



Dr. Mike Letsky at the Office of Naval Research, Grant #66001-00-1-8967.



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# *The Use of Pattern-Sharing Tools and Team Pattern Recognition*

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# *Long Term Goals*

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- Investigate performance of self-synchronizing teams
- Understand how teams collaborate on a shared surface in situations characterized by high stakes, uncertainty and time pressure



# *Objective*

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- Validate Model:

## **Team Recognition Primed Decision-Making**

- Empirical investigation for validity of:
  - **Pattern Sharing of Cognitive Chunks**
- Sharing Representation
  - **Items vs. Chunks**



# *Sharing of Patterns*

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- Discrete “item” sharing gives higher performance
- Cognitive “chunk” sharing yielded higher task performance,
  - even under time pressure (recent work!)**

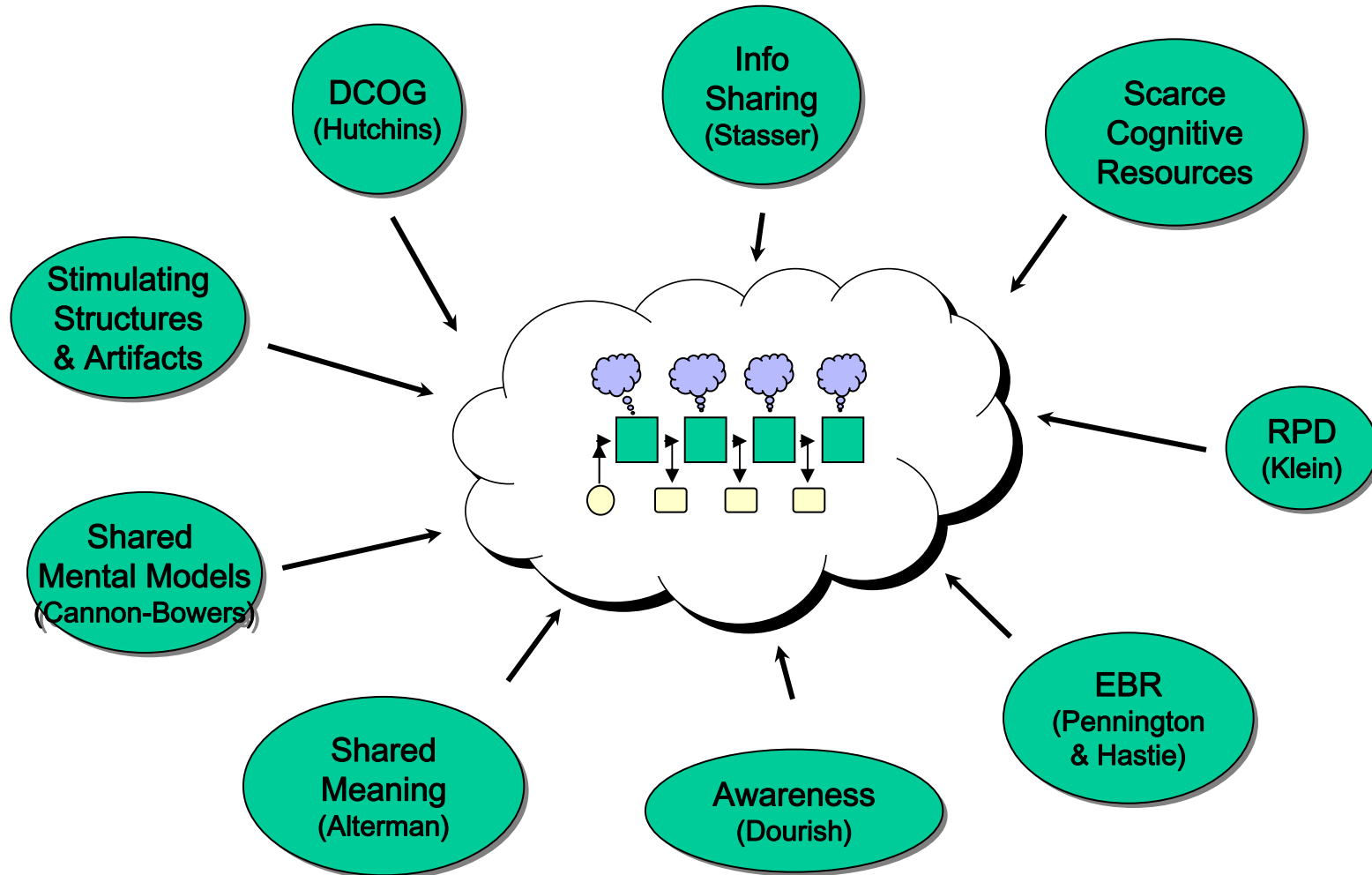


# *Cognitive Limitations*

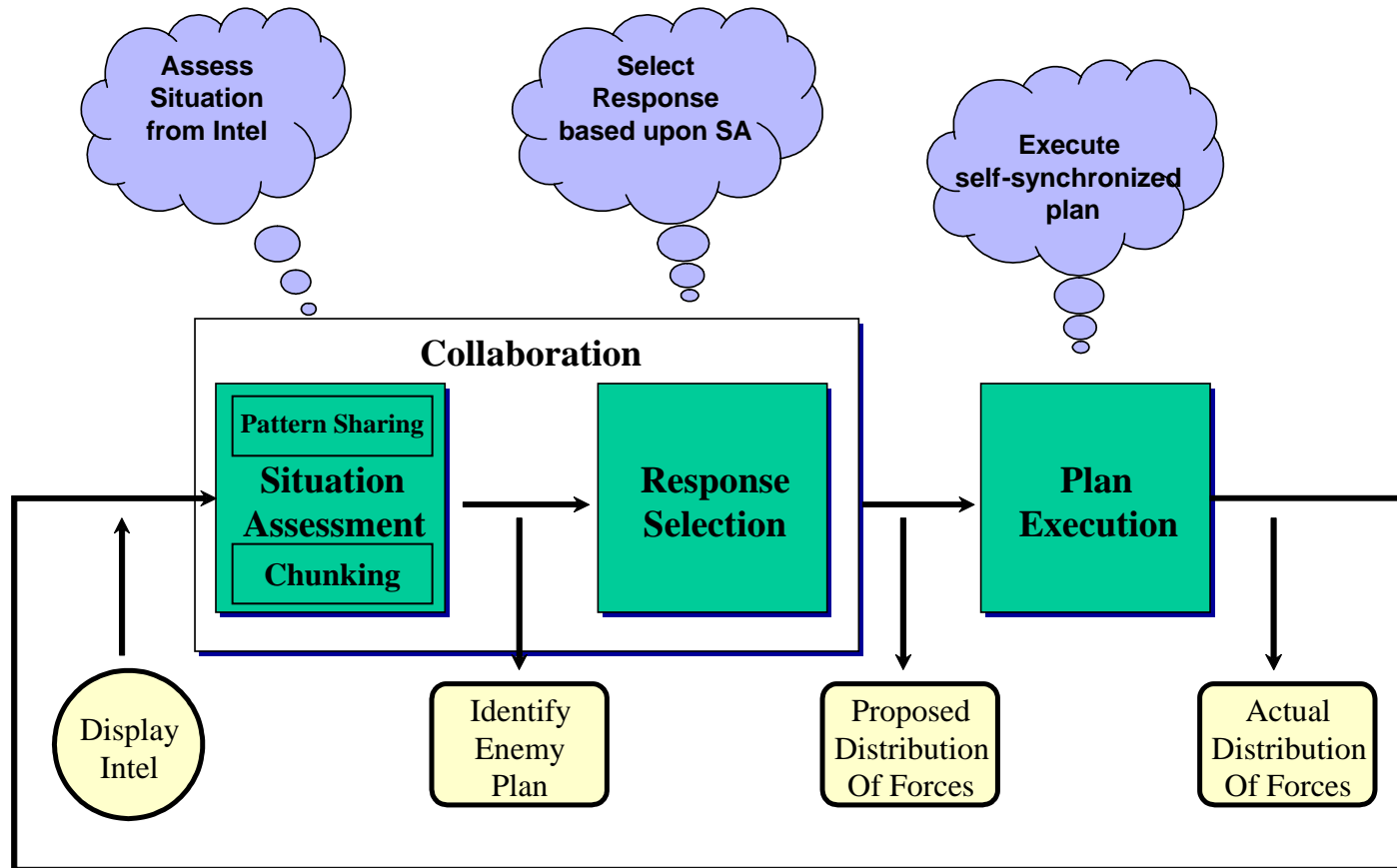
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- **Perception**
- **Attention**
- **Memory**

# Cognitive Map



# Research Model



## Team Recognition Primed Decision Making



# *Hypotheses*

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- H1: The average outcome quality of the groups supported with a stimulating structure for sharing patterns will be greater than the average decision quality of the groups without.
- H2: Among groups supported with a stimulating structure for sharing patterns, the average sharing correctness will be greater for groups using a “chunk” sharing tool.
- H3: Among groups supported with a stimulating structure for sharing patterns, the average sharing time will be less for groups using a “chunk” sharing tool.





# *Methods*

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- Subjects: 57 3-person teams
- Cooperative 3-Player Game
- Reward:
  - **accuracy**

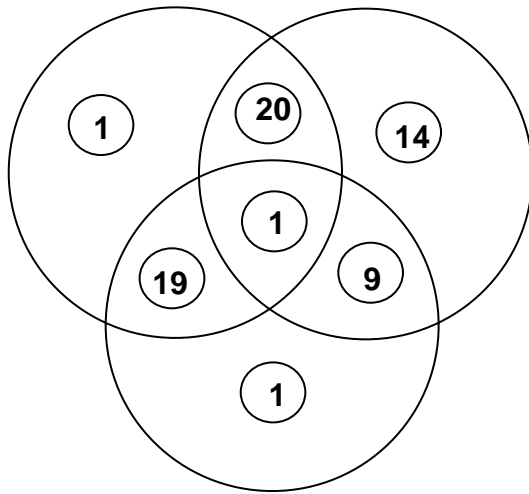


# *Decision Game*

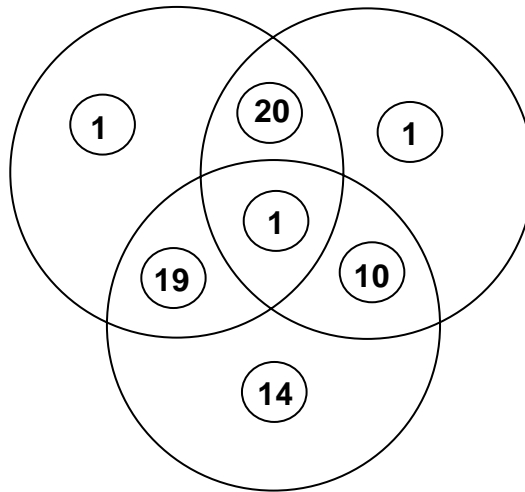
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- Each player has 7 Tokens (numbered 1-7)
- Opponent has asymmetric force
  - Patterns: Definitive, Equivocal, Uncertain
- Team places tokens so total  $\geq$  opponent
- Incentive
  - For total points
- Play is interactive

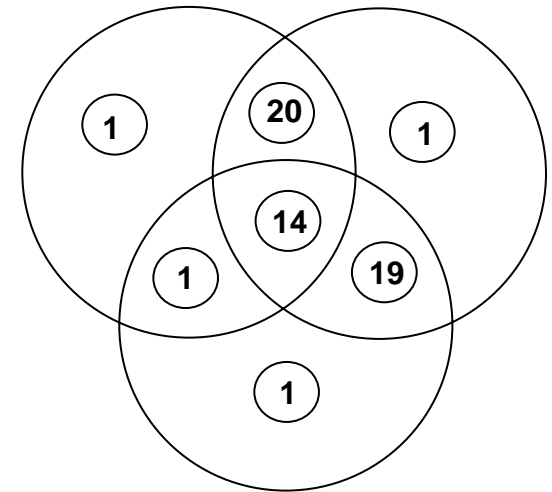
# Patterns



**9**



**10**



**14**

## Chunk Labels

# Pattern Items

Java  
Sockets  
SQL  
RMI  
Multicast

**Pattern Item Indication with Confidence**

**Revealed Intel**

14

Confidence Level

Submit

0 25 50 75 100

Java Applet Window

BEGIN

BEGIN

Current Game: 3

Player:

1 2 3 4 5 6 7

Indicate the Enemy Pattern

Next ->

Total Points: -14

Dec 17, 1:00PM

# Pattern Chunks

14 Confidence Level Submit

0 25 50 75 100

Java Applet Window

Revealed Intel

Pattern Chunk Indication with Confidence

BEGIN ●

BEGIN ●

Current Game: 0

Player: ●

Indicate the Enemy Pattern Next -> Total Points: 0 Dec 17, 1:00PM



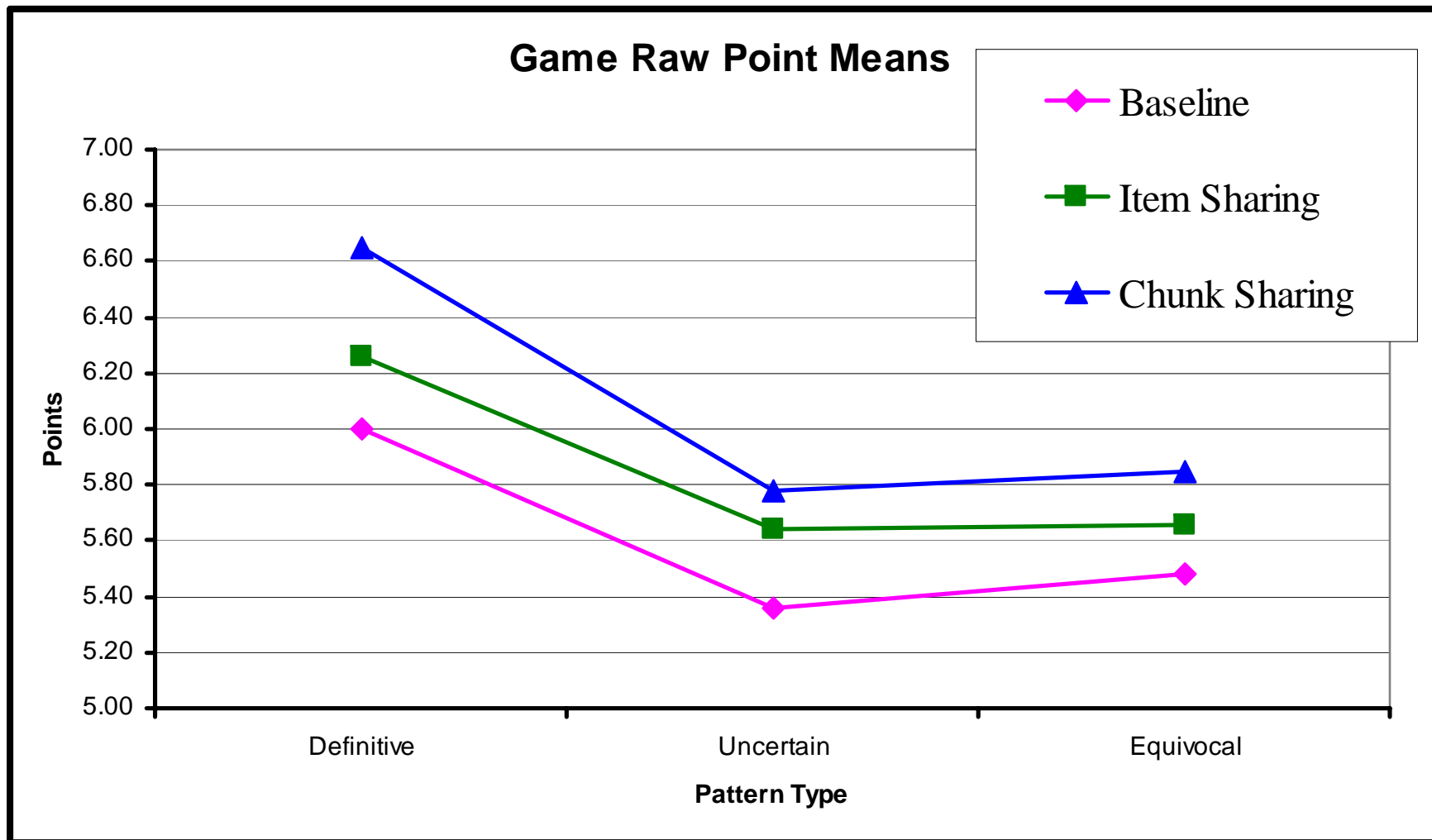


# *Research Measures*

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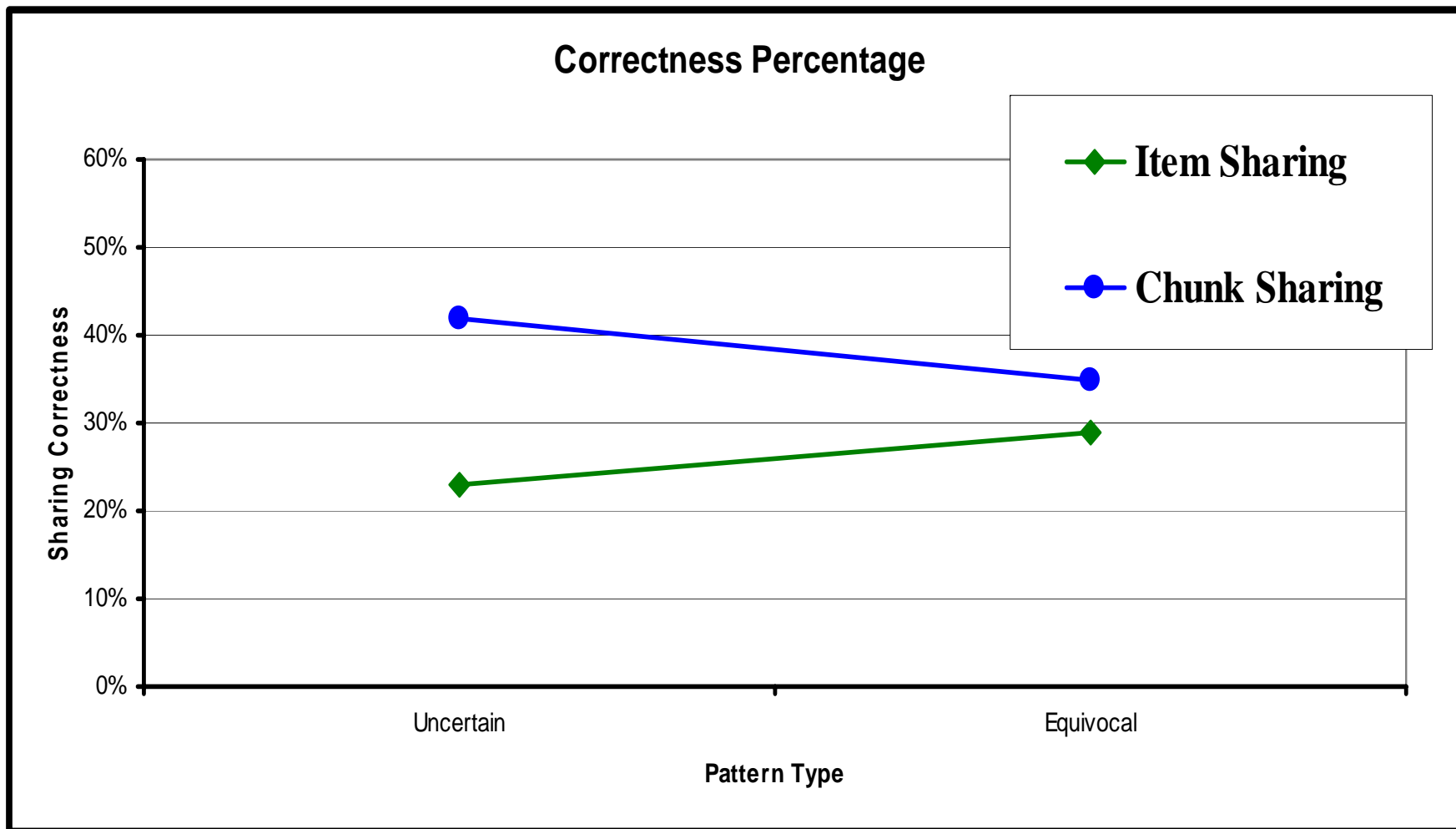
- Outcome Measures:
  - *Quality*
  - *Speed*
- Process Measures:
  - *Pattern Recognition (Confidence)*
  - *Pattern Sharing*
  - *Collaboration*
    - *collisions, bumps, leaders, structures*

# Raw Scores

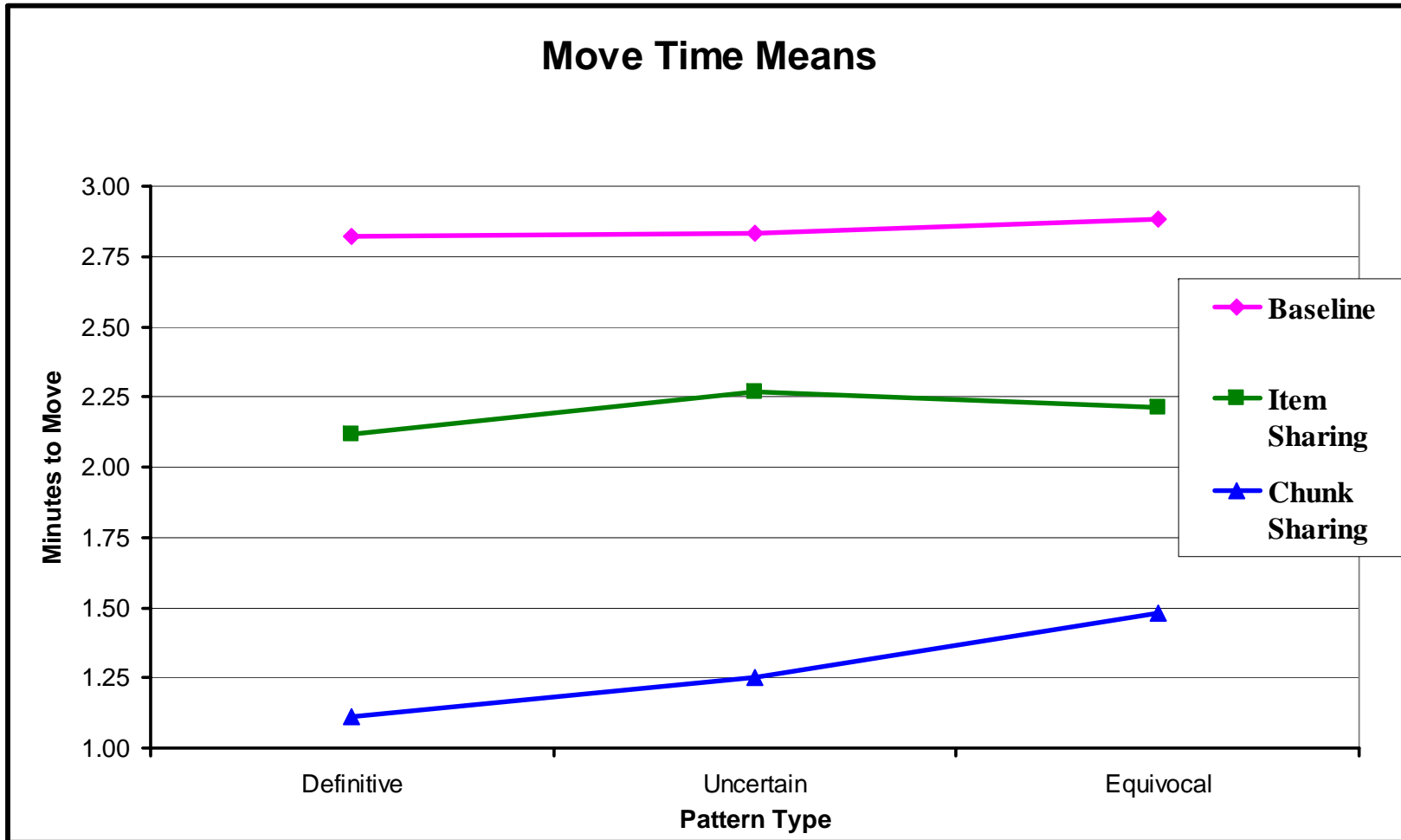




# Sharing Correctness



# Move Time



No time pressure when moving...



# *Conclusions*

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- Sharing of Pattern **Chunks** Improves Performance
  - Cognitive Alignment
  - Reduction in Cognitive Effort
  - Surprisingly thin “stimulating structure”



# *Transitions to Natural Tasks*

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- Principles
  - Provide Pattern-Sharing Tool for Situation Awareness Tasks
  - Provide Stimulating Structure Tool for Action Tasks
  - Transform Effortful Cognitive Tasks into Simple Perceptual Tasks



# *Questions?*

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# *Future Research*

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- Fernand Gobet and Herb Simon
  - Experienced people create complex structures called “templates”
  - Templates have a *core* and *slots* and *linkages* to other templates which facilitates **fast** access to long term memory
  - Templates can store at least 10 items and are often labeled

# Chess Template

a)

## Template-core:

White ♖c4, ♗d5, ♖e4, ♖f2, ♖g2, ♔g1, ♘c3, ♙e2

Black ♜c7, ♜d6, ♜e5, ♜f7, ♜g6, ♜h7, ♚g8, ♛c8, ♞f6, ♞g7

## Slot for pieces:

♗ : h2, h3  
 ♜ : a7, a5  
 ♞ : b8, d7, c5  
 ♚ : f8, e8  
 ♔ : c2, d1  
 ♙ : c1, d2, e3

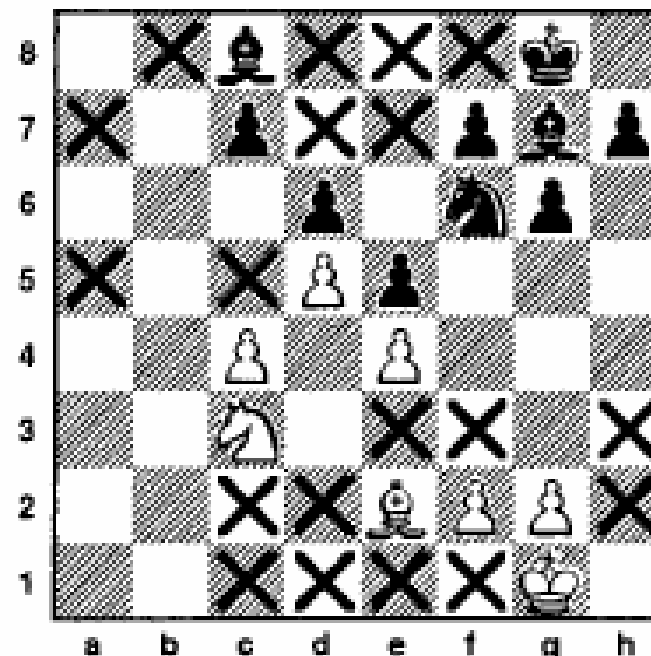
## Slot for squares:

d2 : ♘, ♙, empty  
 e8 : ♚, ♞, empty  
 e1 : ♚, ♘, empty

Slot for opening: King's Indian Defense

Slot for plans: Break in the center with f7-f5

Slot for moves: 1... Nf6-e8  
 1... Nf6-h5



Links to other templates: chunk #231