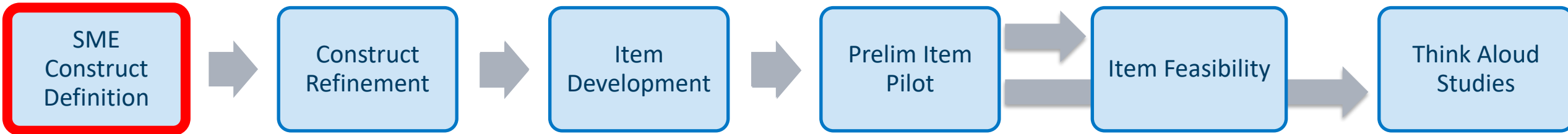# CLINICAL REASONING: FROM THEORY TO CONSTRUCT TO ASSESSMENT

Christopher Runyon, Polina Harik, Melissa Margolis, Monica Cuddy, Su Somay, Alex J. Mechaber

[Exploratory Research and Development]
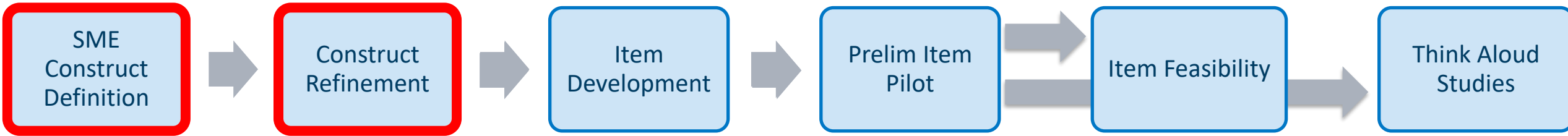
BACKGROUND

In early 2021 NBME embarked on a rigorous research endeavor to expand and enhance the **assessment of critical skills and competencies required for medical practice.** One of the areas identified for enhancement was the assessment of clinical reasoning.

- General exploratory research; not for any specific test.

The complexity of the reasoning process makes it a difficult skill to thoroughly assess with traditional multiple-choice questions.
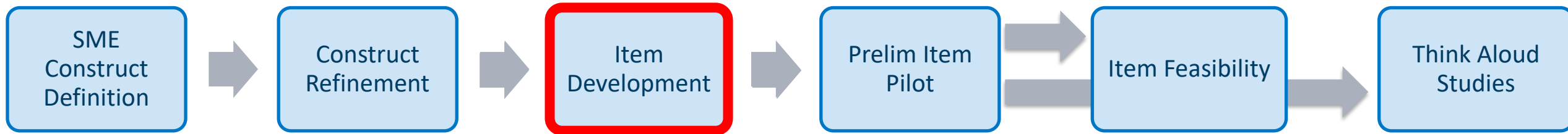
- Daniels et al, 2019

[Exploratory Research and Development]

SME Construct Definition → Construct Refinement → **Item Development** → Prelim Item Pilot → Item Feasibility → Think Aloud Studies

A 32-year-old man comes to the physician because of a 3-week history of severe right heel pain that is worse in the morning or after prolonged sitting. He has not had redness, swelling, or recent trauma. He has not had eye pain, urethral discharge, redness, or pain of any other joints. He is an avid runner; during the past 6 weeks, he has been preparing to run a marathon. He has no history of serious illness. His only medication is acetaminophen as needed for heel pain. He does not smoke cigarettes, drink alcohol, or use illicit drugs. Vital signs are within normal limits. Examination shows mild tenderness to deep palpation of the right heel. The Achilles tendon is nontender and intact. The remainder of the examination shows no abnormalities. What is the most likely diagnosis?

[Exploratory Research and Development]

A patient chart is shown below.

Patient Information

Age:	32 years
Gender:	M, self-identified
Ethnicity:	unspecified
Site of Care:	office

History

Reason for Visit/Chief Concern: "My right heel hurts."

History of Present Illness:

- 3-week history of severe right heel pain
- pain worsens in the morning and after prolonged sitting
- pain is less severe after he completes 1 mile of running
- has not had redness, warmth, or swelling
- has had no history of recent trauma
- has not had pain in other joints or other areas

Past Medical History:
- no serious illnesses

Medication:
- acetaminophen prn for heel pain

Vaccinations:
- received HPV vaccine 5 months ago

Allergies:
- no known drug allergies

Family History:
- mother: alive with type 2 diabetes mellitus
- father: alive with hypertension

Psychsocial History:
- avid runner
- does not smoke cigarettes, drink alcoholic beverages, or use other substances

Physical Examination:

Temp	Pulse	Resp	BP	O₂ Sat	Ht	Wt	BMI
37.0°C (98.6 °F)	65/min	16/min	120/75 mm Hg	98 % on RA	175 cm (5 ft 9 in)	70 kg (155 lb)	23 kg/m2

- **Appearance:** well developed; no apparent distress
- **Skin:** warm; well perfused
- **HEENT:** clear oropharynx; no scleral injection or icterus
- **Pulmonary:** clear to auscultation
- **Cardiac:** regular rate and rhythm; no murmurs, rubs, or gallops
- **Abdominal:** soft; nontender; normal bowel sounds
- **Genitourinary:** testis descended; meatus clear with no discharge or erythema
- **Musculoskeletal:** mild tenderness to deep palpation of the right medial heel;
- **Neurologic:** fully oriented without focal motor or sensory deficits; muscle strength 5/5 on dorsiflexion and plantar flexion

What is the most likely diagnosis?

You indicated that ***plantar fasciitis*** was the most likely diagnosis.

Choose **up to 5** pieces of information on the patient chart that best support ***plantar fasciitis*** as the most likely diagnosis.

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Gender:	M, self-identified
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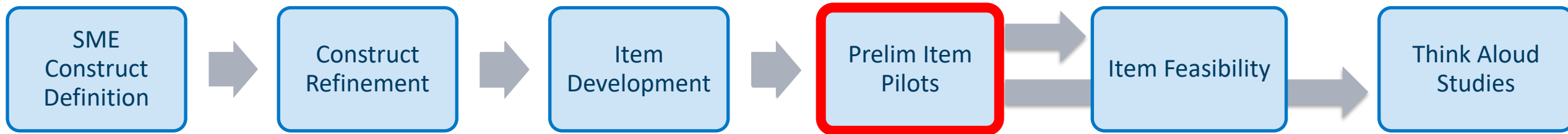- does not smoke cigarettes, drink alcoholic beverages, or use other substances

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[Exploratory Research and Development]

NEW ITEM FORMAT DEVELOPMENT PROCESS

| SME Construct Definition | → | Construct Refinement | → | Item Development | → | Prelim Item Pilots | ⇉ | Item Feasibility | → | Think Aloud Studies |

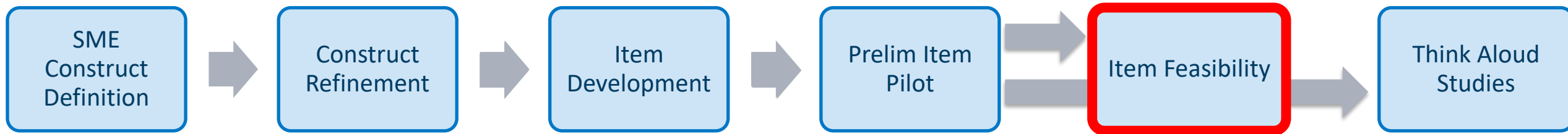Proof-of-Concept Pilots December 2021 / January 2022

7 Think-Aloud Interviews with Students

    - Completed 12 SHARP items

Proof-of-Concept Item Pilot – 177 Students

    - Completed 35 SHARP items

[Exploratory Research and Development]

NEW ITEM FORMAT DEVELOPMENT PROCESS

| SME Construct Definition | → | Construct Refinement | → | Item Development | → | Prelim Item Pilot | → | Item Feasibility | → | Think Aloud Studies |

Average Item Duration:

- 1 Lead-In Question: 135 seconds (Vignette-based MCQ: 90 seconds)
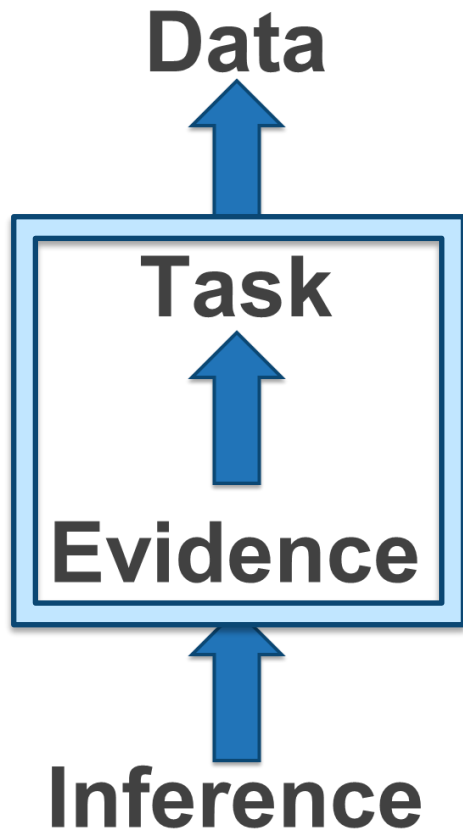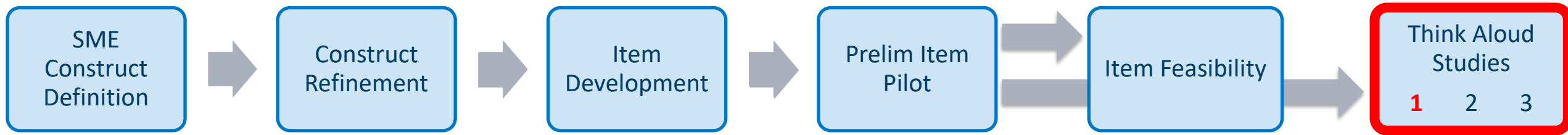
- Multiple Lead-In Questions: 180 seconds

Scoring SAQ:

- Depth of response (e.g., sepsis, encapsulated bacteria)

- Comparing natural language processing methods to SME scoring

Scoring Support:

- Common information across SME scoring groups

[Exploratory Research and Development]

NEW ITEM FORMAT DEVELOPMENT PROCESS

NBME®

| SME Construct Definition | → | Construct Refinement | → | Item Development | → | Prelim Item Pilot | ⇒ | Item Feasibility | → | Think Aloud Studies 1 2 3 |

Data

↑

Task
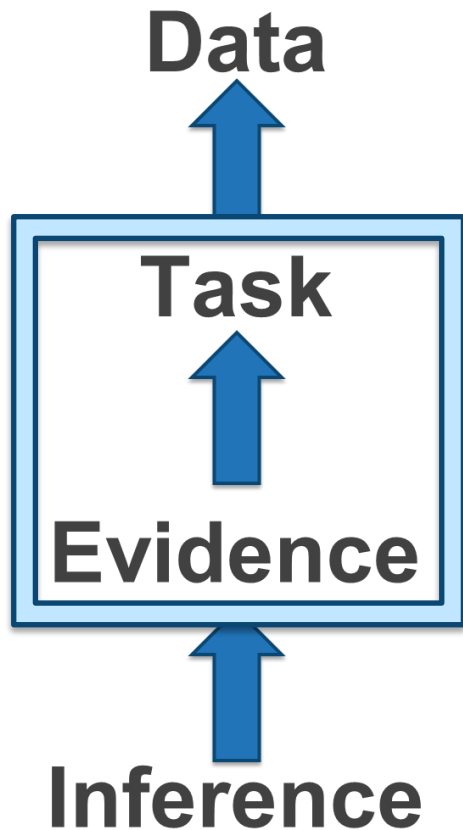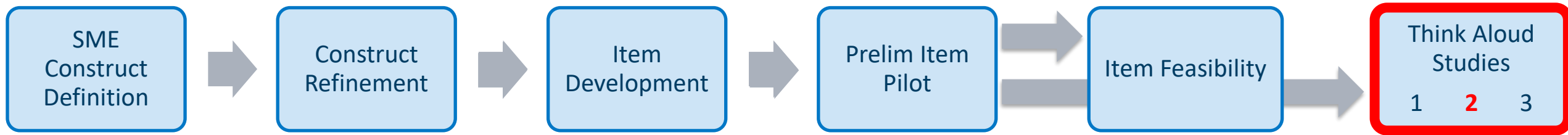
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Evidence

↑

Inference

TA Study 1:   Additional Student Interviews

15 additional Think Aloud interviews

- Qualitative code book developed on initial 5 interviews

- Clinical Reasoning codes (literature review)

- Process codes (related cognitive processes)

- Emotion codes

- Inductive Codes (emergent themes while coding)

[Exploratory Research and Development]

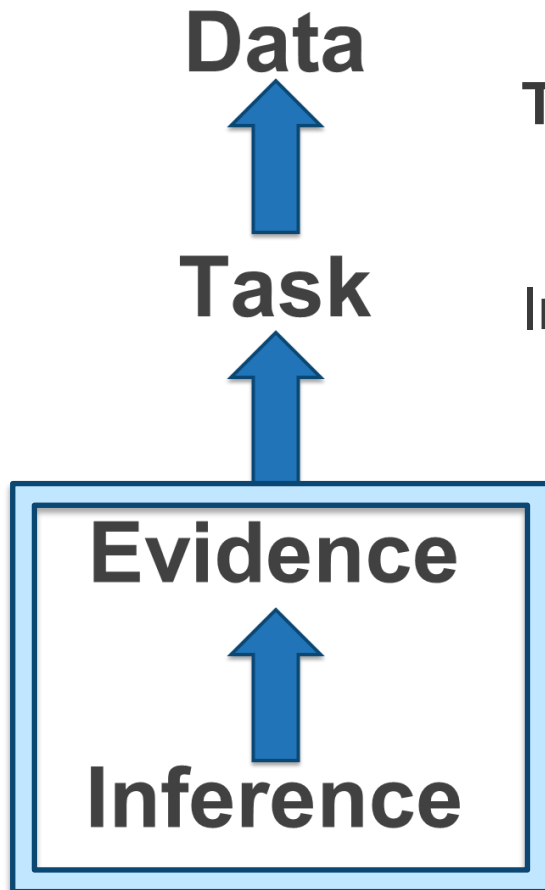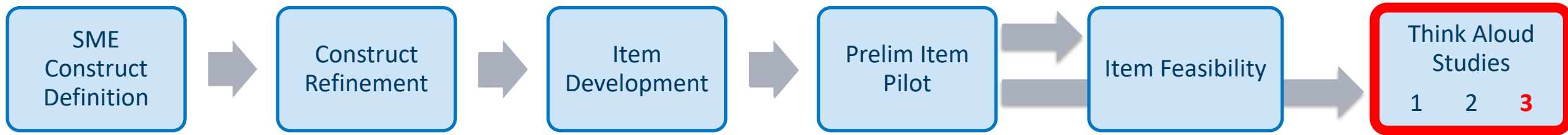# NEW ITEM FORMAT DEVELOPMENT PROCESS

NBME

SME Construct Definition → Construct Refinement → Item Development → Prelim Item Pilot → Item Feasibility → **Think Aloud Studies 1 2 3**

Data

Task

Evidence

Inference

TA Study 3:   SME review of learner responses

Invited SMEs to review learner responses to initial Think Aloud interviews

- Learner x Item Questions (after each response)

- Item Questions (after all responses to same item)

- Summative Item Format Questions (after all responses in total)

[Exploratory Research and Development]

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Wenli Ouyang

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12