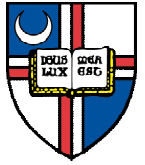




# THE EFFECTS OF AGING & TRUE VS FALSE INFORMATION ON THE IMPLICIT LEARNING OF SEQUENCES

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## Background

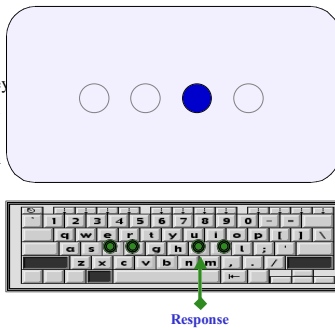
- **Learning of perceptual/motor sequences can occur implicitly**
  - i.e., without awareness or intention (Destrebecqz, & Cleeremans, 2001)
  - it appears to reflect a capacity-demanding, co-variation detection system operating on connectionist principles (Cleeremans & Jimenez, 1998)
  - it depends on frontal-striatal neural circuits (Gomez Beldarrain, Grafman, et al., 1999)
  - declarative knowledge is often acquired simultaneously (Willingham, & Goedert-Eschmann, 1999)
- **Age-related deficits occur in implicit learning of sequences**
  - at least when the regularity is higher order, spanning 3 or more items (Curran, 1997, Howard & Howard, 1997)
  - also there are age-deficits in gaining declarative knowledge of sequences (Howard & Howard, 2001)

## Questions

- **Does co-variation detection occur independent of declarative knowledge?**
  - if so, then information about the regularity, whether true or false, should not influence implicit learning
- **Are age deficits in sequence learning due to deficits in a co-variation detection system?**
  - if so, then age deficits in implicit learning should appear regardless of declarative information

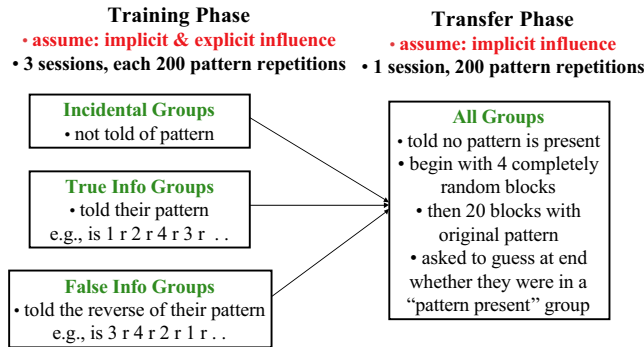
## Alternating SRT Task

- 4 spatially arranged locations
- one fills in on each trial (stimulus)
- participant presses corresponding key
- stimuli follow 4-element-long pattern
  - e.g., positions 1 r 2 r 4 r 3 r
  - where r stands for randomly chosen
- measure of learning:
  - **trial-type effect =**
    - difference in performance
    - i.e., RT or Accuracy
    - **pattern vs random trials**

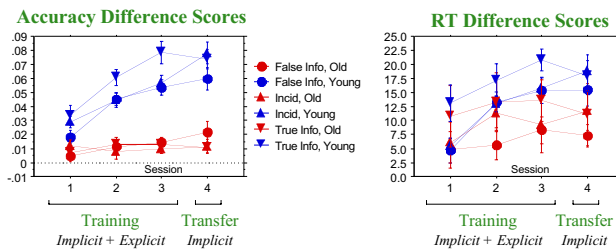


Response

## Method



## Learning Measures: Trial Type Effects



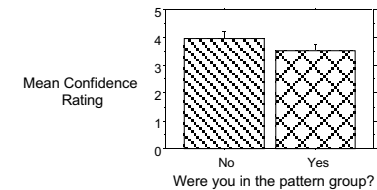
- **Both ages learn regularity**
  - significant trial type effects for both ages (accuracy and RT)
- **But are age-related deficits in learning**
  - significant age x trial-type x session interactions (accuracy and RT)
  - significant age-deficits in all three instructional conditions
- **Instructions affect trial-type effects during training, but not transfer**
  - effect significant only for young people, and then, only during training
  - suggests true and false knowledge influence explicit learning and performance, but not implicit

## Participants

	Young	Old
<b>Gender</b>	20F, 16M	23F, 13M
<b>Age</b>	20.18 (1.00)	72.22 (5.43)
<b>Education</b>	14.15 (1.16)	16.20 (2.49)
<b>Self-Rated Health</b>	4.68 (0.53)	4.40 (0.69)
Standard deviations in parentheses		

## Declarative Knowledge

- **Is the Incidental Group's learning implicit? Yes**
  - end of session 3, asked to guess their alternating pattern out of 6 possible
  - both age groups choose at near chance (16.7%) levels:
    - (young = 25%, old = 10%)
  - accuracy of guess and confidence not correlated significantly,  $r = -.24$
- **Manipulation Checks:**
  - **Did the True & False Info Groups really differ in declarative knowledge? Yes**
    - both ages >98% correct at recalling instructed pattern after each block
  - **Did the Transfer phase tap only implicit learning? Yes**
    - only 61% of people thought they were in "pattern present" group (chance=50%)
    - confidence no higher for those saying "yes" than those saying "no"



## Conclusions

- **Age deficits in implicit learning of complex perceptual/motor sequences**
  - even when both ages have the same declarative information
    - so not due to declarative/explicit knowledge
  - deficits likely reflect
    - age-related capacity limits
    - deficits in frontal-striatal systems
  - deficits likely influence
    - learning new skills (computers, musical instruments, sports)
    - acquiring new languages
    - adapting to new routines and environments
- **Implicit learning is largely independent of declarative knowledge**
  - little affected either by accurate, or by misleading, information
  - co-variation detection mechanism is independent of declarative knowledge