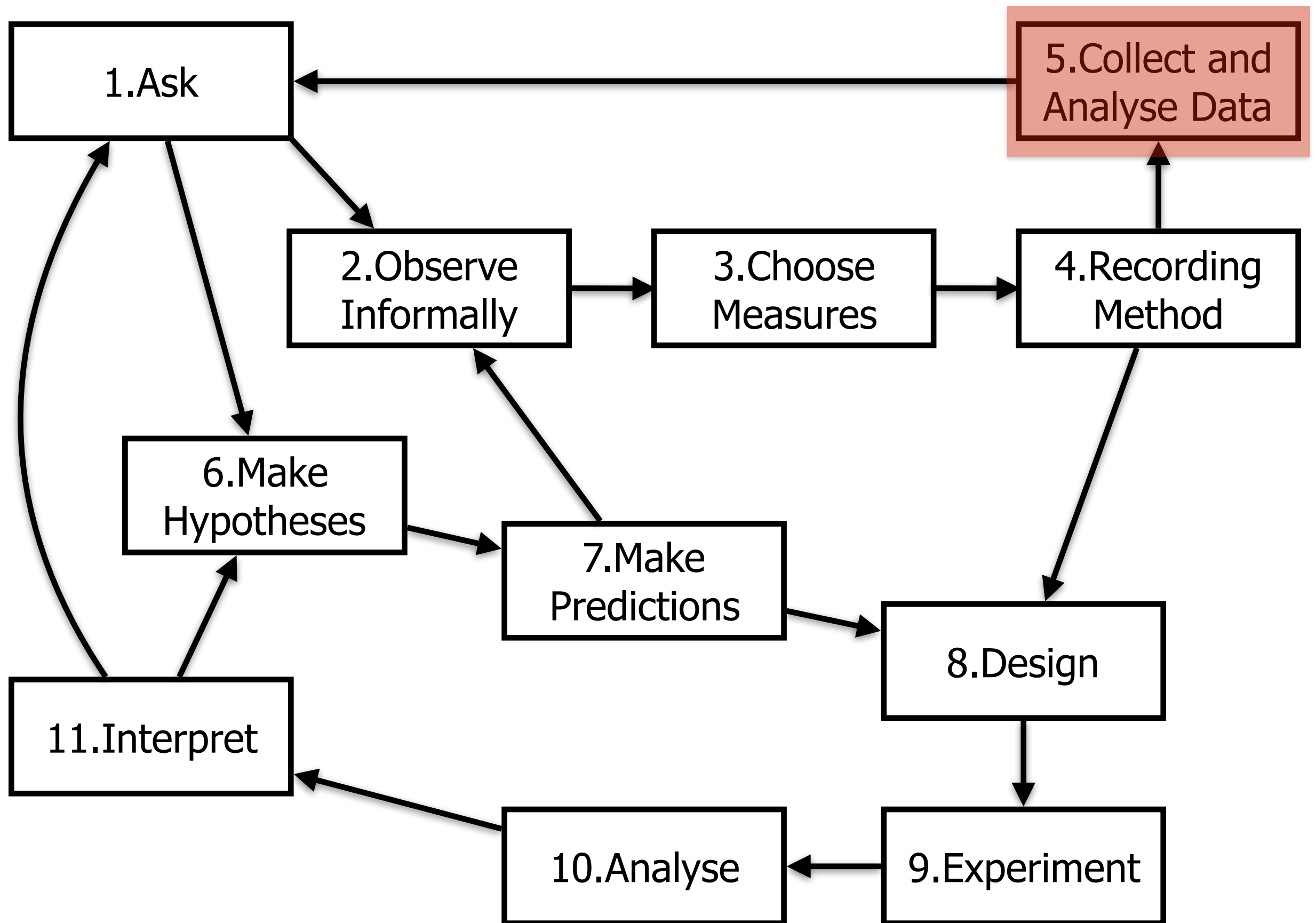
3. Identify the Behavioural Variables that Need to be Measured.

Number of occurrences for different types of subjects (female and male or callers and receivers) of silences, laughter interruptions, fillers and back-channel

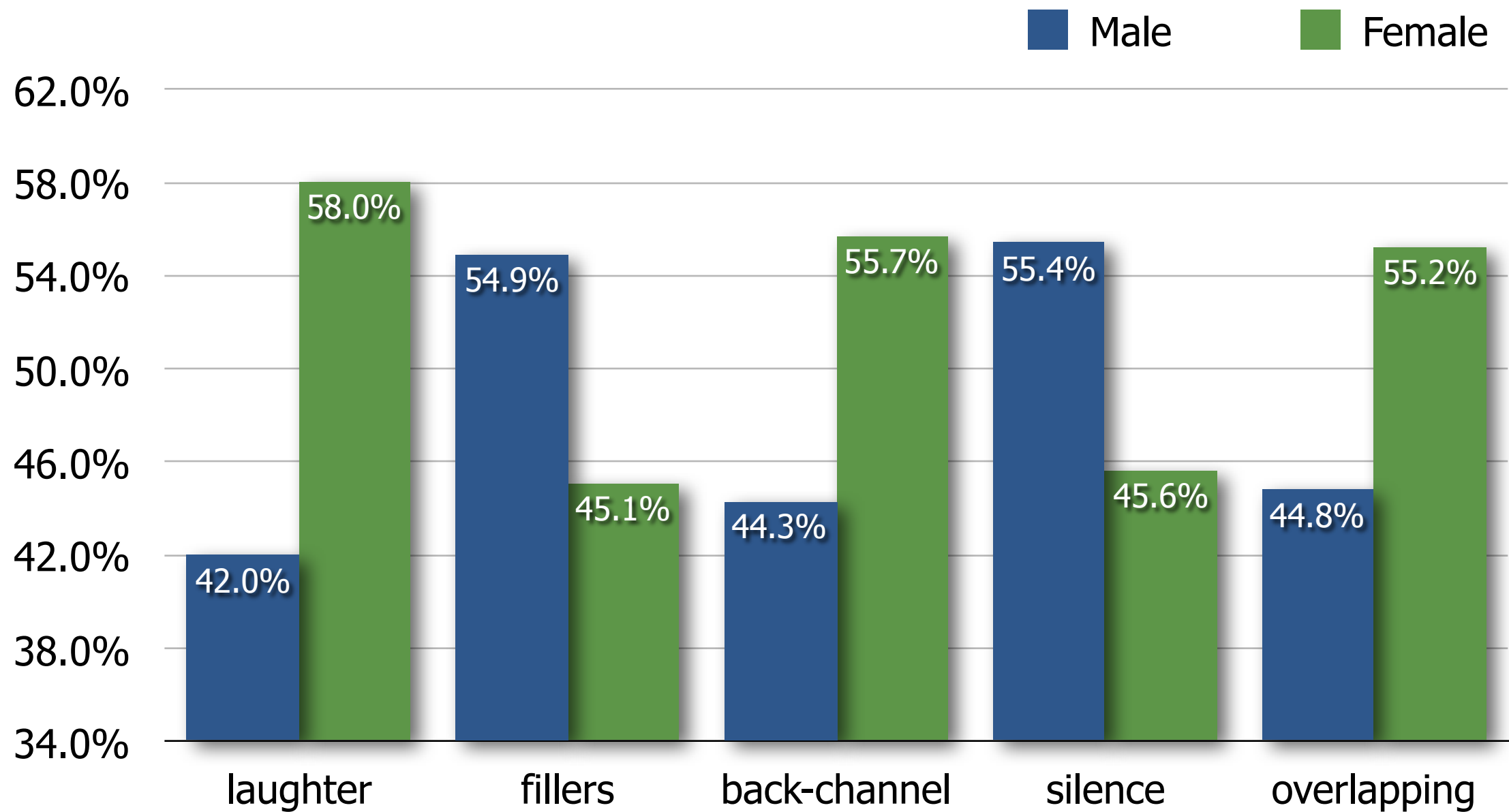


4. Choose Suitable Recording Methods.



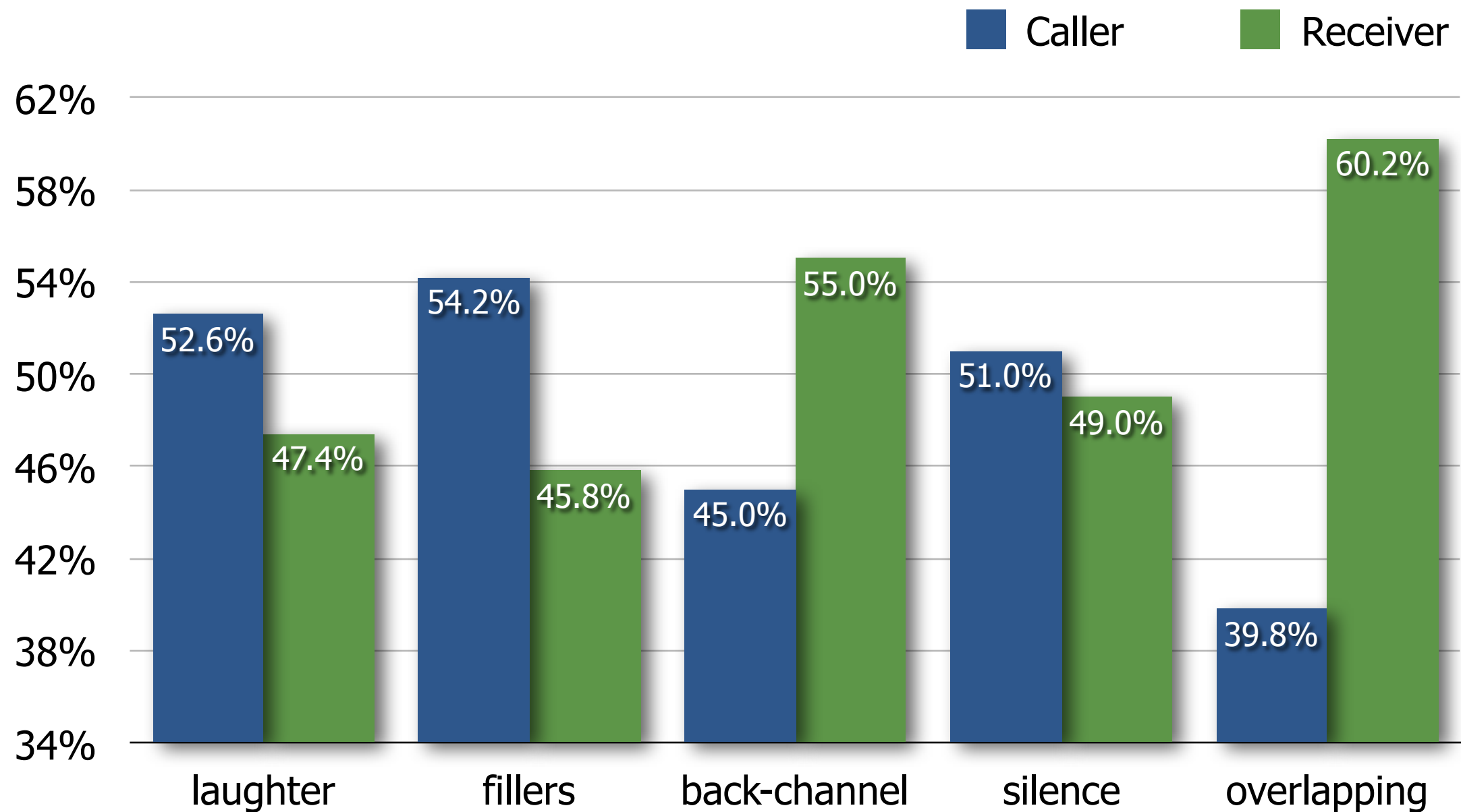


5. Collect and Analyse the Data.

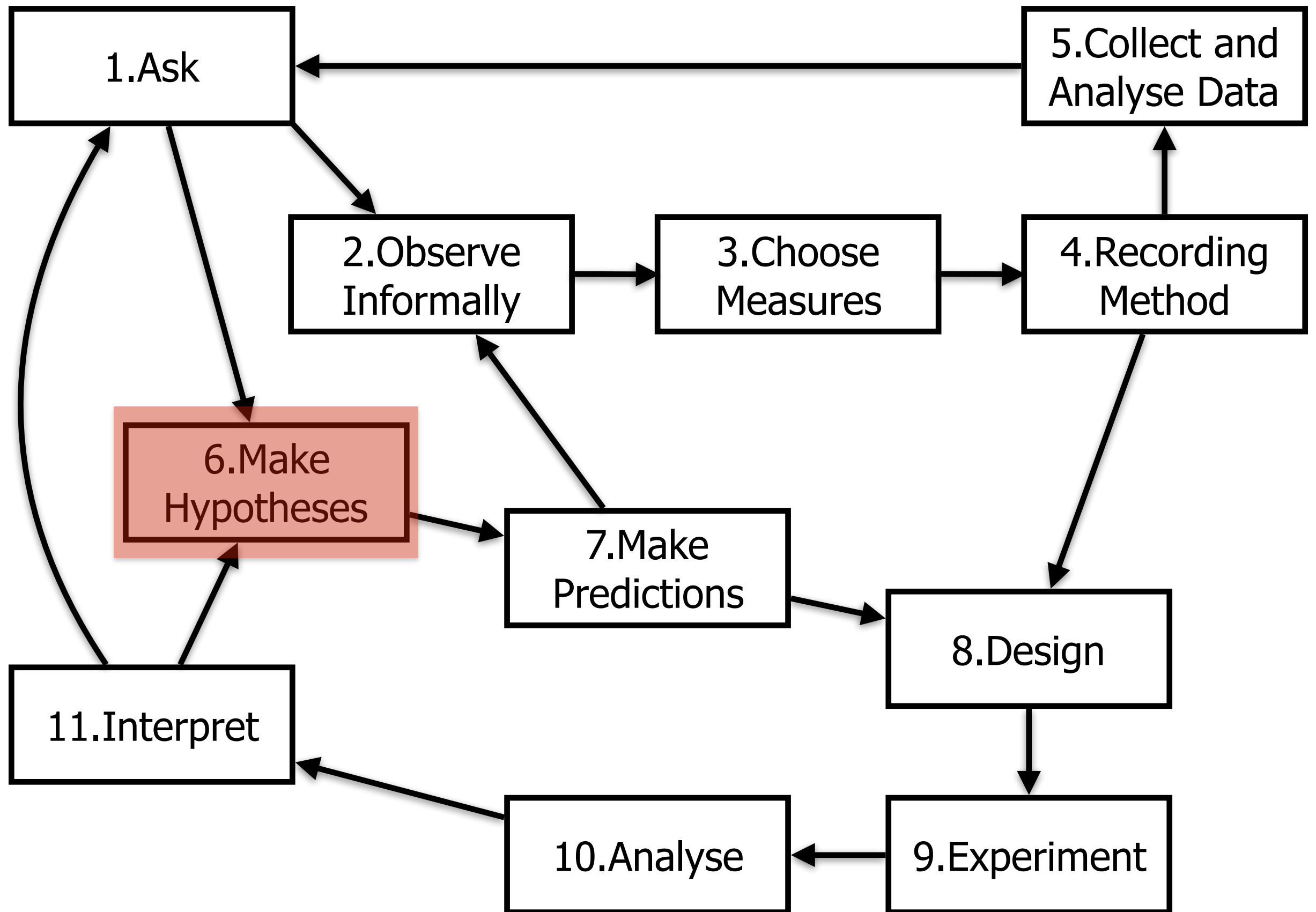


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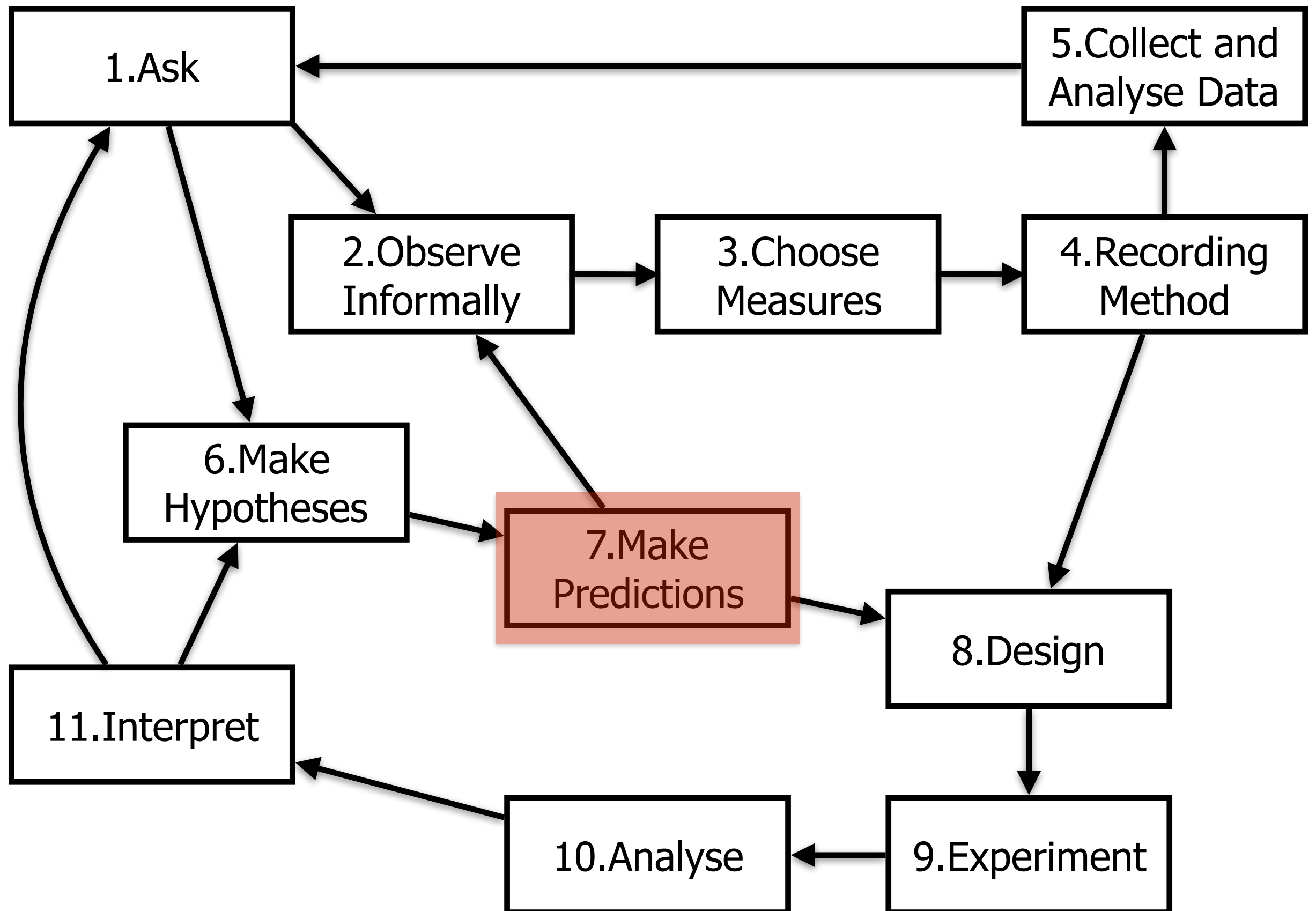


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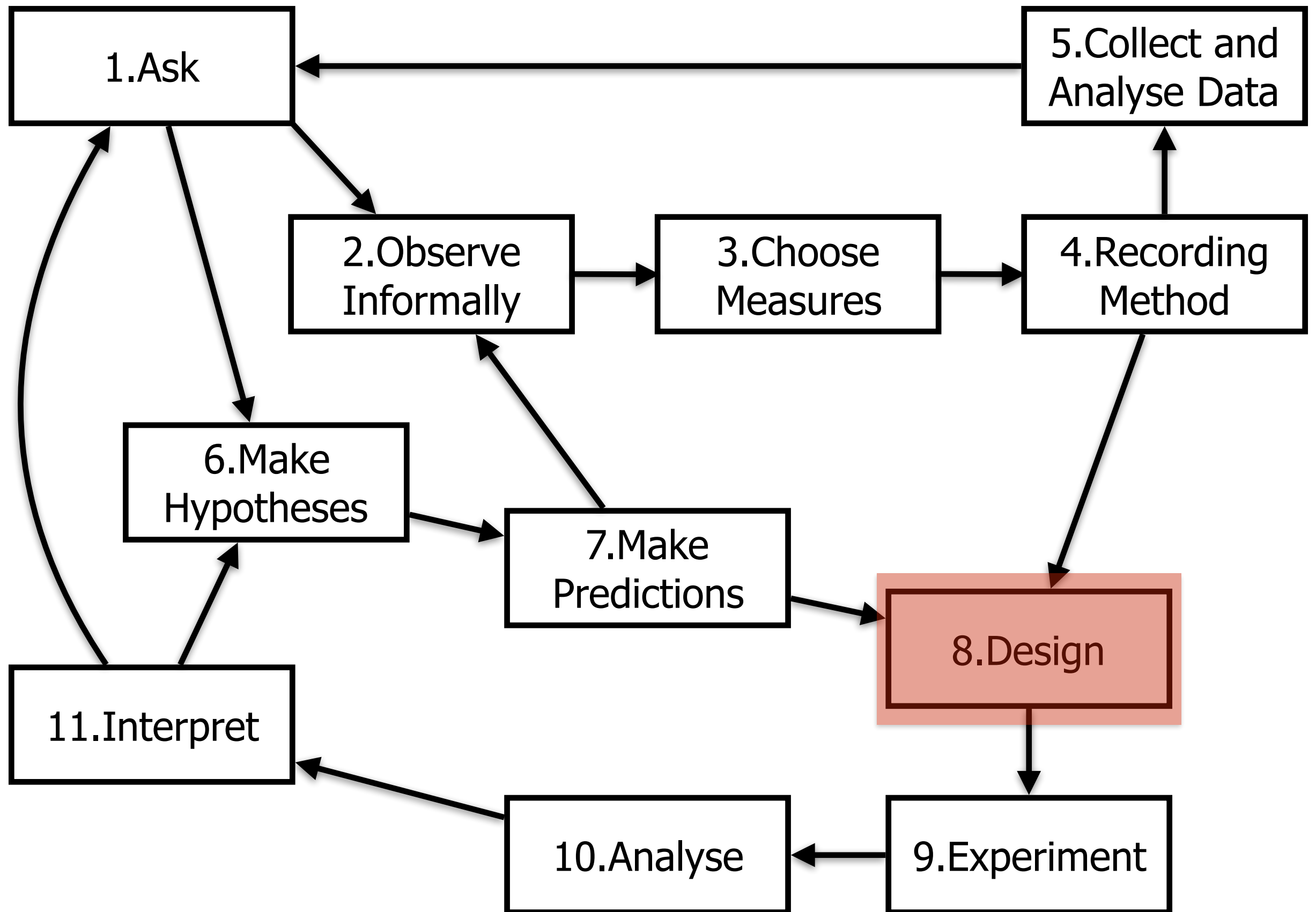
6. Formulate Precise Hypotheses.

There is a statistically significant relationship between social dimensions (gender and role) and number of occurrences of frequent nonverbal cues

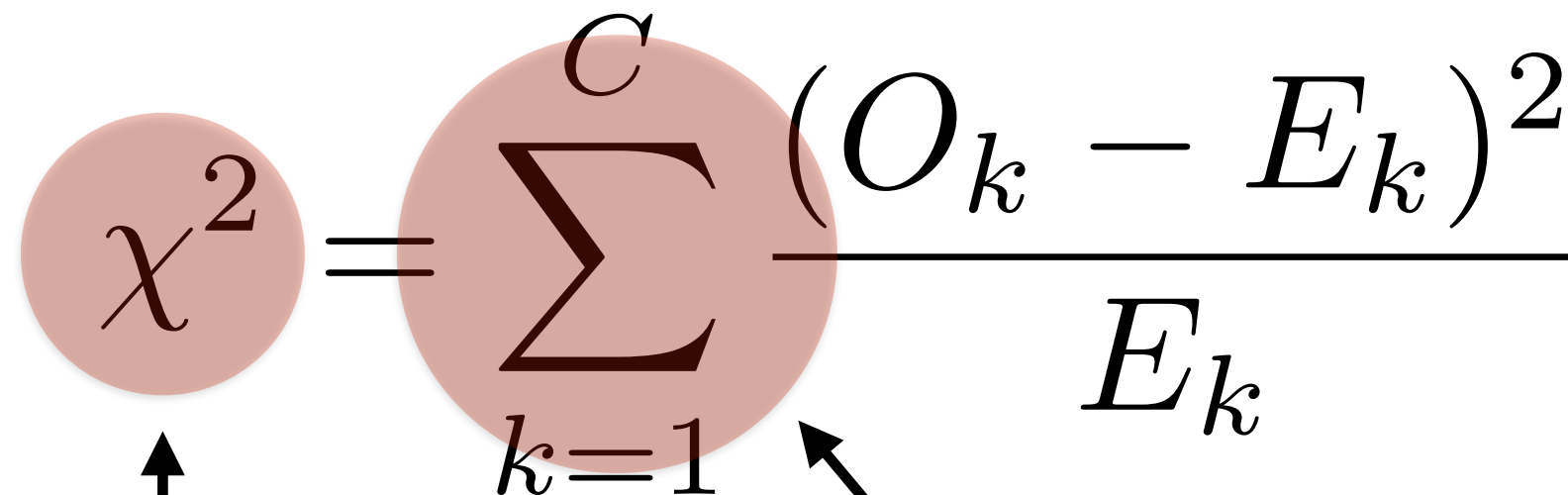


7. Make Predictions from the Hypotheses.

The observed differences, at least for some cues, are statistically significant



8.Design the Tests.

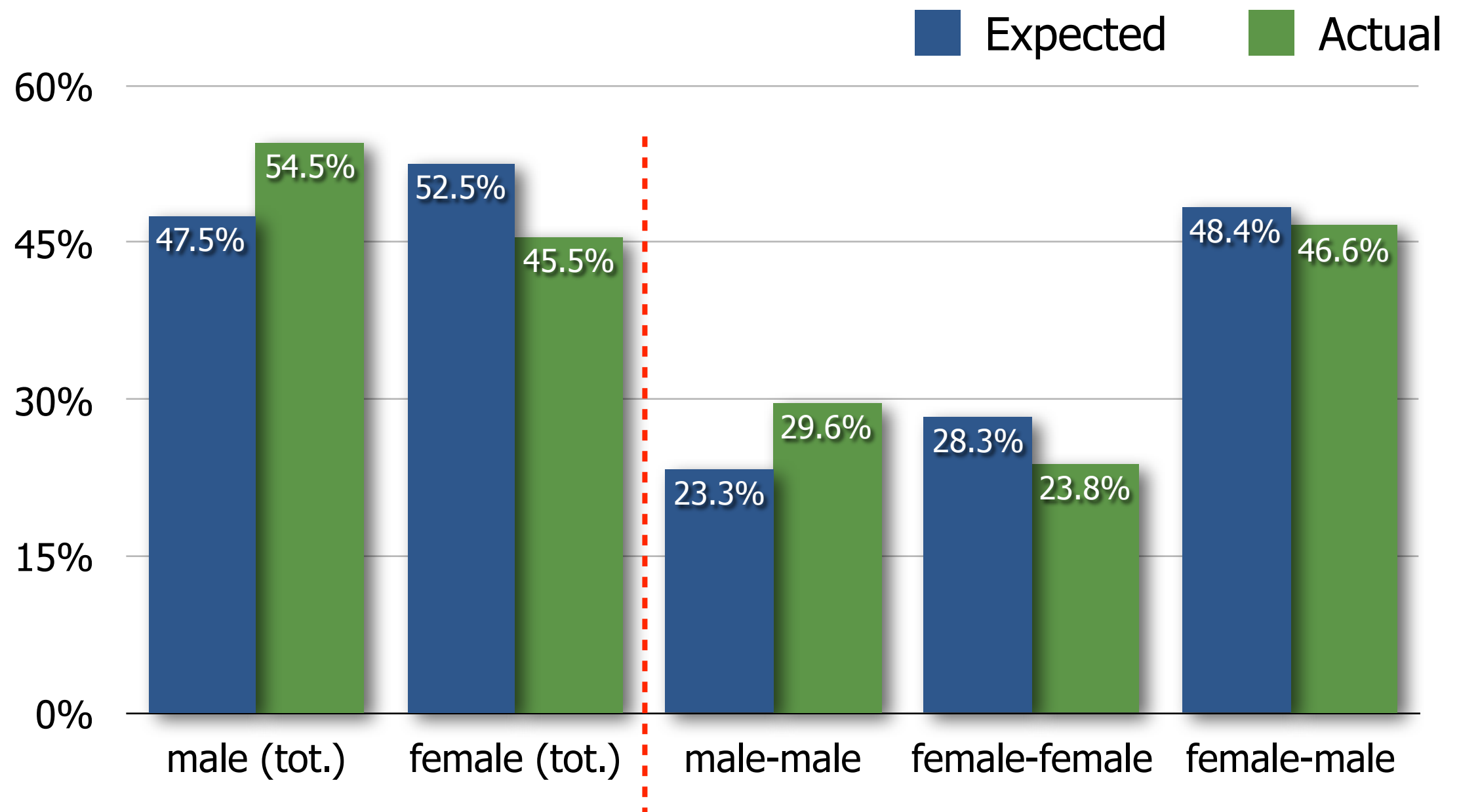


The diagram shows the chi-squared test formula: $\chi^2 = \sum_{k=1}^C \frac{(O_k - E_k)^2}{E_k}$. The χ^2 term is enclosed in a light red circle. The summation symbol \sum is also enclosed in a light red circle. An arrow points from the text 'This variable tests whether there is a matching between the observations (O) and the expectations (E)' to the χ^2 circle. Another arrow points from the text 'Sum over all categories being compared (female vs male or callers vs receivers)' to the summation circle.

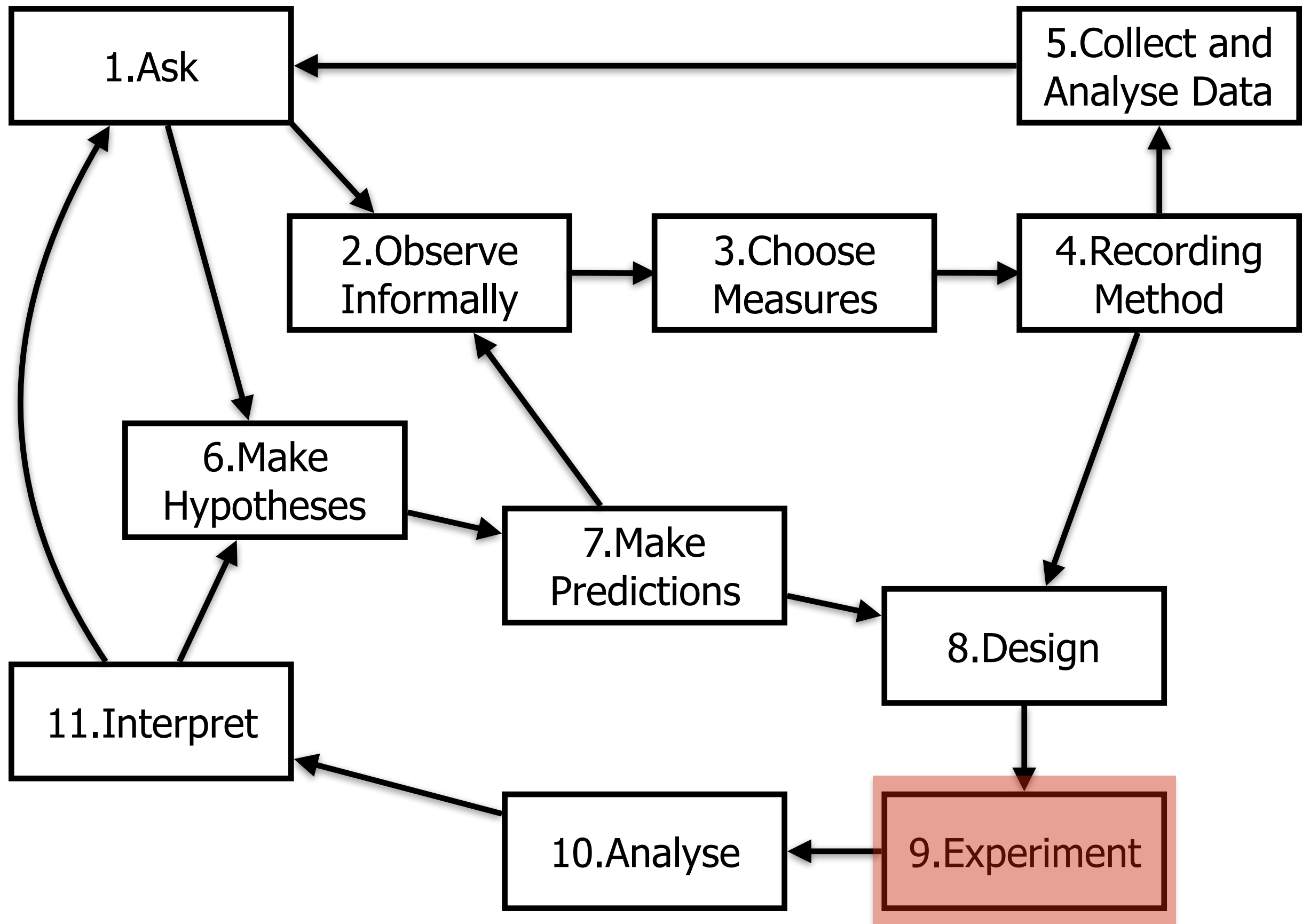
$$\chi^2 = \sum_{k=1}^C \frac{(O_k - E_k)^2}{E_k}$$

This variable tests whether there is a matching between the observations (O) and the expectations (E)

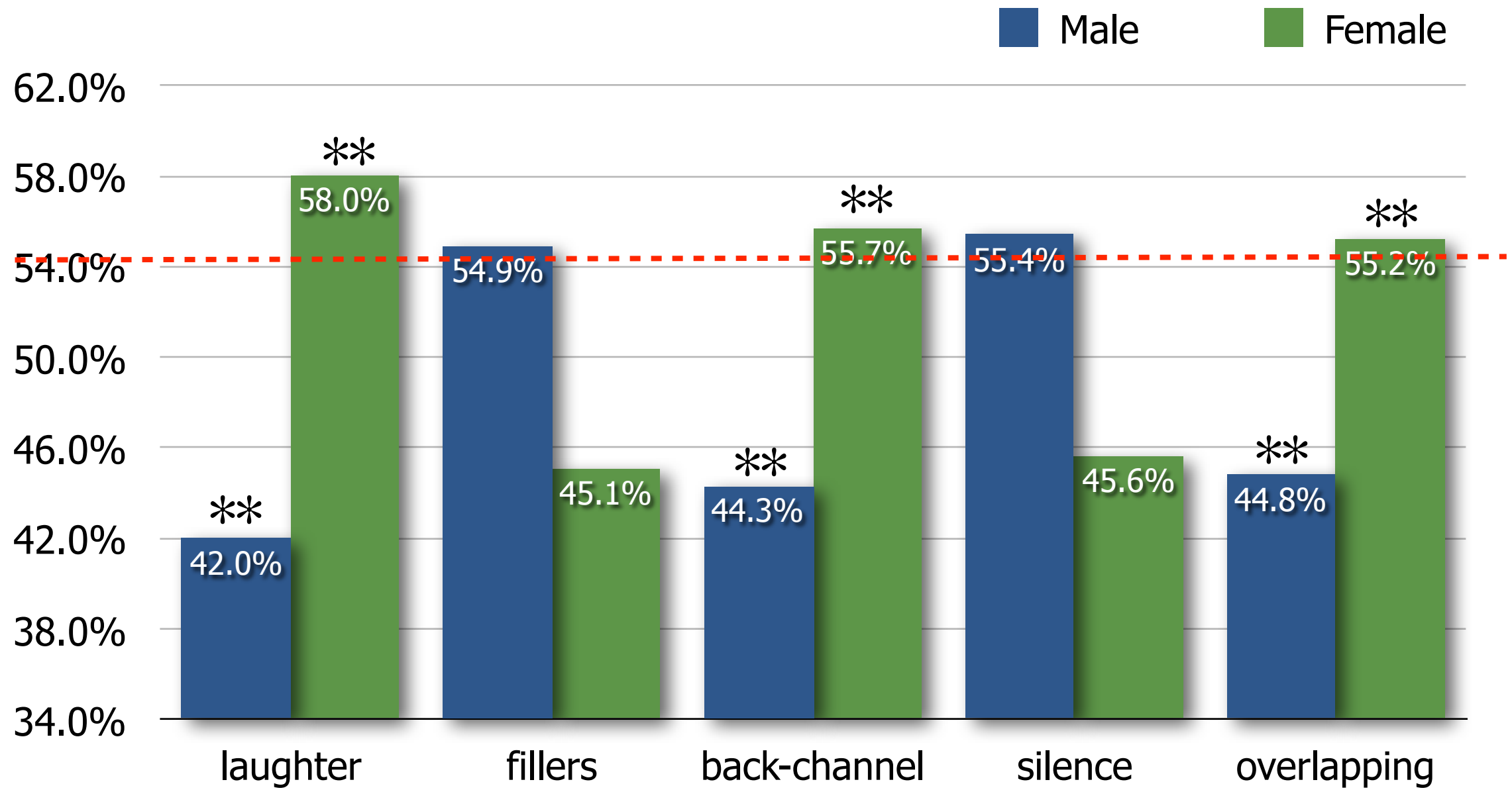
Sum over all categories being compared (female vs male or callers vs receivers)



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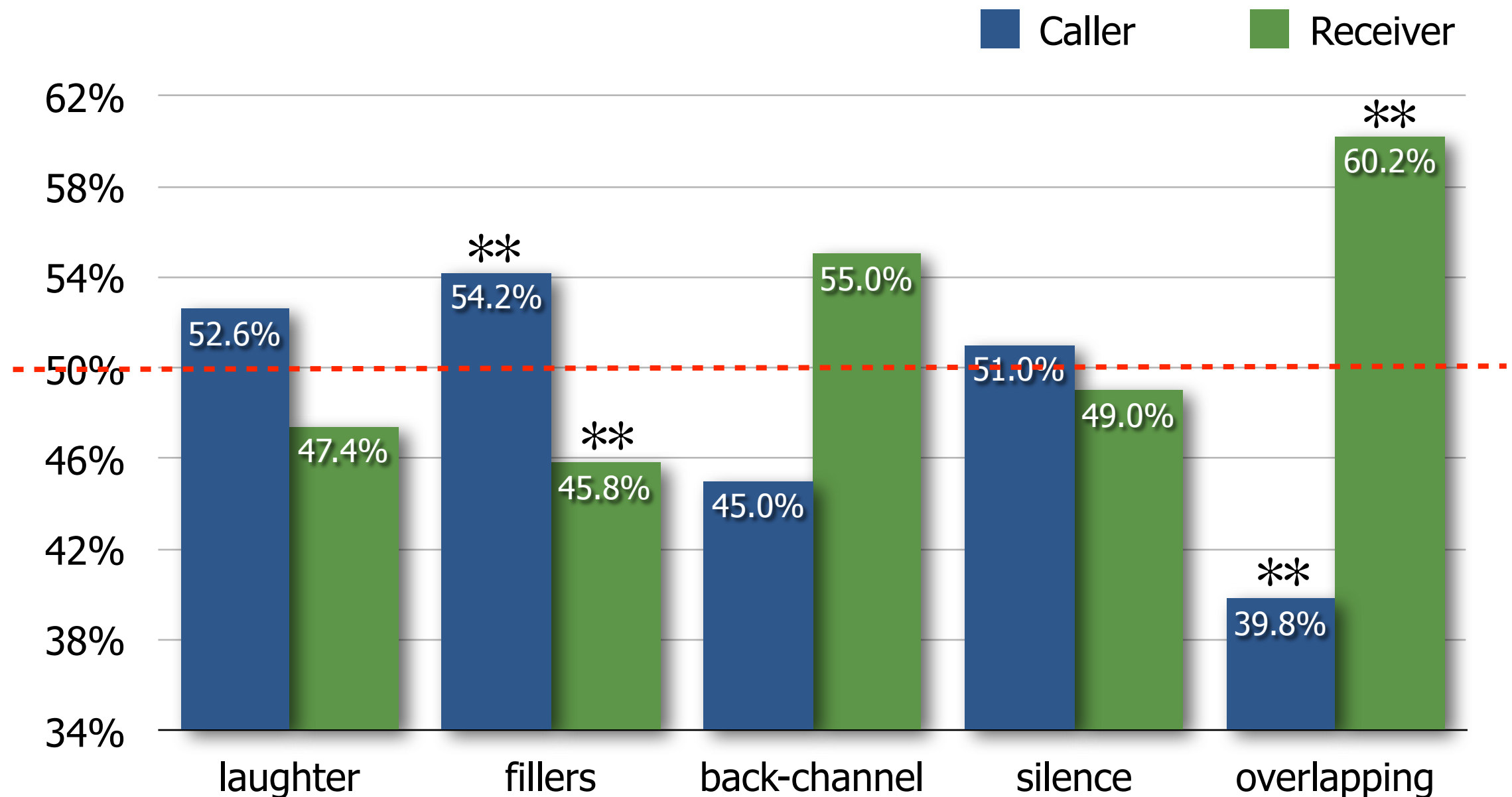


9.Run Tests of your Hypotheses.

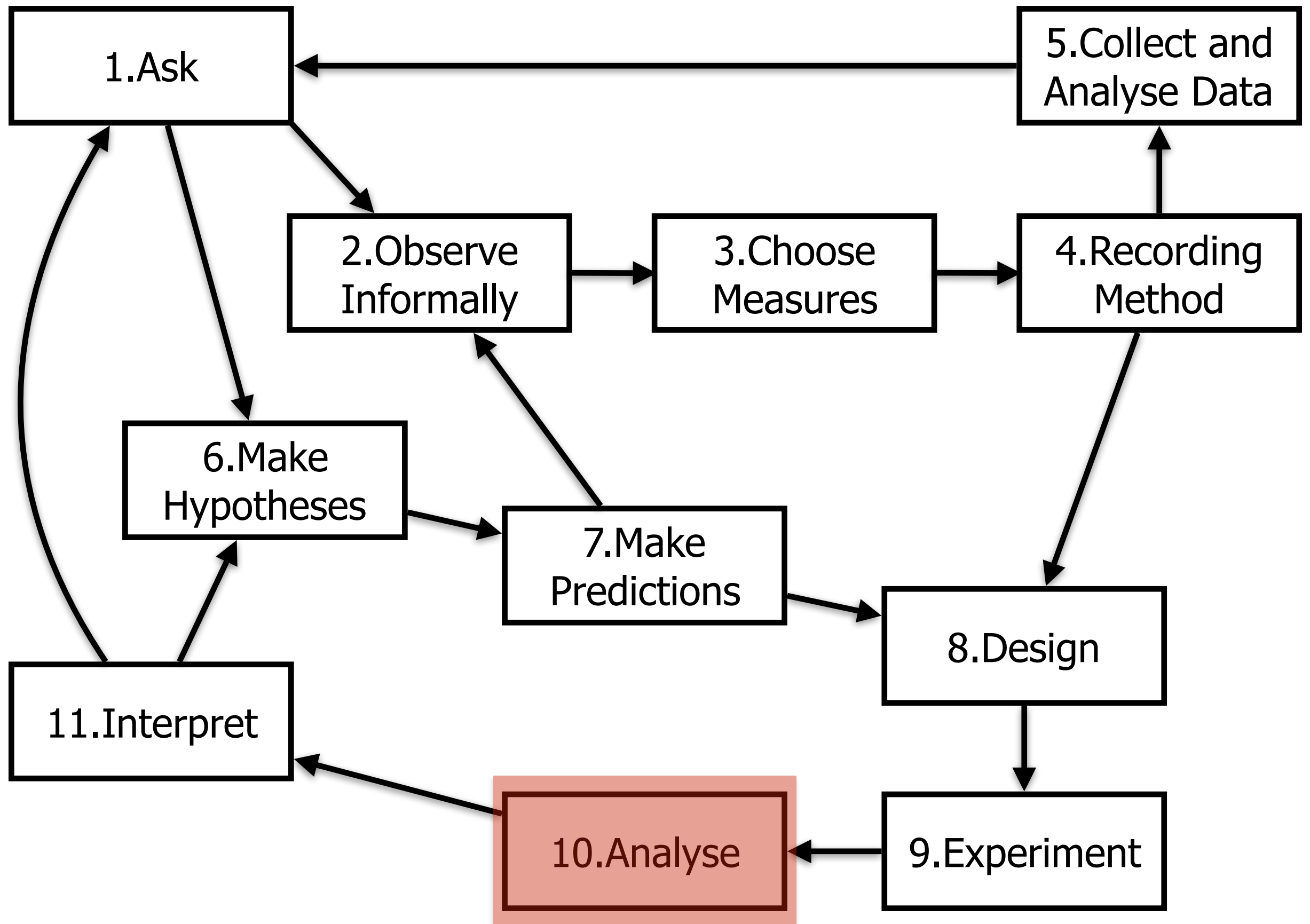


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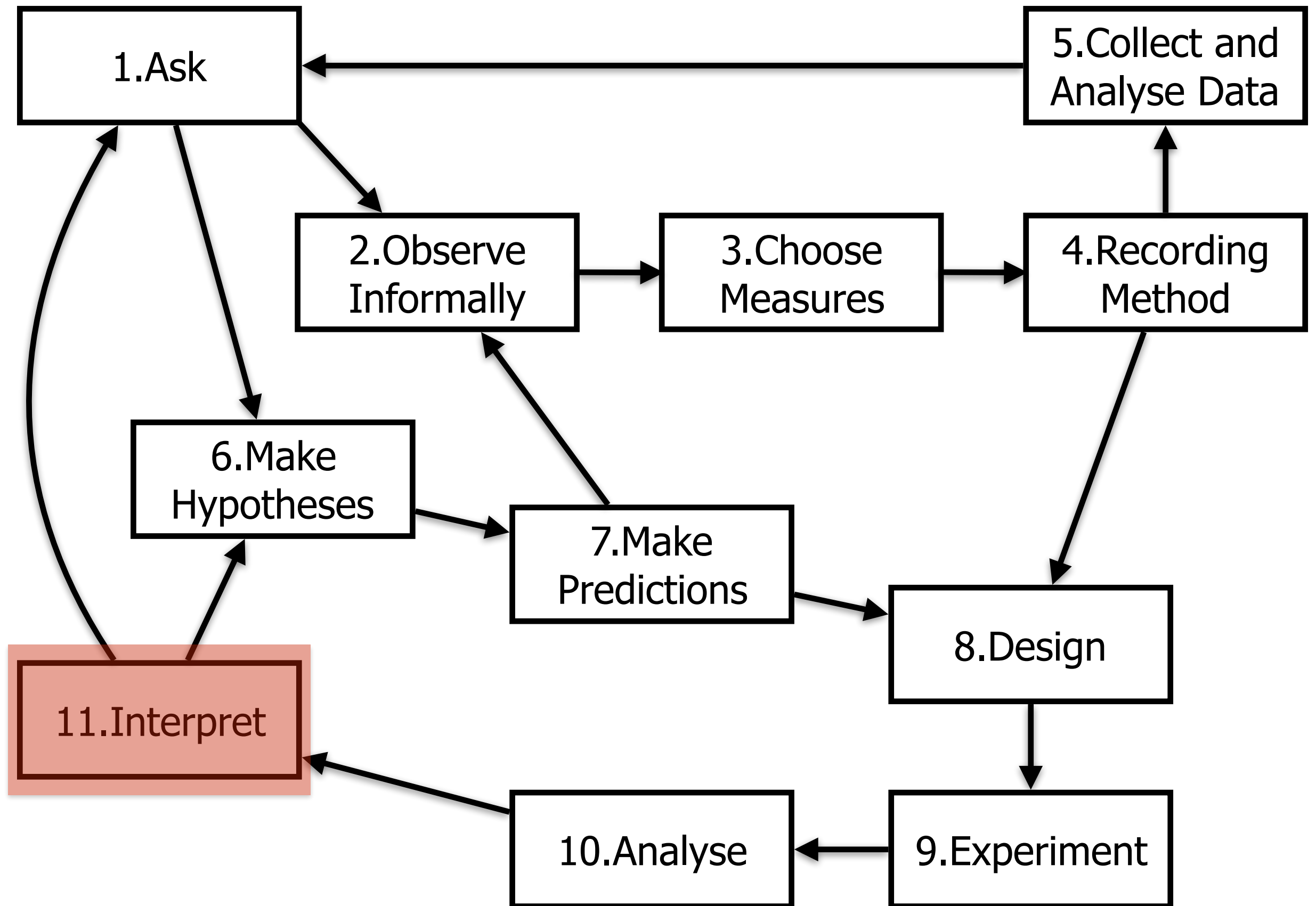


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10. Analyse the Results of your Tests.

There is a relationship between the use of nonverbal communication and major social dimensions (both gender and role)



11. Consider Alternative Interpretations of the Evidence.

It is possible that the differences in observed behaviour reflect differences in perceived social status

Gender Differences.

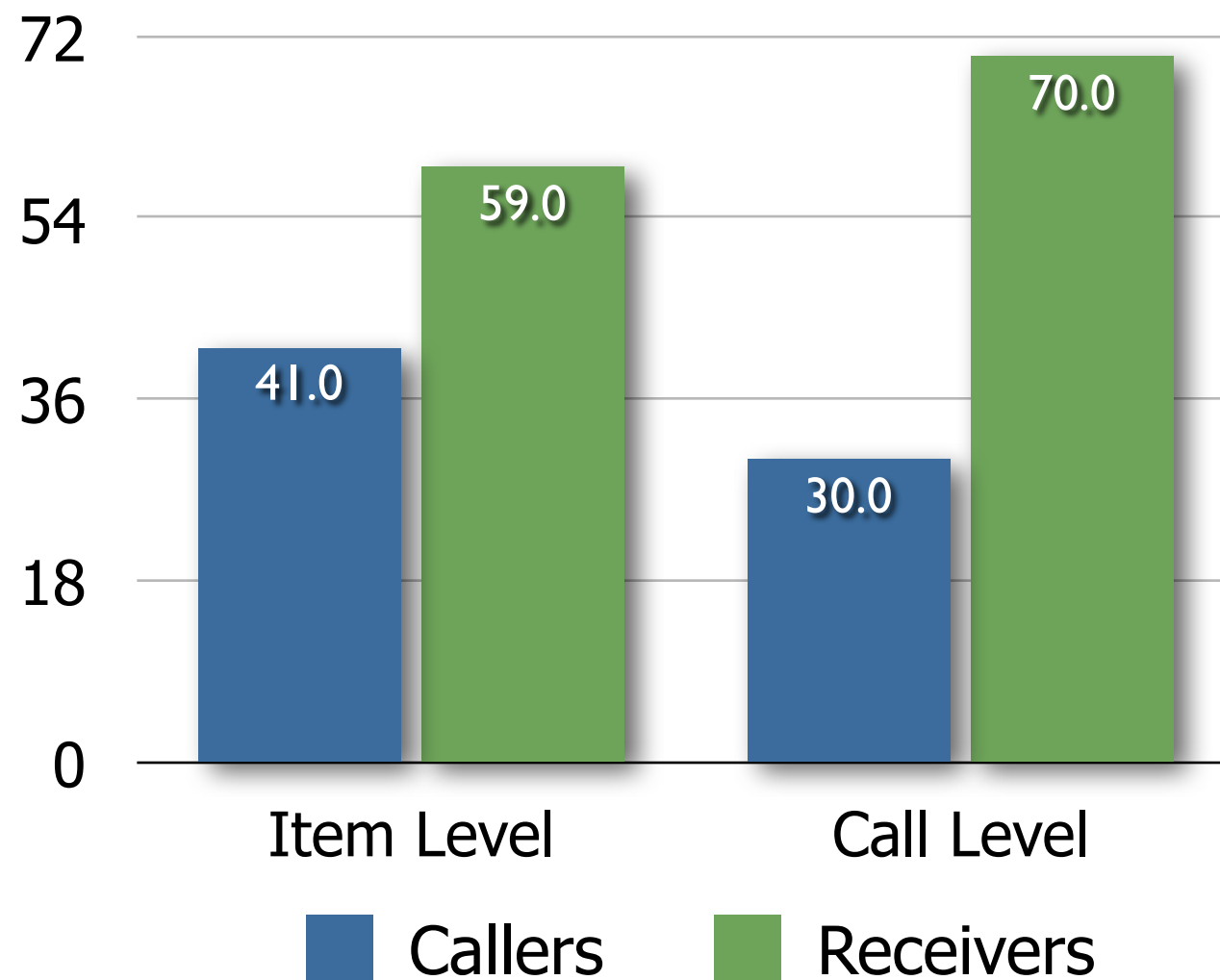
“[...] men and women are generally perceived as differing in status (importance, dominance, power, etc.) and also that they often feel themselves to differ in this way”

Leffler, Gillespie & Conaty, “The Effects of Status Differentiation on Nonverbal Behavior”, *Social Psychology Quarterly*, 45(3):153–161, 1982

Role Differences.

“[...] when communicating with a higher status person, the lower status person [...] has more filled and unfilled pauses than normal”

Richmond, McCroskey & Payne, “Nonverbal Behavior in Interpersonal Relations”, Prentice Hall, 1991



Receivers win against callers in 59% of the negotiations (70% of the times at the call level).

Calling or receiving makes the difference ($p < 0.005$).

Vinciarelli, Salamin & Polychroniou, "Negotiating Over Mobile Phones: Calling or Being Called can Make the Difference", Cognitive Computation, Vol. 6, no. 4, pp. 677-688, 2014.

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- The 11 Steps of Behaviour Analysis
- An Example: Mobile Phone Conversations
- **Conclusions**

Conclusions

- Measuring behaviour requires one to carefully design the experiments in terms of measurable and quantitative observations
- Any conclusion about the data must be based on sound statistical approaches
- It is important to provide an interpretation of the observation, possibly based on the relevant literature (psychology, ethology, sociology, etc.)