

# Children's Recognition of the Difference between Controlled and Automatic Cognitive Activities

Bradford H. Pillow and RaeAnne M. Pearson

Department of Psychology Northern Illinois University

## Introduction

Two experiments examined children's intuitions about whether cognitive activities are deliberate or automatic. Learning about the controllability vs. automaticity of cognitive activities is important because:

- Theories of cognition commonly distinguish between deliberate, controlled processes and automatic processes, and this distinction is likely to be included in adults' commonsense psychology.
- Controlled and automatic processes should differ in their phenomenology. Because controlled processes are deliberate and more effortful, there may be more conscious cues associated with their occurrence. Thus, first-person experience may provide evidence that contributes to children's learning about the controlled-automatic distinction.
- Recognition of the difference between controlled and automatic processes may be important for children's monitoring and evaluation of their own thinking.
- Recognizing that other people may engage in automatic cognitive processes, as well as controlled processes, could facilitate children's ability to evaluate others' reasoning.

We investigated (a) age related changes in judgments of the controllability of particular processes, and (b) the emergence of a controlled-automatic distinction in children's understanding of the mind.

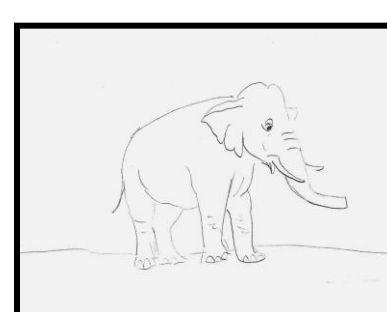
## Study 1

### METHOD

**Participants:** Twenty first-grade children, 20 third-grade children, 20 fifth-grade children, and 20 adults participated.

**Tasks:** Participants engaged in 5 tasks:

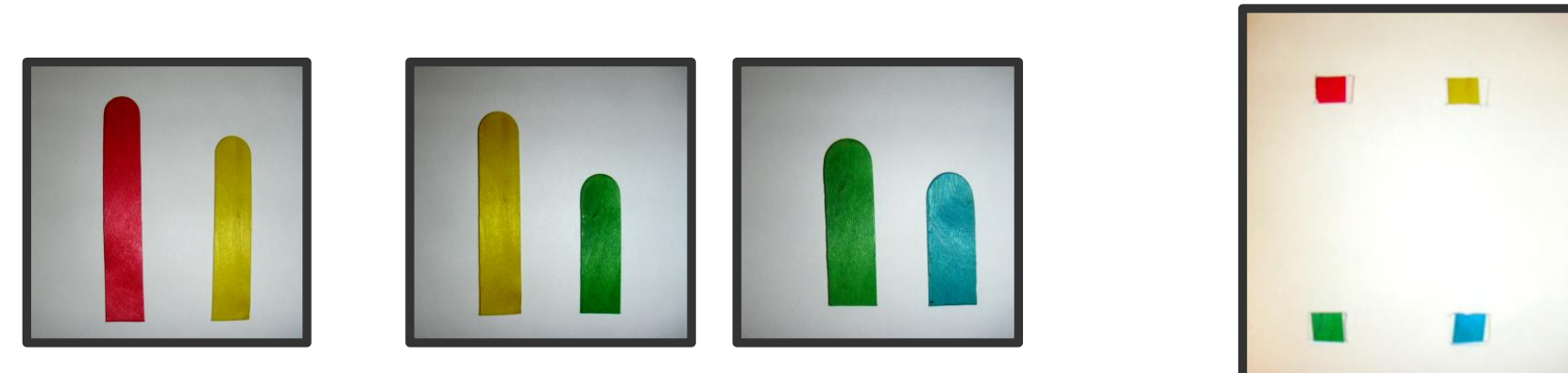
- Object Recognition:** Participants saw a drawing of an elephant and were asked to identify it.



- Deduction Inference:** Participants saw a blue and a green dinosaur. After the dinosaurs were hidden in separate containers, participants viewed one of them and were asked to identify the color of the other dinosaur, which remained hidden.

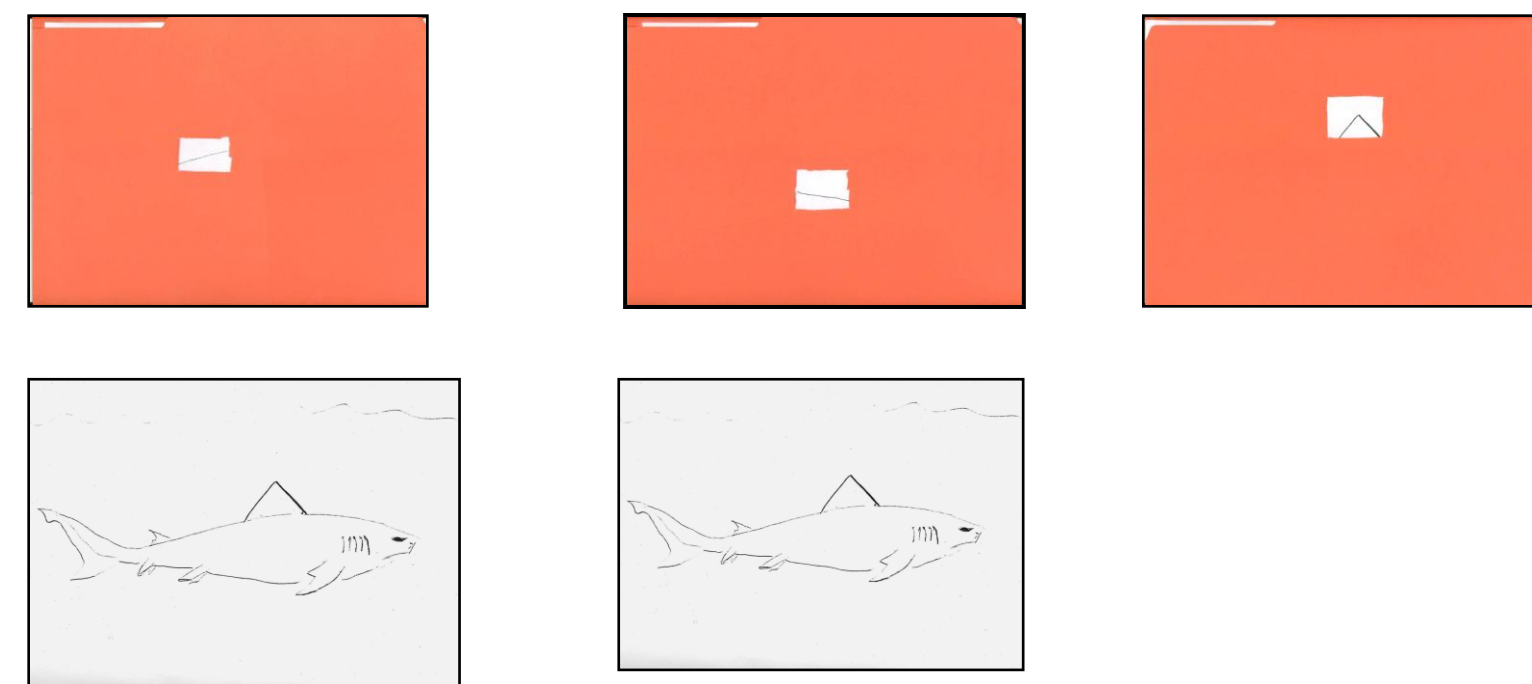


**Transitive Inference:** Participants were shown 4 sticks differing in length and color, one pair at a time. The with equal parts of the top portions of each stick visible, participants were asked which of two non-adjacent sticks was longest.

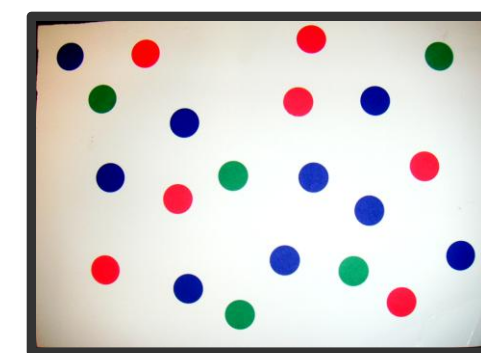


**Interpretative Inference:** Participants viewed a sequence of three pictures of sharks. Each picture was inside of a file folder, and a small square aperture had been cut out of each folder so that a nondescript portion of the drawing was visible. A different region of the shark was visible for each of the three drawings. Participants first

viewed each picture through the square aperture and then opened the folder to reveal the full shark. While viewing the third picture through the aperture, which showed the triangle of the shark's fin participants were asked to identify the picture. Participants made decisions before opening each folder.



**Counting:** Participants saw a card with 5 blue dots, 7 red dots, and 9 green dots, and were asked to count the green dots.



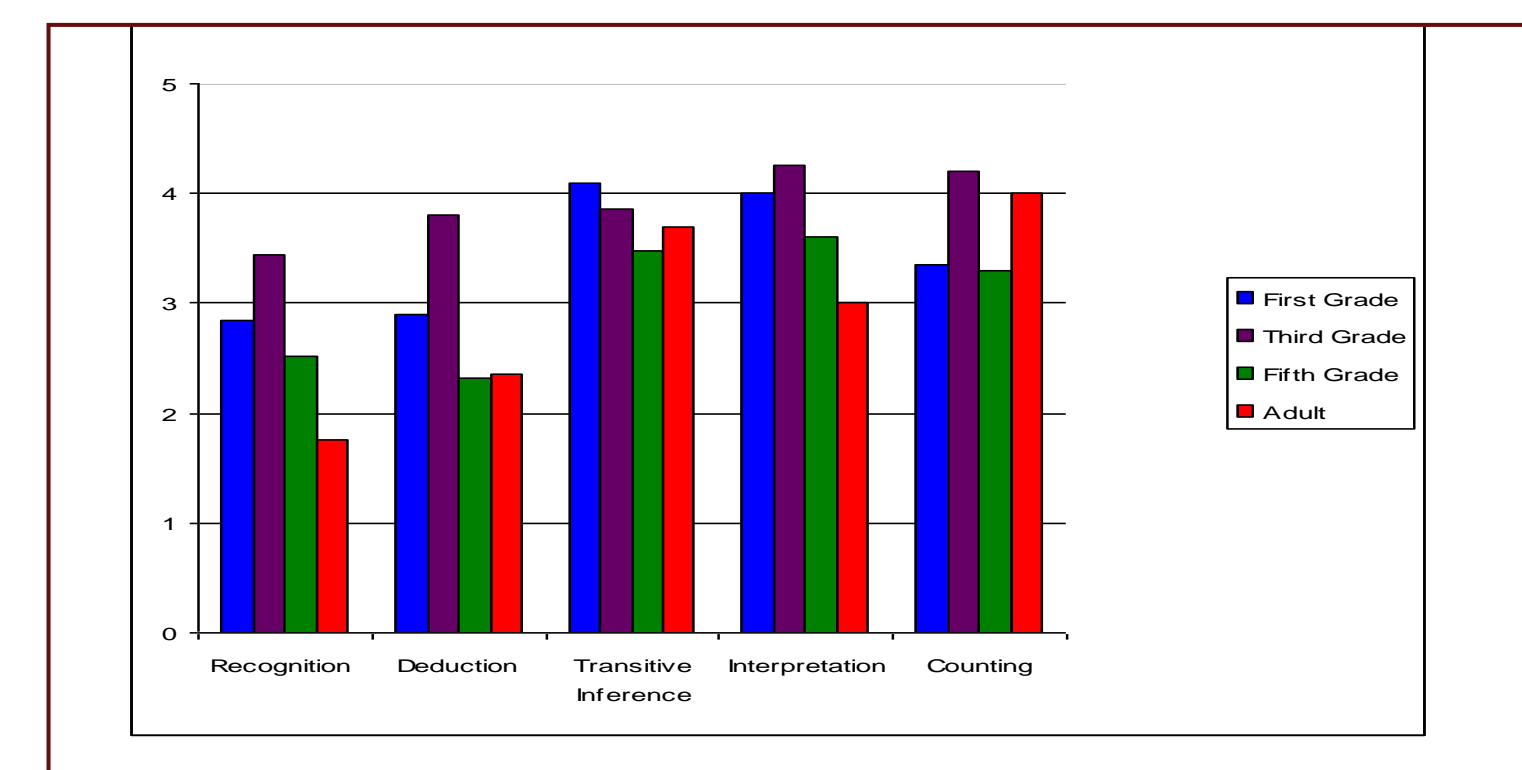
**Ratings:** After each task participants made two ratings on a 5-point scale:

- Effort:** Participants rated how much they had tried to engage in the activity.
- Purpose:** Participants rated the degree to which they had engaged in the activity on purpose.

**Rationale:** The 5 tasks included one activity that should be judged to occur automatically with little or no effort (*Object Recognition*), one activity that should be seen as deliberate and effortful (*Counting*), and three examples of inferential activity, for which intuitions about effort and purposefulness might vary by age and across individuals. Therefore, judgments concerning Object Recognition and Counting provided a standard of comparison for the other tasks.

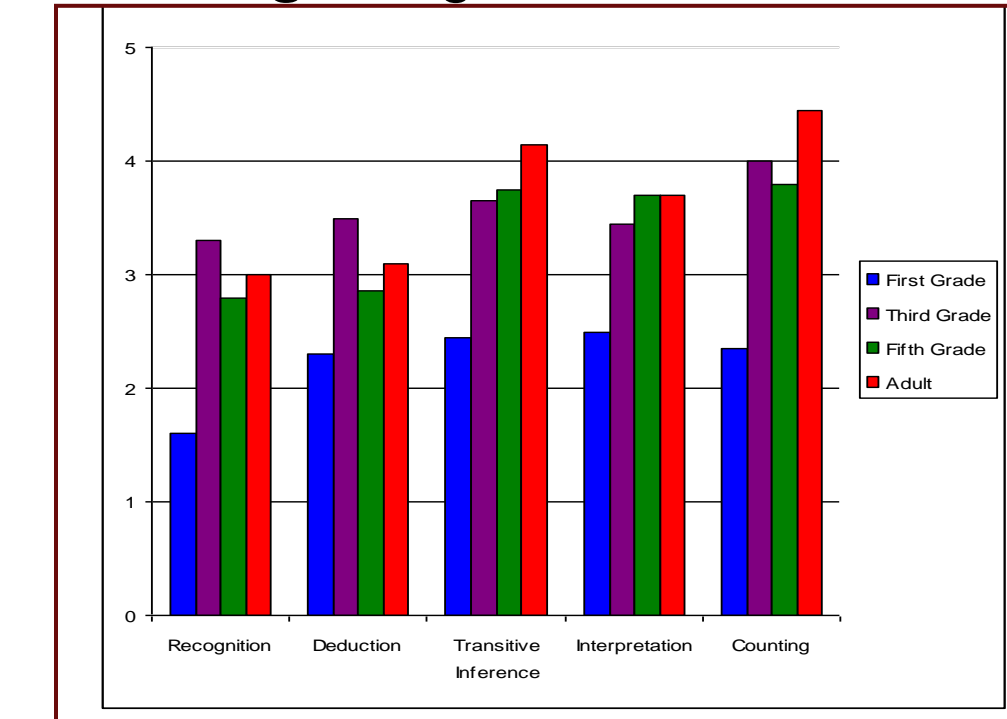
## RESULTS

**Effort Ratings:** There were significant effects of Age and Task, and a significant Age x Task interaction:



- First-grade:** Significant effect of Task: Transitive Inference was rated as more effortful than Object Recognition or Deduction.
- Third-grade:** No significant effect of Task.
- Fifth-grade:** Significant effect of Task: Counting was rated as more effortful than Deduction. Transitive Inference and Interpretative Inference were rated as more effortful than Object Recognition or Deduction by Elimination.
- Adult:** Significant effect of Task: Counting was rated as more effortful than Object Recognition, Deduction by Elimination, and Interpretative Inference. Transitive Inference was rated as more effortful than Object Recognition or Deduction. Interpretative Inference was rated as more effortful than Object Recognition.

**Purpose Ratings:** Significant effects of both Age and Task:



- Age:** First-grade children gave significantly lower purpose ratings than did the other age groups.

**Task:** Participants gave higher Purpose ratings for Counting and Transitive Inference than for Object Recognition or Deduction by Elimination, and participants also gave higher purpose ratings for Interpretative Inference than for Object Recognition.

Separate analyses of the performance of each age group indicated that the effect of Task was significant only for fifth-grade children and adults:

- Fifth-grade:** Among fifth-grade children, Counting, Transitive Inference, and Interpretative Inference were rated as more purposeful than Object Recognition or Deduction by Elimination.
- Adults:** Among adults, Counting and Transitive Inference were rated as more purposeful than Object Recognition or Deduction by Elimination.

These results suggest that both fifth-grade children and adults recognize a distinction between automatic and controlled cognitive processes:

- Counting and Transitive Inference appear to be regarded as controlled processes that require effort and are performed on purpose.
- Object Recognition and Deduction by Elimination are regarded as automatic processes that require relatively little effort and are performed less purposefully.

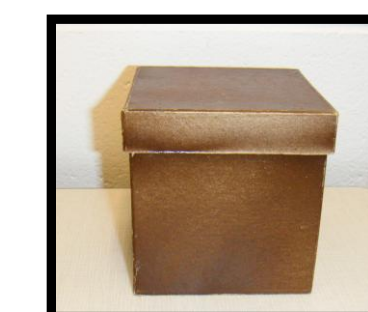
## Study 2

### METHOD

**Participants:** Twenty first-grade children, 20 third-grade children, 20 fifth-grade children, and 20 adults participated.

**Tasks:** Participants engaged in 4 tasks:

- Object Recognition: Same as Study 1.
- Deductive Inference: Same as Study 1.
- Interpretative Inference: Same as Study 1.
- Pretend: Participants were asked to pretend there was something inside an empty box.



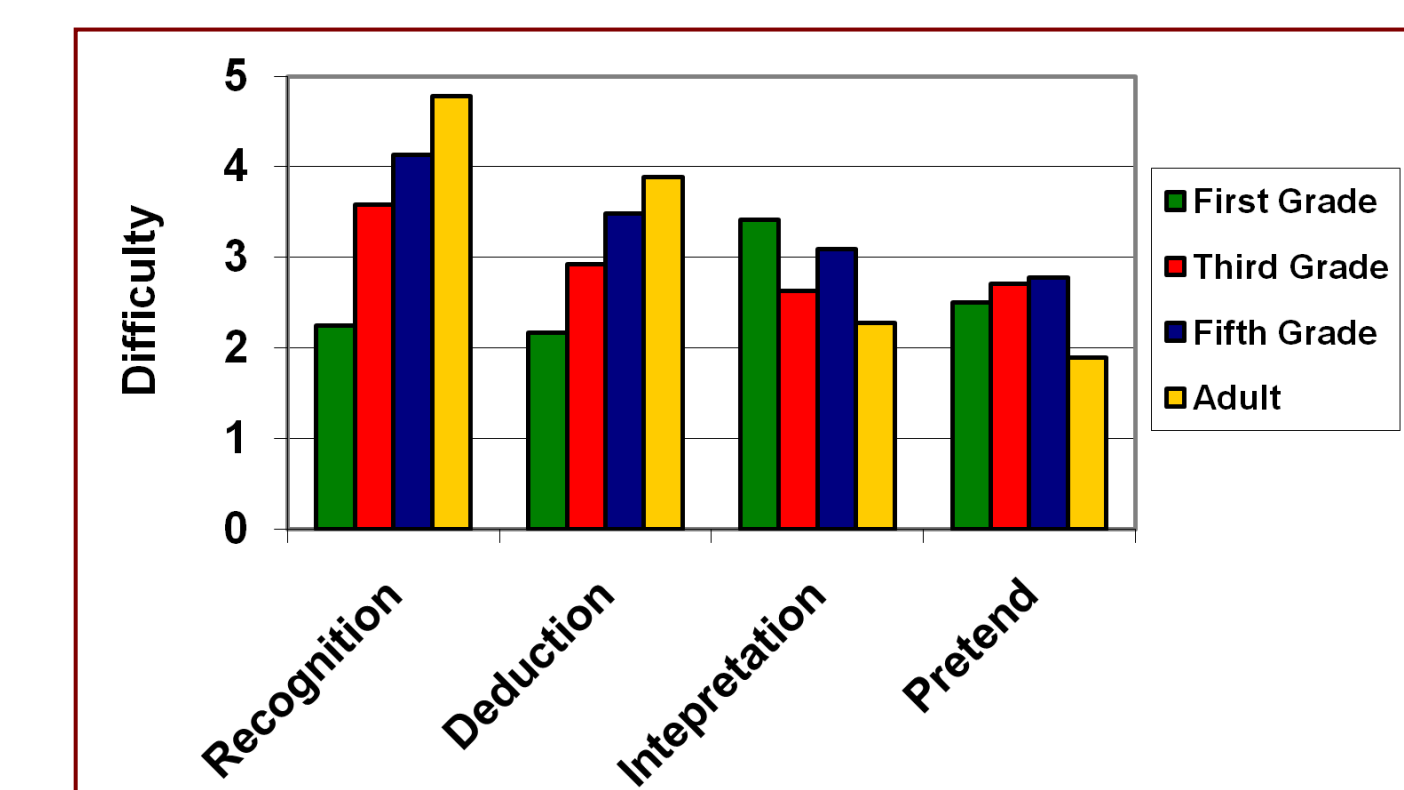
**Ratings:** After each task participants made two ratings on a 5-point scale:

- Want Question:** e.g., "When you looked at the picture, did you want to see an elephant? Show me with the arrow. How much did you want to see an elephant? Put the arrow here if you wanted to do it a lot, put the arrow here if it just happened, and put the arrow here if you wanted to do it a little bit."
- Option Difficulty Question:** e.g., "When you looked at the picture, did you have to see an elephant or could you see a giraffe instead? Show me with the arrow. Put the arrow here if it would be very easy. Put the arrow here if it would be very hard, and put the arrow here if it would be very easy."

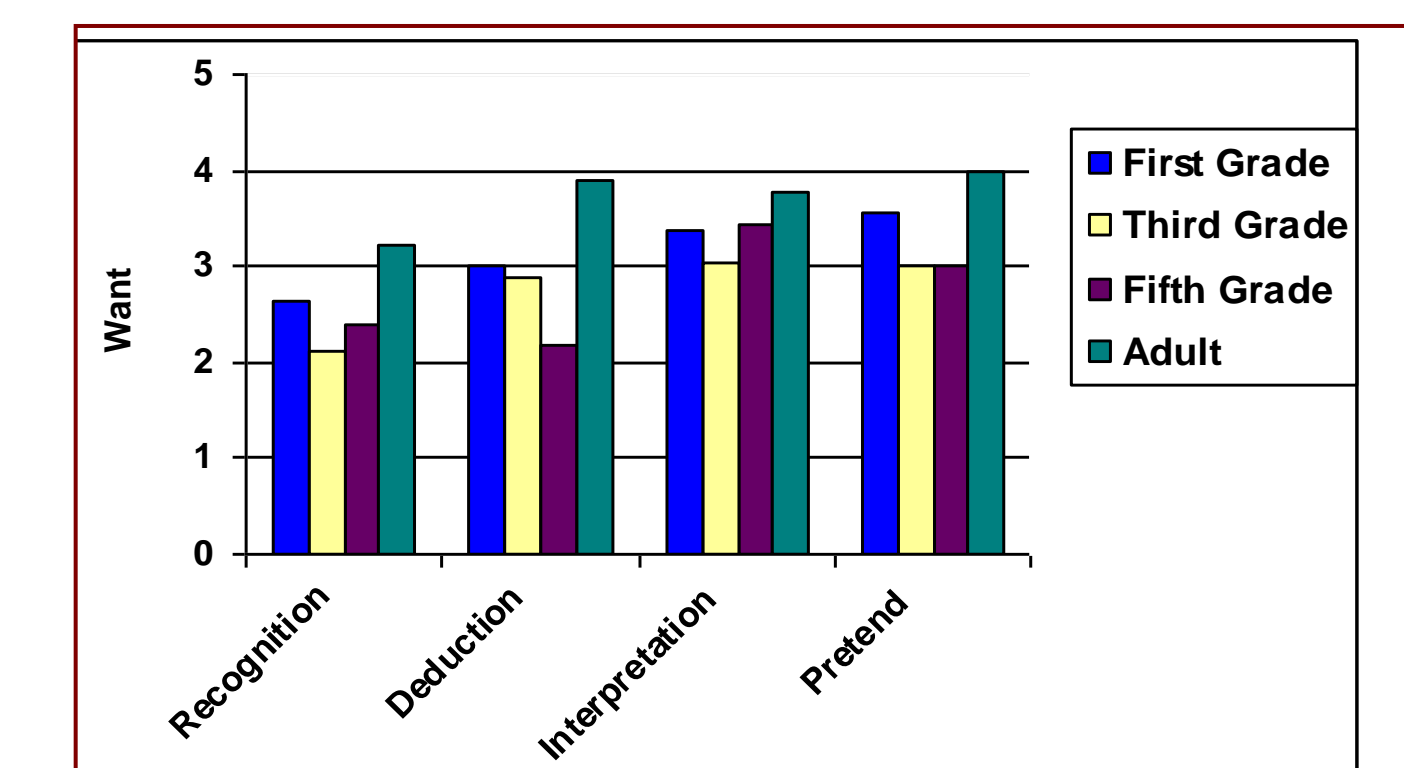
## RESULTS

**Option Difficulty Question:** Main effects of Age and Task, and an Age x Task Interaction:

- First-grade children did not distinguish among the 4 tasks in their ratings.
- Both third-grade and fifth-grade children gave higher difficulty ratings for the alternative option for Object Recognition than they did for Interpretative Inference or Pretend.
- Adults gave higher difficulty ratings for the alternative option for Object Recognition than they did for Interpretative Inference or Pretend, and adults also gave higher ratings for Deductive Inference compared to Interpretative Inference or Pretend.



- Want Question:** There were main effects of Age and Task, with Adults giving higher ratings than children overall, and Object Recognition receiving lower ratings than the other tasks.



## Conclusion

A distinction between controlled and automatic processes appears to emerge by third-grade, but is further refined between fifth-grade and adulthood.

Children and adults differentiate automatic and controlled processes in terms of:

- The effort required for the activity.
- The extent to which the activity is performed purposely.
- The extent to which outcomes are influenced by what a person wants
- The ease of deliberately altering the outcome of a process.

Correspondence:  
pillow@niu.edu

Poster available at:  
bradfordpillow.weebly.com

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