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Applying and Evaluating a Taxonomy of Resilient Performance Among Certified Flight Instructors

Kristine M. Kiernan Ph.D.
Embry-Riddle Aeronautical University, kiern4fd@erau.edu

David S. Cross Ph.D., Ed.D.
Embry-Riddle Aeronautical University, crossaf6@erau.edu

Mark Scharf Ph.D.
Embry-Riddle Aeronautical University, scharc01@erau.edu

Identifying and classifying resilient behavior among flight instructors

Kristy Kiernan, David Cross, Mark Scharf
Embry-Riddle Aeronautical University

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Overview

- Aviation has robust ways to investigate errors, incidents, and accidents

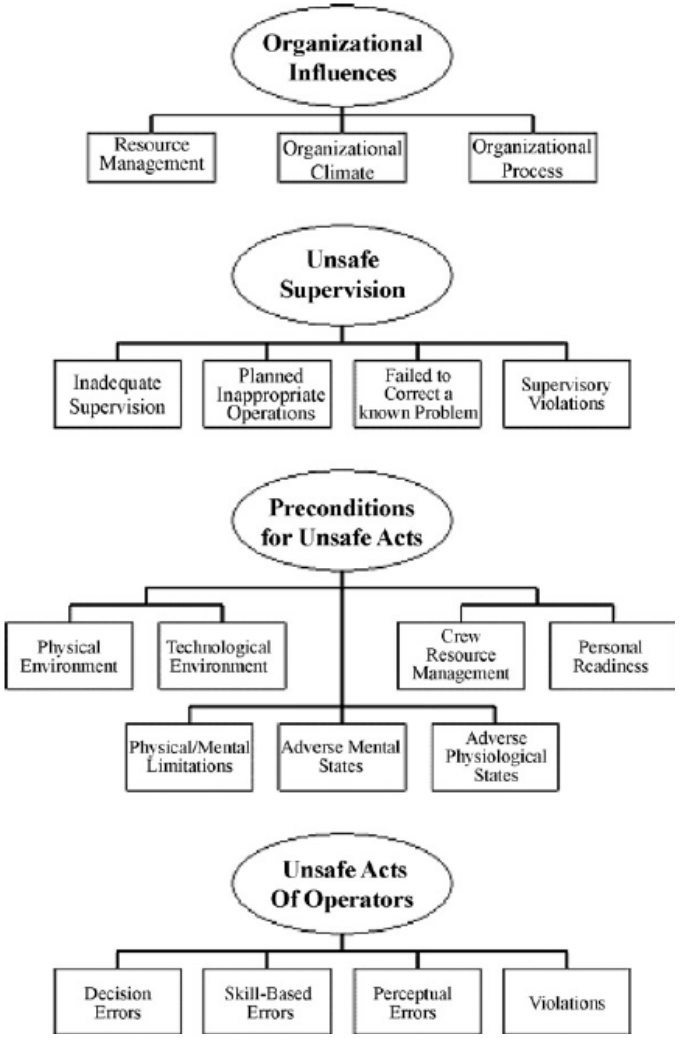
…but insufficient ways to study success

Background

- Sources of data for error:
  - Aviation Safety Reporting System
  - Aviation Safety Action Program
  - Flight Operational Quality Assurance
  - Incident Reporting
  - Accident Investigation
  - Line Operations Safety Assessments

Background

- Common language
  - Human Factors Analysis and Classification System
  - Threat and Error Management



Accident Causation

- Linear models of accident causation:

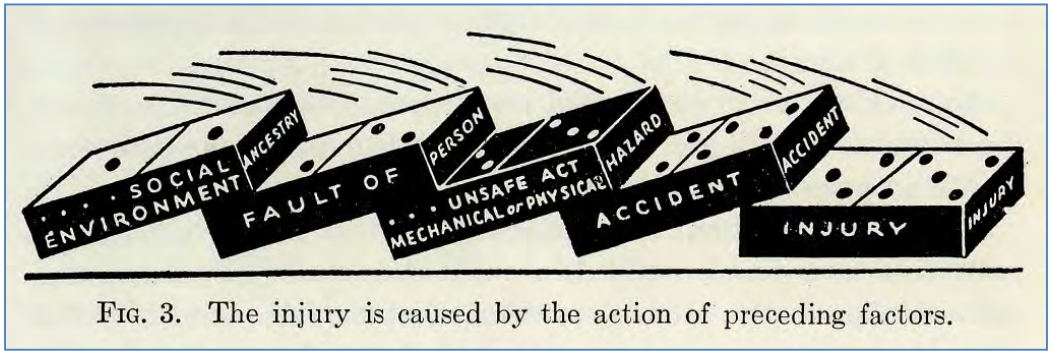
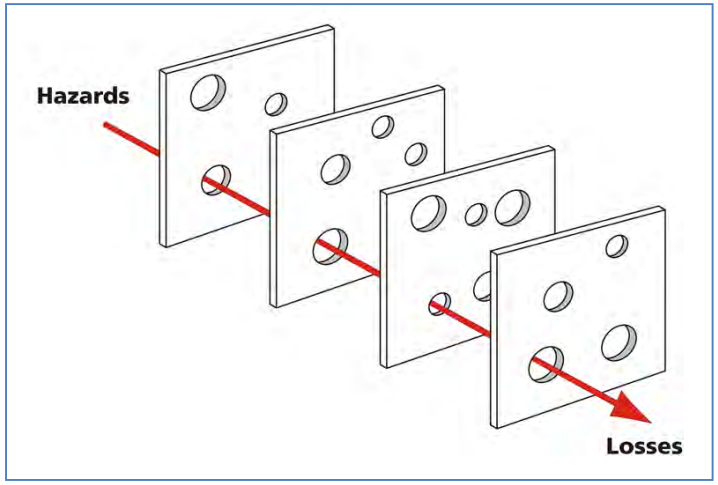


FIG. 3. The injury is caused by the action of preceding factors.

https://risk-engineering.org/concept/Heinrich-dominos



https://en.wikipedia.org/wiki/Swiss_cheese_model

…but what if it's not deterministic?

How to prevent accidents if cause and effect does not explain it?

Safety I

- Reduce the incidence of negative outcomes
  - How? Study negative outcomes

Safety II

- Increase the incidence of positive outcomes
  - How? Study positive outcomes

New approach

Not:

What kept it from going wrong?

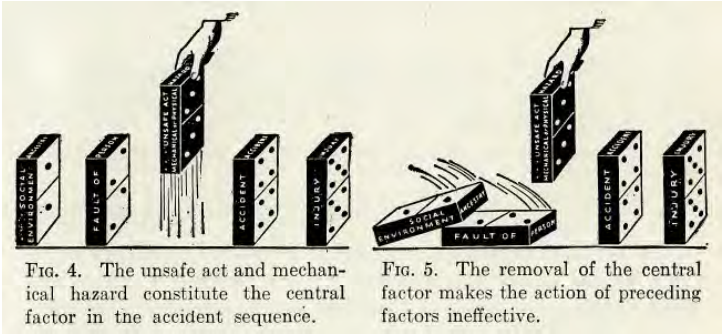


FIG. 4. The unsafe act and mechanical hazard constitute the central factor in the accident sequence.

FIG. 5. The removal of the central factor makes the action of preceding factors ineffective.

Instead:

What helped it go right?

Model for “Right”

NOT just 0 accidents!

Resilient Performance:

When a system can “adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.”

Hollnagel, 2011, p. xxxvi

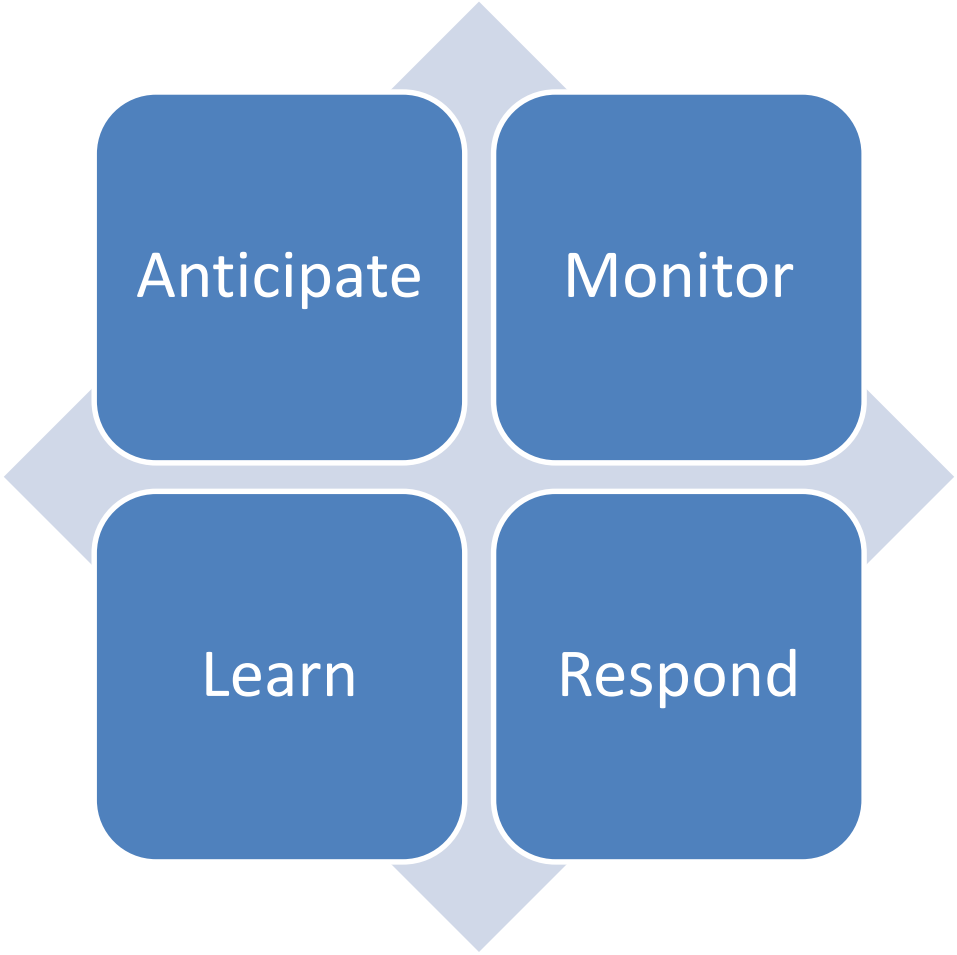
Paradigm Shift

- How do you study the absence of an accident?

Instead:

- How do you study the routine behaviors that contribute to system flexibility and resilience?

Enablers of Resilient Performance



Research Questions

- What behaviors do CFIs display that contribute to system resilience?
- How do these behaviors group into a taxonomy?

Research Questions

- But equally important, developing reliable, valid, repeatable, robust approach to data analysis.

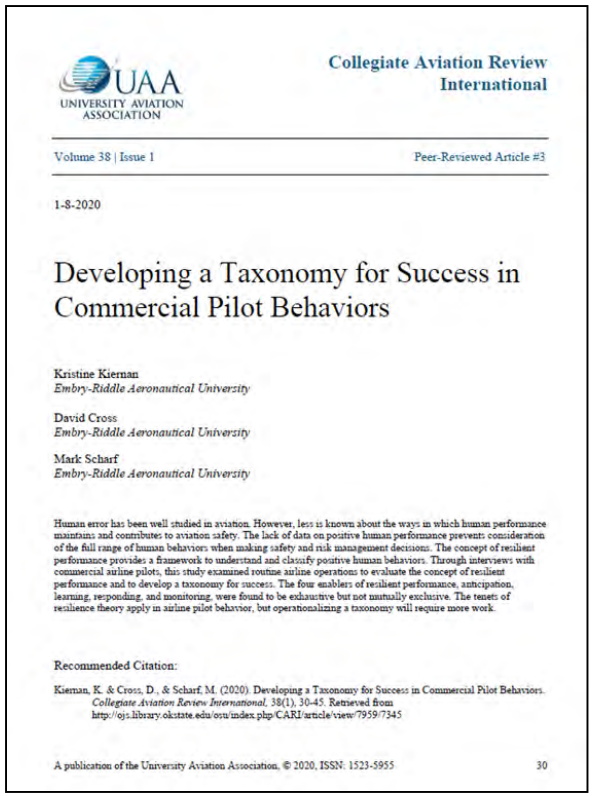
Method

- Qualitative approach
- Semi-structured interviews with Certified Flight Instructors
- Critical incident debrief approach of unexpected or unplanned event

Challenges

- Validity and Reliability

Challenges



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Developing a Taxonomy for Success in Commercial Pilot Behaviors

Kristine Kiernan
Embry-Riddle Aeronautical University

David Cross
Embry-Riddle Aeronautical University

Mark Scharf
Embry-Riddle Aeronautical University

Human error has been well studied in aviation. However, less is known about the ways in which human performance maintains and contributes to aviation safety. The lack of data on positive human performance prevents consideration of the full range of human behaviors when making safety and risk management decisions. The concept of resilient performance provides a framework to understand and classify positive human behaviors. Through interviews with commercial airline pilots, this study examined routine airline operations to evaluate the concept of resilient performance and to develop a taxonomy for success. The four enablers of resilient performance, anticipation, learning, responding, and monitoring, were found to be exhaustive but not mutually exclusive. The tenets of resilience theory apply in airline pilot behavior, but operationalizing a taxonomy will require more work.

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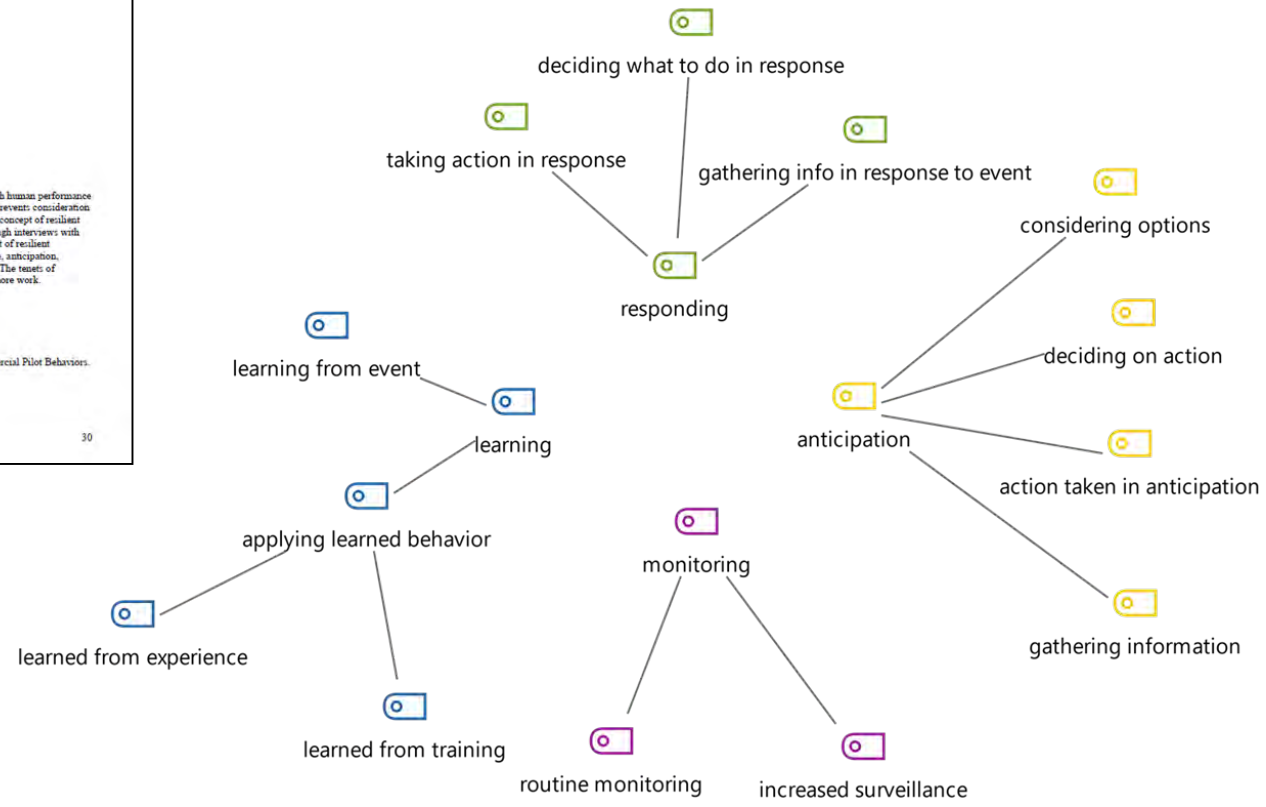
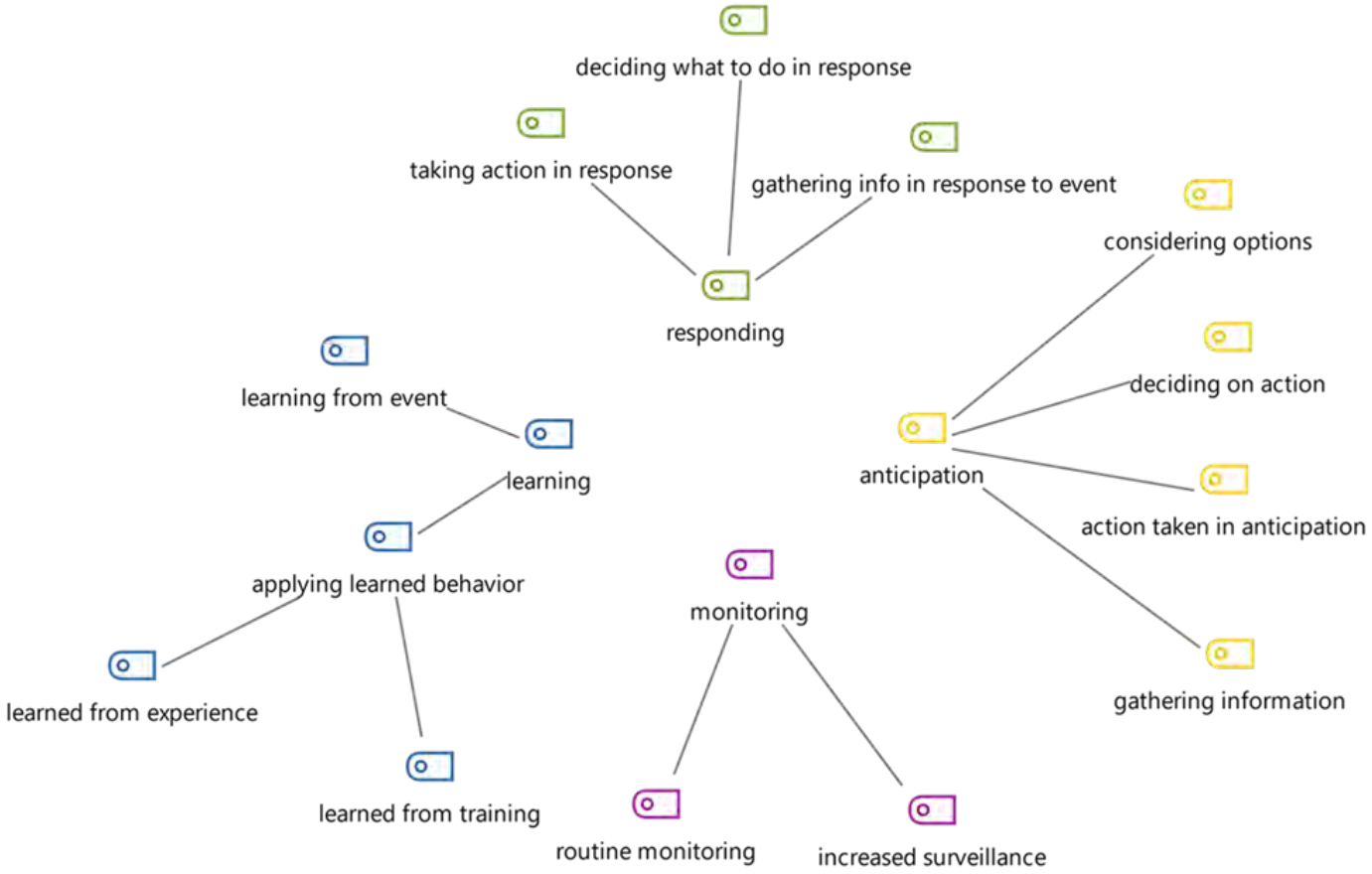
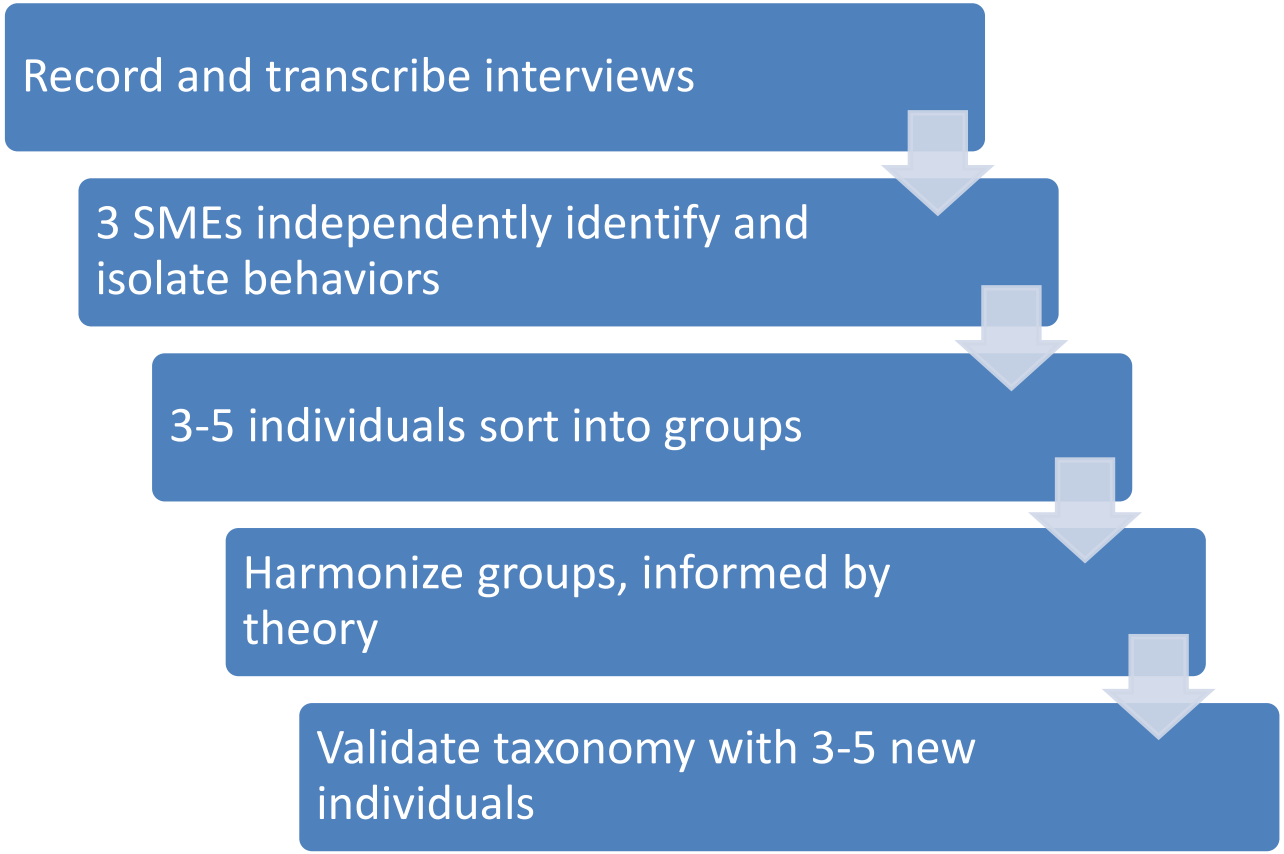


Preliminary Model



Data analysis approach based on development of HFACS



Thanks to Dr. Scott Shappell for sharing information on development of HFACS

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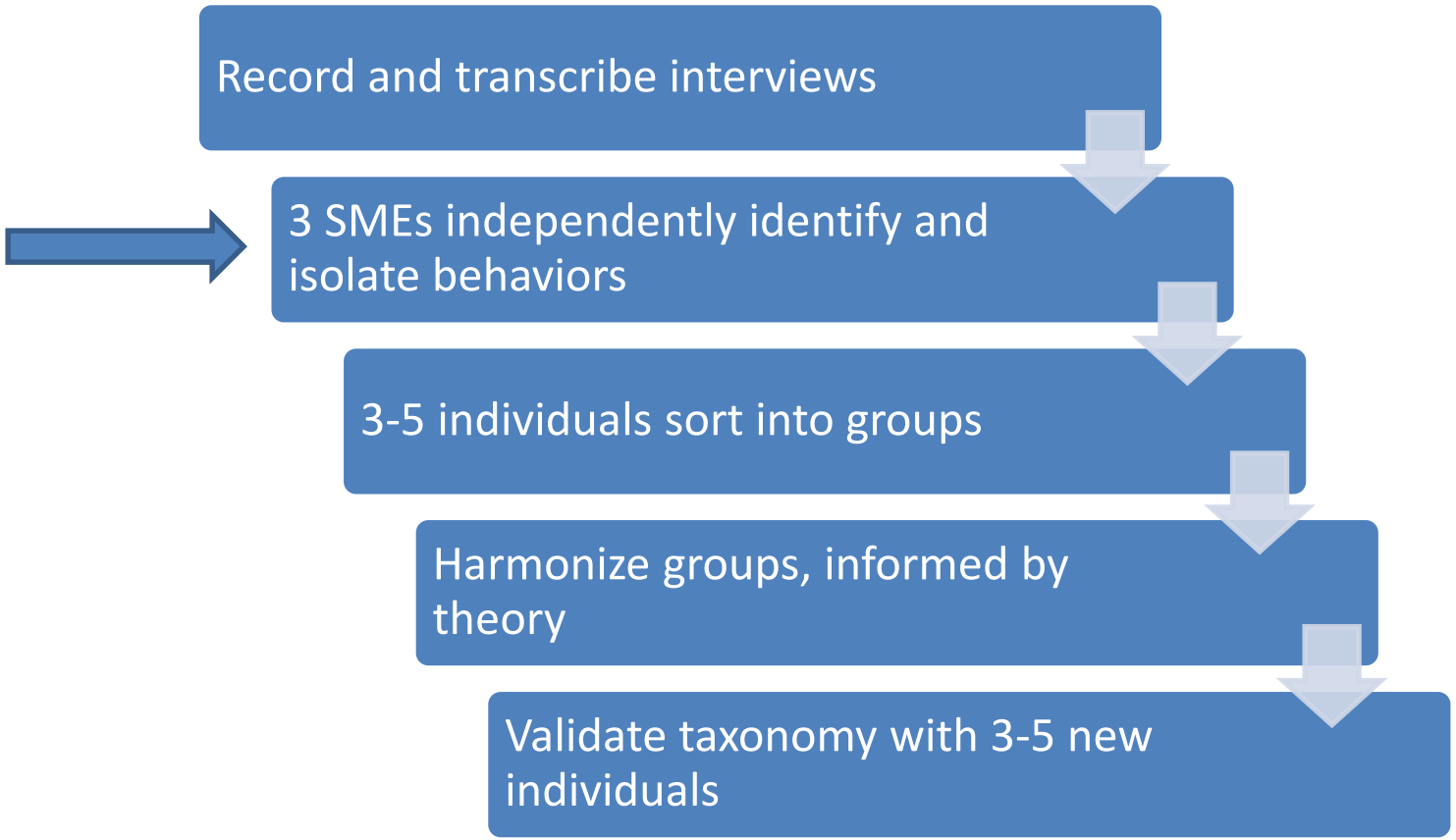

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Future of this field

- How do we study success?
- How do we quantify positive behaviors?
- How do we classify positive human contributions –
  - Behaviors?
  - Attitudes?
- Where else in system does resilience reside?
- How do we increase resilience?

Questions?