Business Research Methods

Module 1

What, how, why: Using theory to form research questions

TODAY'S AGENDA

- Describe different forms of propositional logic
  - Induction
  - Deduction
- Discuss four different forms of propositional logic
  - Two types of valid arguments
    - Modus ponens
    - Modus Tollens
  - Two types of invalid arguments
    - Affirming the consequent
    - Denying the antecedent


THE TRUTH IS OUT THERE ...

Logic and inference

- How do we arrive at truth?

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- Induction

Logic and inference

- How do we arrive at truth?

- Deduction
  - The process by which one moves from a general theory to particular statements concerning the data.

- Induction
  - The process by which one moves from a particular set of data to a general theory or concept.

Deduction (deductive reasoning)

- This occurs when we begin with a statement and arrive at its logical consequences

- Example
  - If personality traits are hereditary, we would expect to find greater similarity in the presence of neuroticism among siblings than between strangers.

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Statement

Deduction (deductive reasoning)

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- Example
  - **If personality traits are hereditary, we would expect to find greater similarity in the presence of neuroticism among siblings than between strangers.**

Statement

Logical consequence

Induction (inductive reasoning)

- This occurs when we begin an observation and figure out a general rule that explains it.

- Example
  - I just saw a monkey use sign language to ask me for food; therefore, it is true that monkeys can communicate with humans.

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  - **I just saw a monkey use sign language to ask me for food;** therefore, it is true that monkeys can communicate with humans.

Observation

Induction (inductive reasoning)

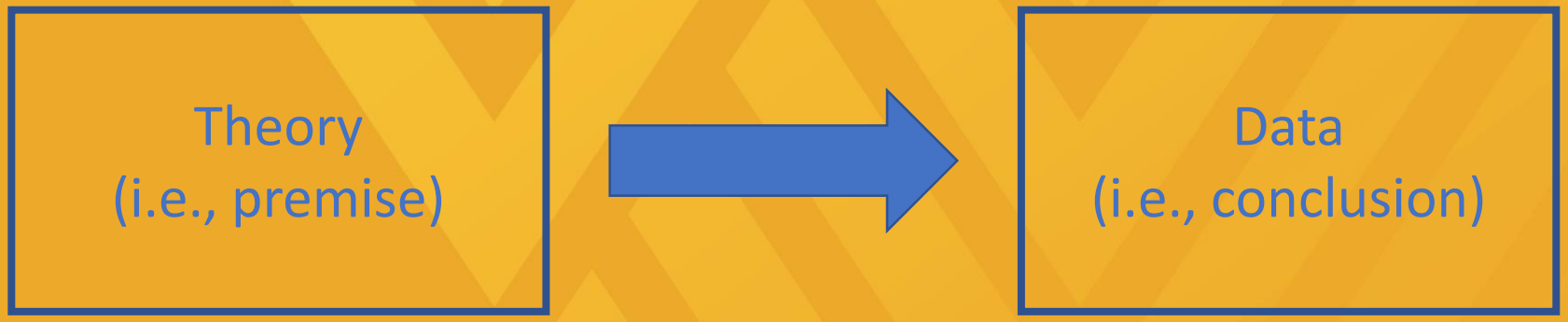
- This occurs when we begin an observation and figure out a general rule that explains it.

- Example
  - **I just saw a monkey use sign language to ask me for food; therefore, it is true that monkeys can communicate with humans.**

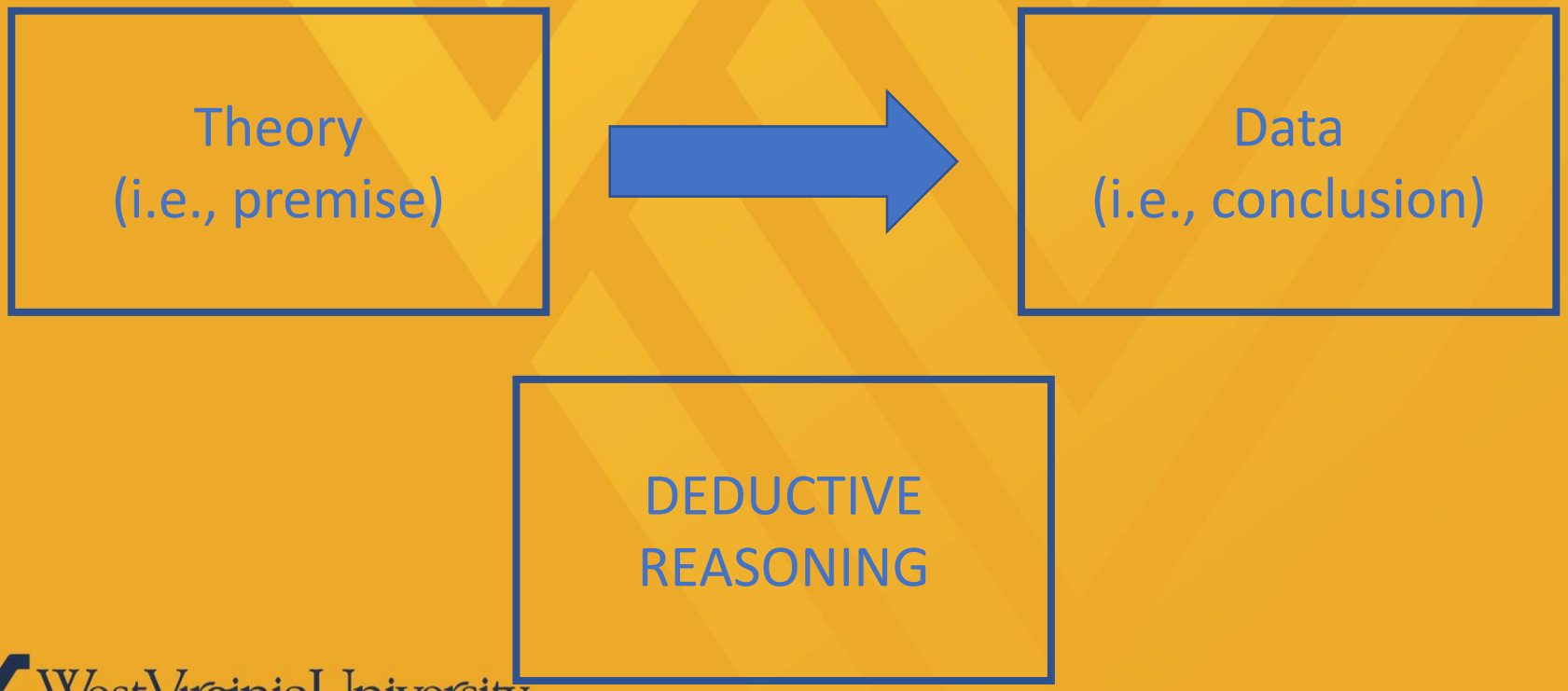
Observation

General rule

Deductive or inductive?



Deductive or inductive?



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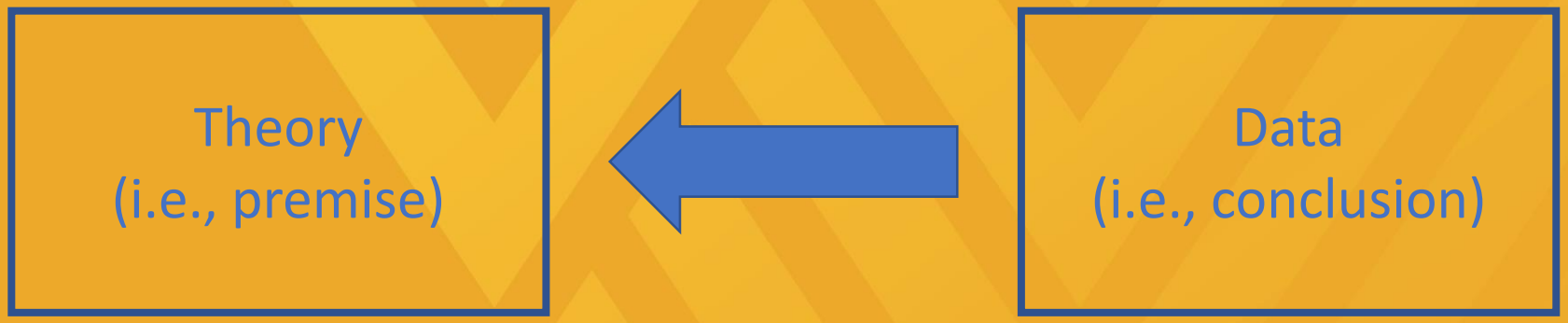

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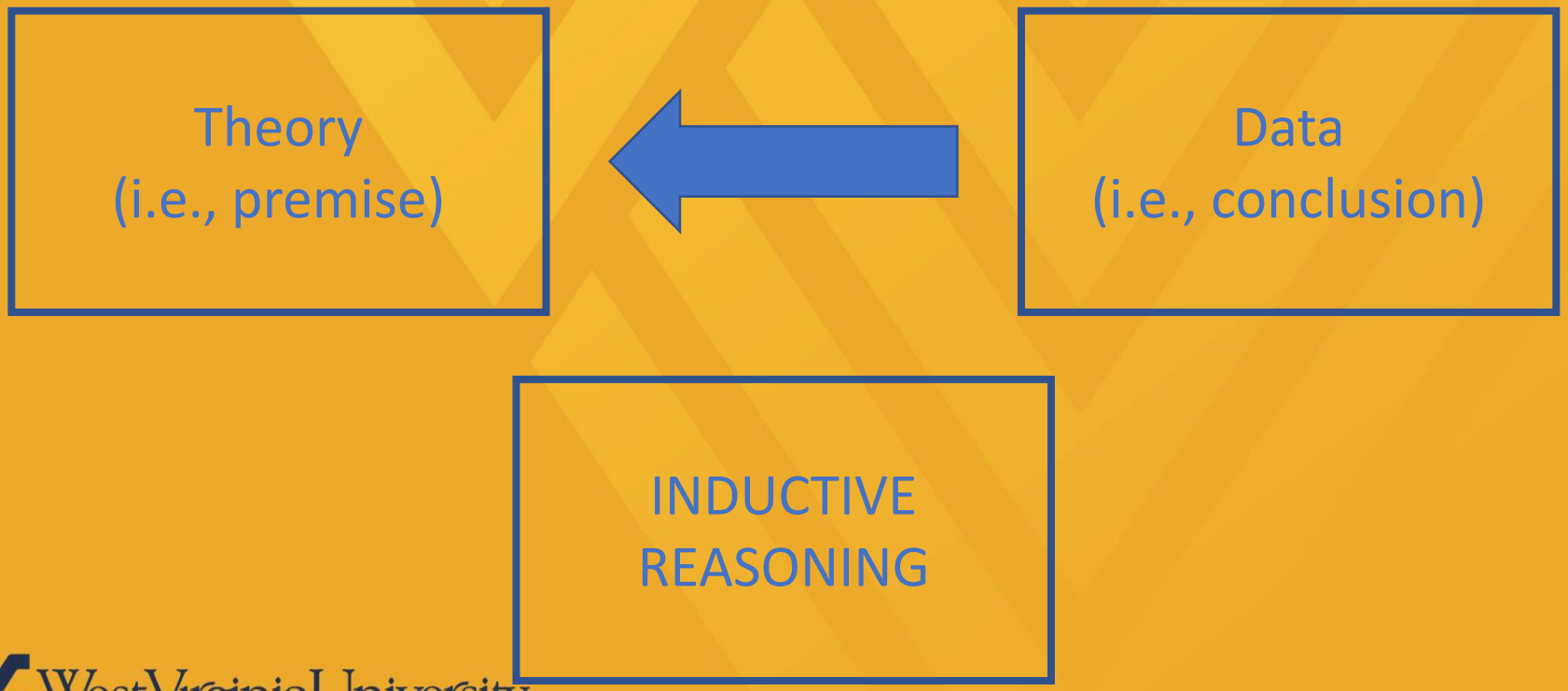

The Importance of Falsification

- In so far as a scientific statement speaks about reality, it must be falsifiable; and in so far as it is not falsifiable, it does not speak about reality.

  Karl Popper

Deductive or inductive?

- Which approach is better?
  - Effectively, this question asks: Is it better to start with a theory or is it better to start with data?

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Deductive or inductive?

- Which approach is better?
  - Effectively, this question asks: Is it better to start with a theory or is it better to start with data?
- In a perfect world, it would not matter!
- Academics often use the deductive approach. In contrast, practitioners (at times) often use the inductive approach.

Deductive or inductive?

Unfortunately, scientific findings indicate that researchers may, at times, be tempted to engage in questionable research practices, which may lead to an abundance of false positives.

Deductive or inductive?

Unfortunately, scientific findings indicate that researchers may, at times, be tempted to engage in **questionable research practices**, which may lead to an abundance of false positives.

Questionable research practices

Table 1

Definitions of Questionable Research Practices (QRPs)

QRPs	Description	Sources
(1) Selectively report hypotheses	Hypotheses with statistically nonsignificant results were less likely to be reported than hypotheses that achieved statistical significance.	Banks, Kepes, & McDaniel (2012); Banks & McDaniel (2011); Bedeian, Taylor, & Miller (2010); Kepes, Banks, McDaniel, & Whetzel (2012); Leung (2011); O'Boyle, Banks, & Gonzalez-Mule (in press); Pigott, Valentine, Polanin, Williams, & Canada (2013); Schmidt & Hunter (2015); Simmons, Nelson, & Simonsohn (2011)
(2) Exclude data post hoc	A researcher conducts hypothesis testing. Some initial results are not statistically significant. After potential outliers have been removed, some of the initial results become statistically significant.	Bedeian et al. (2010); De Vries, Anderson, & Martinson (2006); Kepes & McDaniel (2013); O'Boyle et al. (in press); Schmidt & Hunter (2015); Simmons et al. (2011)
(3) HARKing	HARKing or "hypothesizing after results are known" occurs when a researcher analyzes data. After the data analysis, the researcher develops and reports post hoc hypotheses that suggest that findings were defined a priori rather than identified post hoc.	Bedeian et al. (2010); Hitchcock & Sober (2004); John, Loewenstein, & Prelec (2012); Kepes & McDaniel (2013); Kerr (1998); Leung (2011); O'Boyle et al. (in press); Schmidt & Hunter (2015)
(4) Selectively include control variables	Occurs when a researcher conducts multiple analyses to test the same hypothesis, each time adding or removing different control variables. The researcher reports only the use of control variables that allow for a statistically significant result.	John et al. (2012); Kepes & McDaniel (2013); O'Boyle et al. (in press); Simmons et al. (2011)
(5) Falsify data	Fabricating a data set rather than engaging in an actual data collection.	Bedeian et al. (2010); John et al. (2012); Schmidt & Hunter (2015)
(6) "Round off" a *p* value	Reporting that a *p* value of .054 is $p < .05$ rather than $p = .05$.	Bakker & Wicherts (2011, 2014); John et al. (2012); Nuijten, Hartgerink, Van Assen, Epskamp, & Wicherts (in press)

Note: The list of references for each QRP is an illustrative list and does not include all authors who have questioned the application of each of these practices.

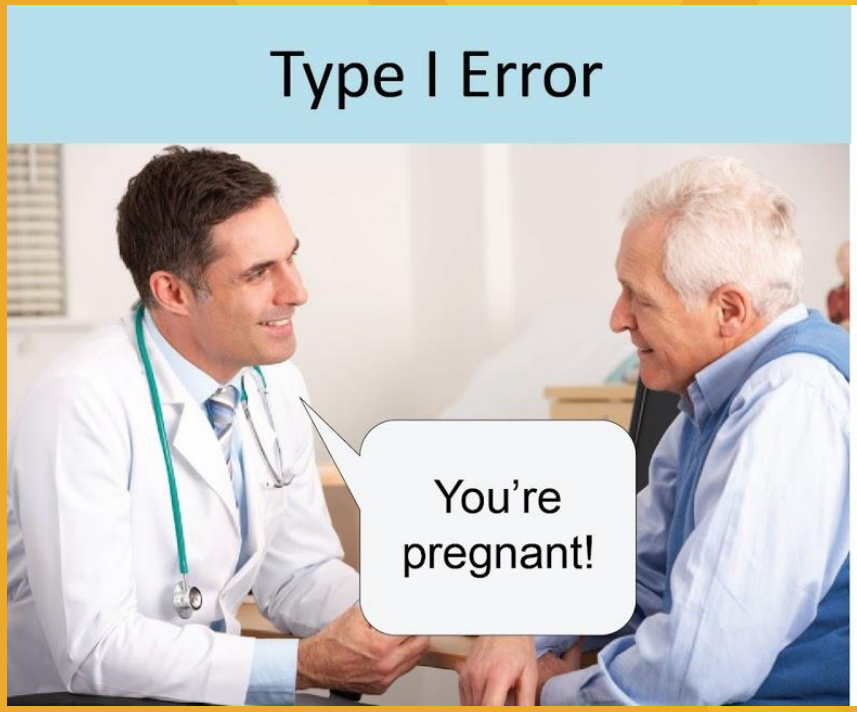
Source: Banks, G. C., O'Boyle Jr, E. H., Pollack, J. M., White, C. D., Batchelor, J. H., Whelpley, C. E., ... & Adkins, C. L. (2016). Questions about questionable research practices in the field of management: A guest commentary. *Journal of Management*, *42*(1), 5-20.

Deductive or inductive?

Unfortunately, scientific findings indicate that researchers may, at times, be tempted to engage in questionable research practices, which may lead to an abundance of **false positives**.

False positive and false negative

False positive and false negative



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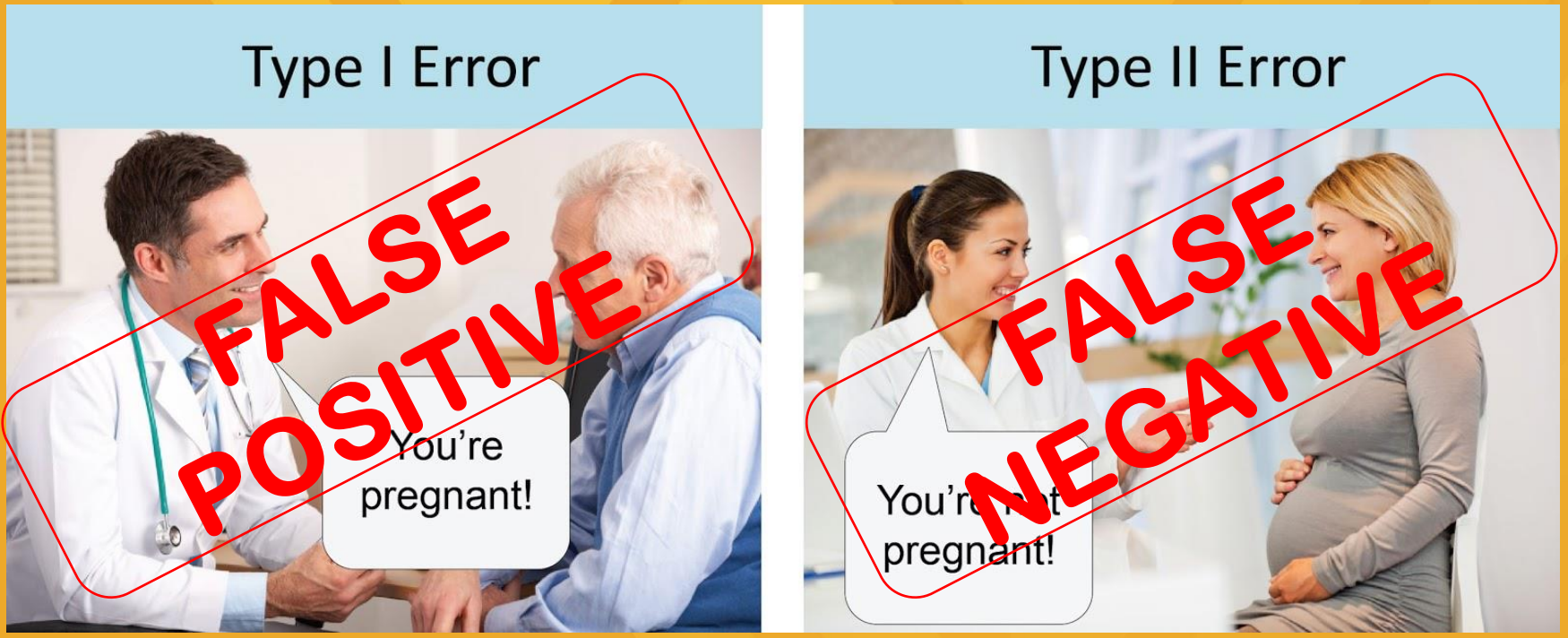

The Importance of Falsification

- Example
  - Friend: You know, all business research methods courses are really boring!
  - You: That's not true; I'm taking a business research methods class right now that is really interesting.

The Importance of Falsification

- In so far as a scientific statement speaks about reality, it must be falsifiable; and in so far as it is not falsifiable, it does not speak about reality.

  Karl Popper

- Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve.

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The Importance of Falsification

Valid arguments

Modus Ponens (confirmatory)

If “x,” then “y.”

“x”

Therefore, “y”

If anxiety is increased, then heart rate will be increased.

Anxiety is increased. Therefore, heart rate will increase.

Modus Tollens (disconfirmatory)

If “x,” then “y.”

Not “y”

Therefore, not “x”

If anxiety is increased, then heart rate will be increased.

Heart rate is not increased. Therefore, anxiety is not increased.

The Importance of Falsification

Invalid arguments

Affirming the consequent

If “x,” then “y.”

“y”

Therefore, “p”

If anxiety is increased, then heart rate will be increased.

Heart rate is increased. Therefore, anxiety is increased.

Denying the Antecedent

If “x,” then “y.”

Not “x”

Therefore, not “y”

If anxiety is increased, then heart rate will be increased.

Anxiety is not increased. Therefore, heart rate will not be increased.

Bringing it all together…

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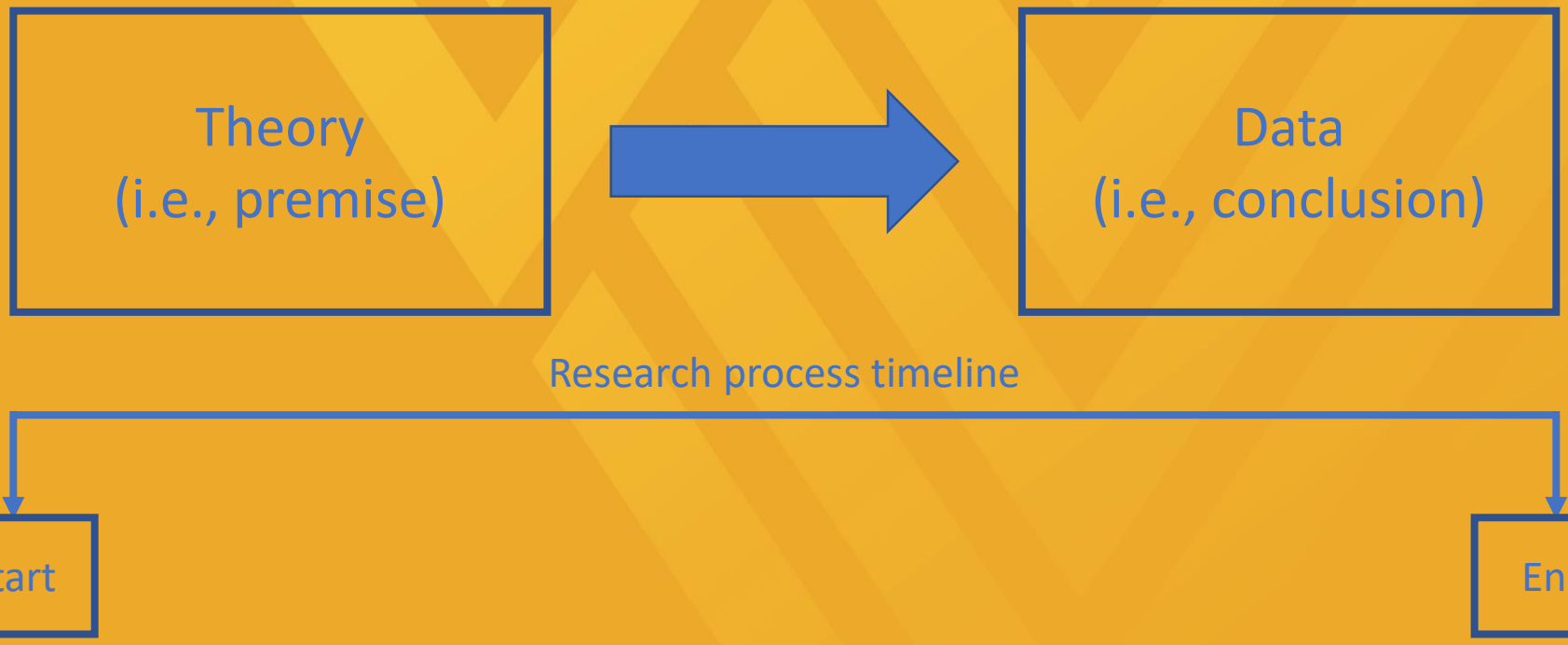

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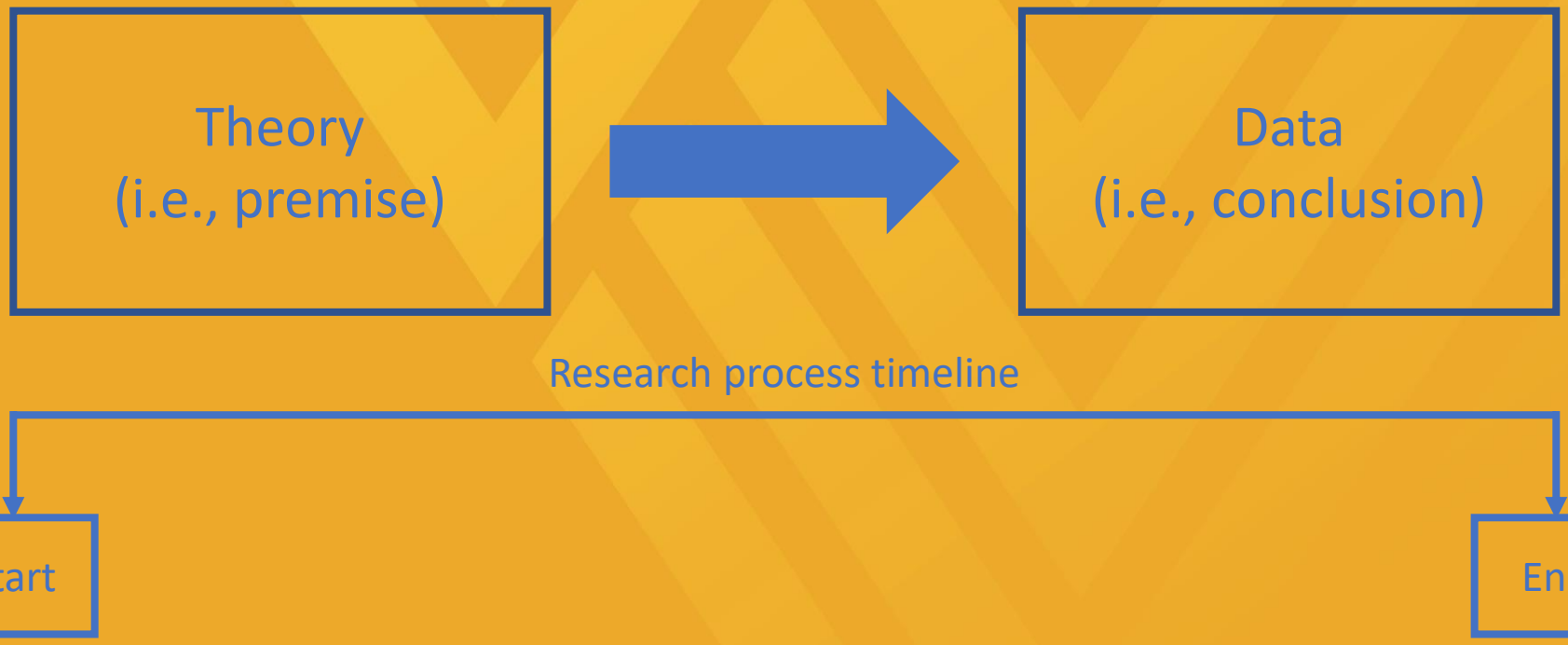

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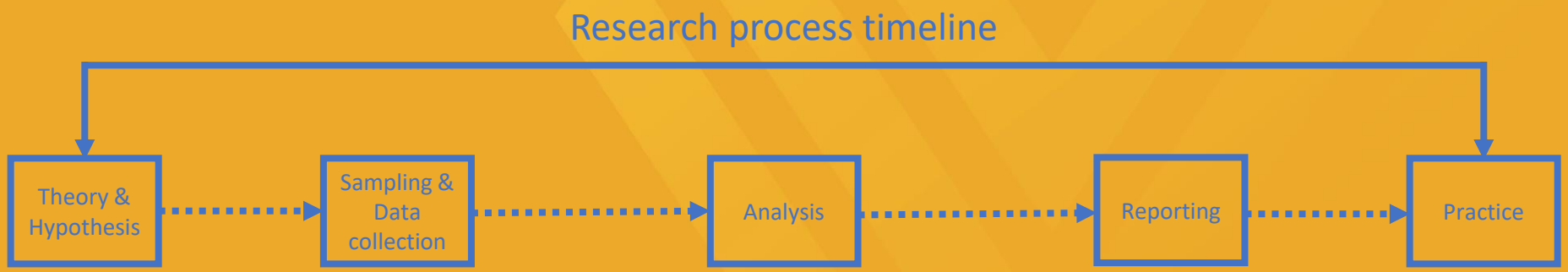

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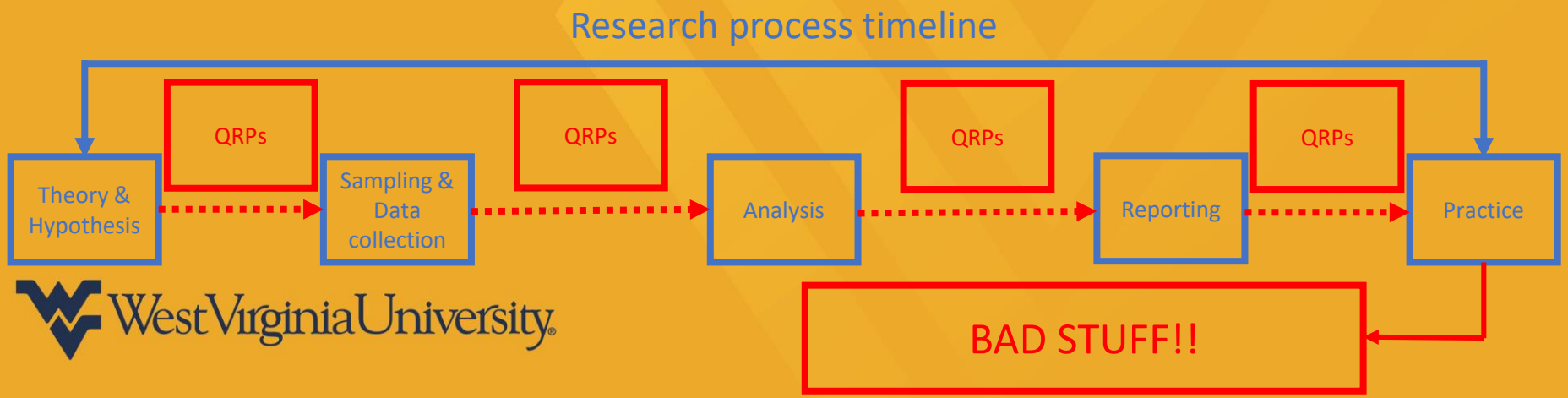

WestVirginiaUniversity.

Bringing it all together…