Blocking in Category Learning

Bott, L., Hoffman, A. B., & Murphy, G. L. (2007). Blocking in category learning. Journal of Experimental Psychology: General, 136(4), 685.

Present by Zory Zhang @ 

Outline

Goal: Convey that (external) error-based learning is not the sole mechanism of human (category) learning.

- ❶ Demo of Exp.3
- ❷ Research Question
- ❸ Exp.3 Settings
- ❹ Exp.3 Results
- ❺ Implications

❶ Demo of Exp.3

Are we ready?

Not juicy

high tone

Juicy

low tone

Not juicy

high tone

Juicy

low tone

Not juicy

high tone

Big
Juicy
Red

low tone

Small

Not juicy

Red

high tone

Red

Juicy

Small

low tone

Juicy
Big
Green

low tone

Not juicy
Small
Green

high tone

Big
Red
Juicy

low tone

Not juicy

Small

Green

high tone

Green

Not juicy

Big

high tone

Big

Green

Small

Red

How do you feel?

Actually low = {big, juicy, red} = prototype
Should be extremely easy if a little bit attention
Tricked?
Focused too much on the juicy/nonjuicy?

Def. **Blocking effect** in associative learning [2].

Group	Phase 1	Phase 2	Test Phase	Results
Blocking 🐀				
Control 🐀	-	LT+ 💡🔊⚡	T 🔊	T → fear 🔊→😨

Group	Phase 1	Phase 2	Test Phase	Results
Blocking	L+	LT+		
Control	-	LT+		

Group	Phase 1	Phase 2	Test Phase	Results
Blocking	L+	LT+	T	
Control	-	LT+	T	

Group	Phase 1	Phase 2	Test Phase	Results
Blocking 🐀	L+ 💡⚡	LT+ 💡🔊⚡	T 🔊	T → no fear 🔊→😐
Control 🐀	-	LT+ 💡🔊⚡	T 🔊	T → fear 🔊→😨

- Explained as consequence of behavioral-error-driven learning.

❷ Research Question

- Question: Is category learning purely behavioral-error-driven as well?
- Use blocking to produce new evidences!
- YOU know how to predict outcomes -> no error in predicting -> don't learn other features

Outline

- ❶ Demo of Exp.3
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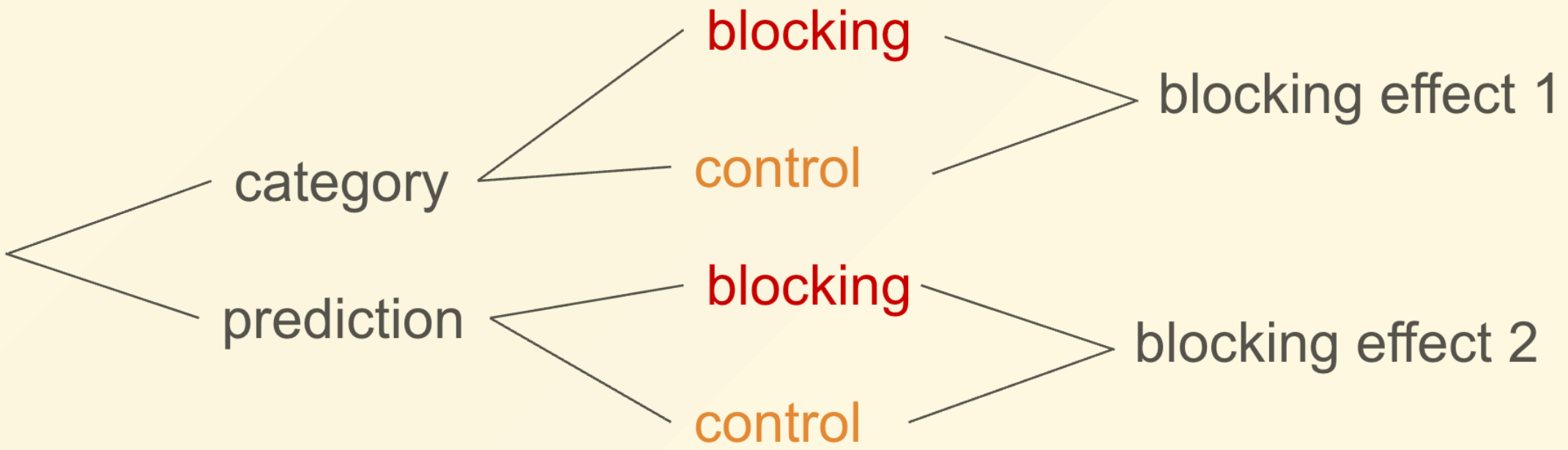
- ❺ Implications

❸ Exp.3 Settings

- Materials
  - Pre-experiment instruction: depends on task.
  - Phase 1: depends on condition.
  - Same Phase 2: One feature fully diagnostic of category (YOU: Juicy/Not juicy).
  - Same testing: judge most likely tone/category for each feature.

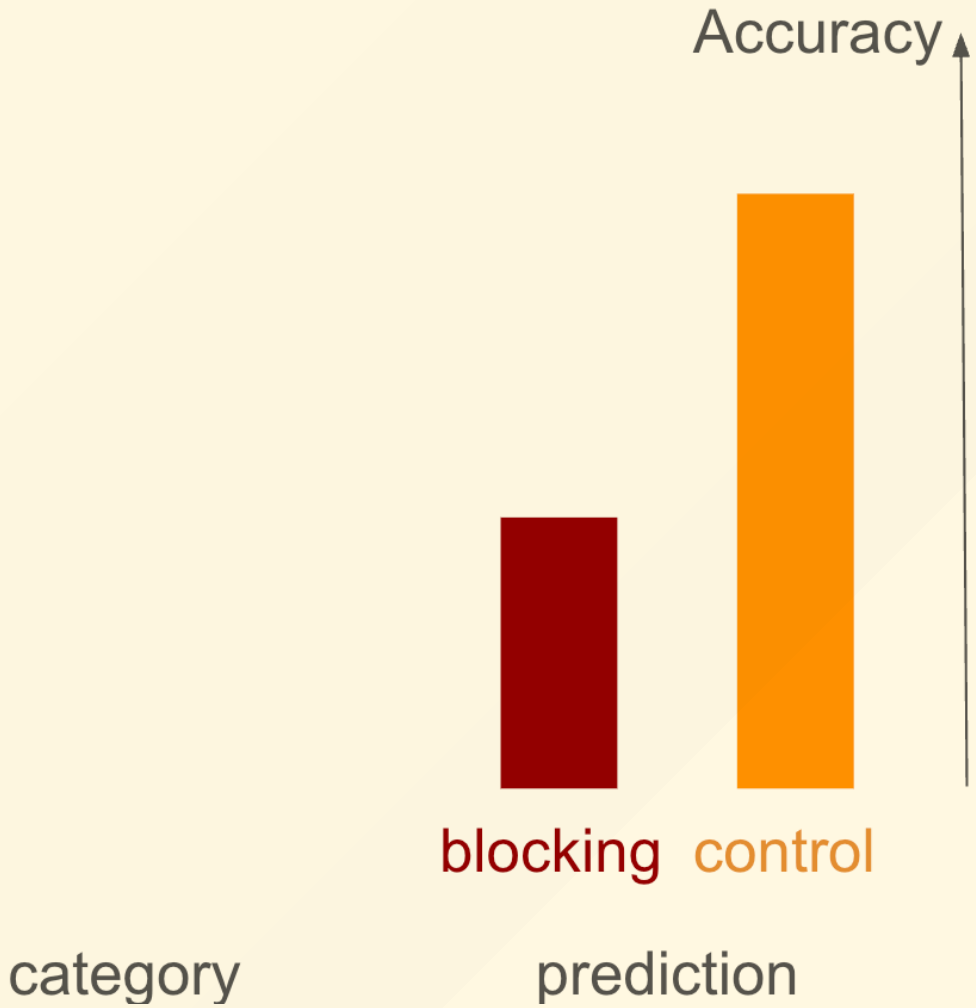
- 2 conditions:
  - blocking condition (YOU): Pre-trained to use the diagnostic feature (YOU: Juicy/Not juicy) in Phase 1 -> Almost no behavioral error during Phase 2.
  - control condition: No such Phase 1 -> Some errors early on duiring Phase 2.
- Now interestingly, 2 pre-experiment *instructions*:
  - prediction task (YOU): predict high/low tone.
  - category learning task: [let me demo]

4 groups. Between subject.

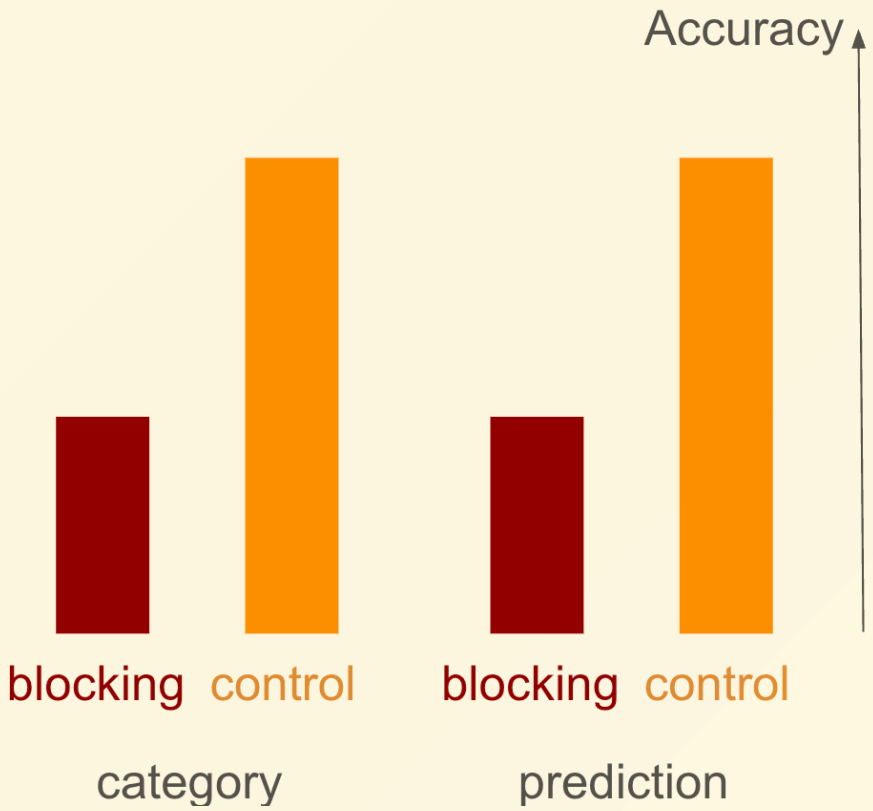


- Blocking effect = accuracy(control) - accuracy(blocking) of feature understanding in Test Phase.

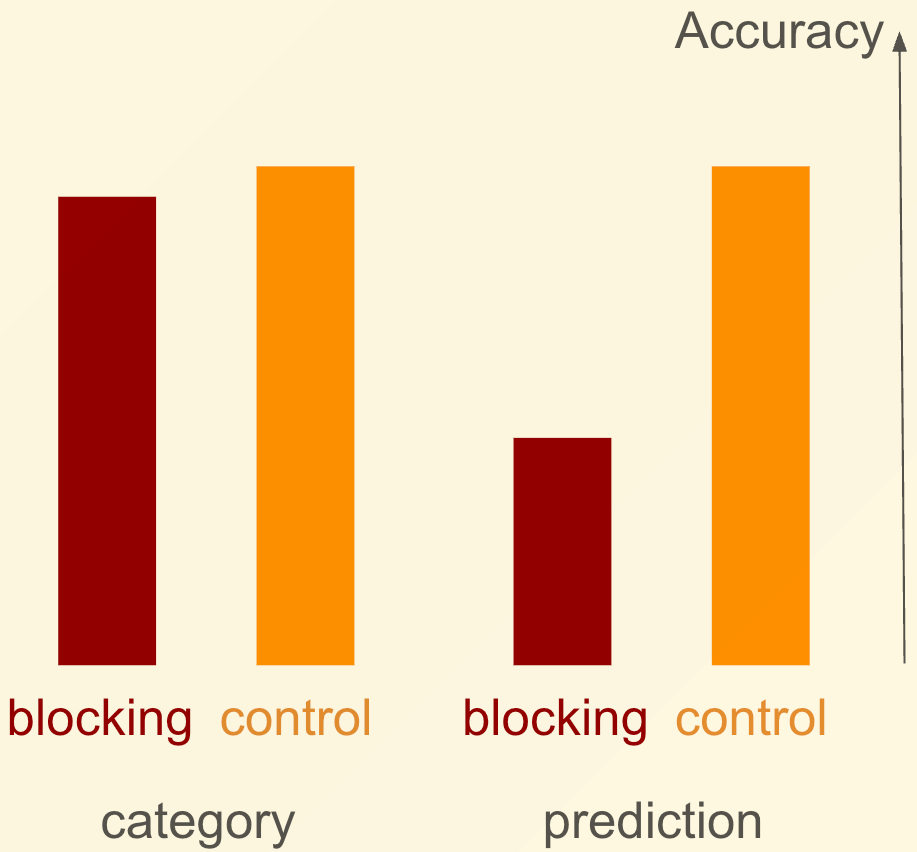
Prediction: reproducing blocking effect



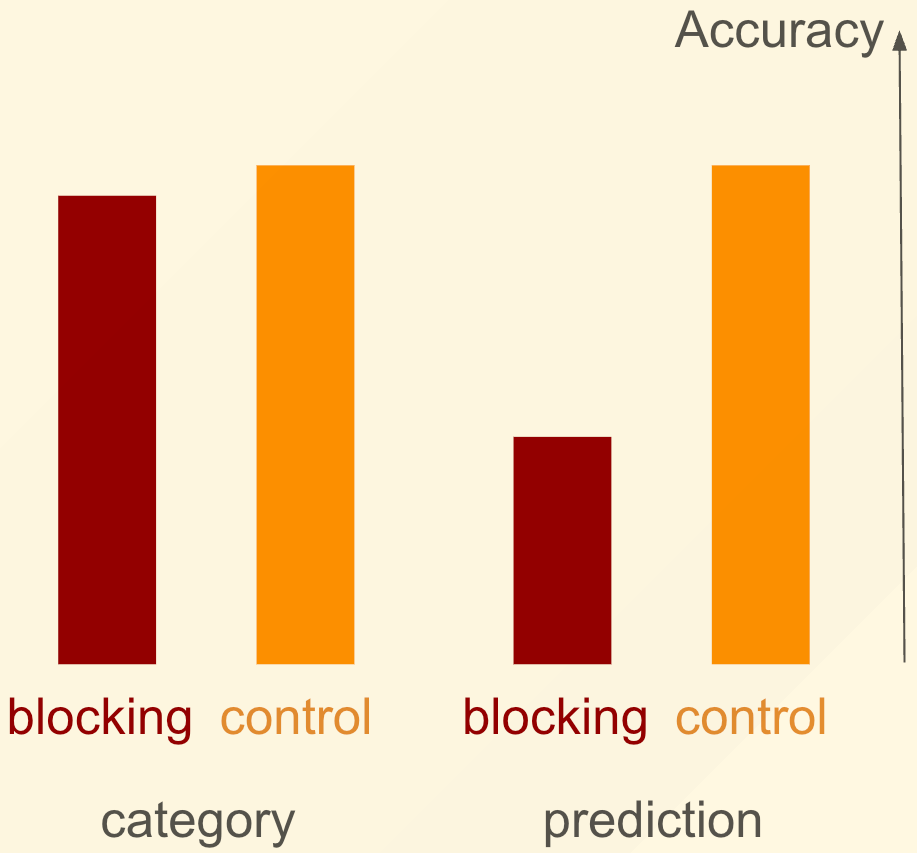
Prediction 1: if category learning is also error-driven



Prediction 2: if category learning is complicated



❹ Exp.3 Results



❺ Implications

- Totally expected. The whole purpose of having categories is to support:
  - **generalization**: something about x might be true for y because of the same category, when you don't know much about y
  - **inference**: categorize even when you don't know about the all features of it + (make judgement on the ground of category)
- To **learn about** a category, you **should** get information about it as much as you can, beyond what you need to *categorize* future items.

- Predicting outcomes is another story:
  - even when beyond associative learning, people assume number of causes = 1 when learning a new causal system.
  - People assume the contrary in real-world categories.
- "Learners' construal of the task determines what they learn."
- Big deal back then: many theories of category learning assumed an error-driven mechanism.
- Still largely true today.
- Comment: I think they should have measured and reported reaction time.

Relevance

- Linguistic priming: Lexical/syntactic/verb-bias/phonotactic priming (Quite differrent from visual/auditory priming)
- Evidence: The more surprising the prime is, the stronger error.
- Thoery: Priming as error-based implicit learning.
- Blocking in phonotactic learning?
- Clarification: FierceFire3 does not emphasize error-based learning. It is about using patterns in speech errors to reveal our implicit knowledge. See "Tuning the blueprint" paper for this mindset.

Thank You! Q&A time.

References

1. Bott, L., Hoffman, A. B., & Murphy, G. L. (2007). Blocking in category learning. Journal of Experimental Psychology: General, 136(4), 685.
2. https://www.youtube.com/watch?v=N4aq7PoH0Dc

Backup slides

Conforming to the theory theory account, it appears that people have a hypothesis about how data is generated (#cause=1 or "they are categories") that is influenced by testimony.

Stimuli Summary

Dimension type	Dimension number	Category A	Category B
Knowledge	1	Used on mountains	Used on safaris
	2	Goes on glaciers	Goes in jungles
	3	Made in Norway	Made in Africa
	4	Heavily insulated	Lightly insulated
Rote	5	Has air bags	Does not have air bags
	6	License plate in front	License plate in back
	7	Has cloth seat covers	Has vinyl seat covers
	8	Has manual transmission	Has automatic transmission
	9	Has CD player	Has cassette player
	10	Has rear wheel drive	Has front wheel drive
	11	Has a small trunk	Has a large trunk
	12	Has two doors	Has four doors

Exp. 1 & 2

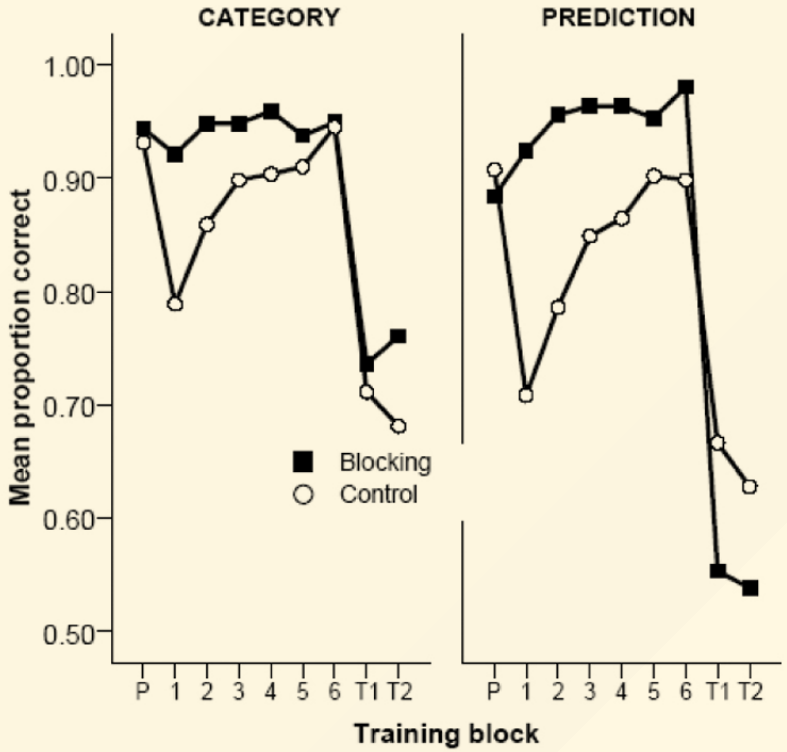
Learning real-world categories with thematic and causal knowledge (exp.1) or no knowledge (exp.2).

- blocking condition: One feature fully diagnostic of category. Almost no behavioral error.
- control condition: No feature fully diagnostic of category. Quite some behavioral errors.

Exp. 3

- 4-6 epoches (blocks) of learning stimuli
- 2 epoches (blocks) of 16 features (8 dimensions) -> 32 judgements
- Categories named Mobbles and Streaths
- This will also be a feedback text "correct/incorrect" on the screen, ofc, after each judgement during training.

- Phase 2 (On non-defining features only)
  - Category control >> prediction control
  - Category learning lets you learn faster (in control condition)



- Test Phase
  - Prediction task blocking effect $p<.05$
  - Prediction blocking condition at chance level, $p=.24$