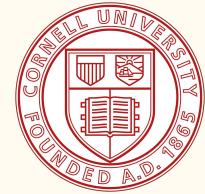


Experimentally extracting implicit instruments

Ashlyn Winship, Zander Lynch,
John R. Starr, Yifan Wu, Lucas Y. Li,
and Marten van Schijndel

Cornell University Department of Linguistics

PEER
April 18, 2025



The chef chops an onion.



Ashlyn walks Doc.



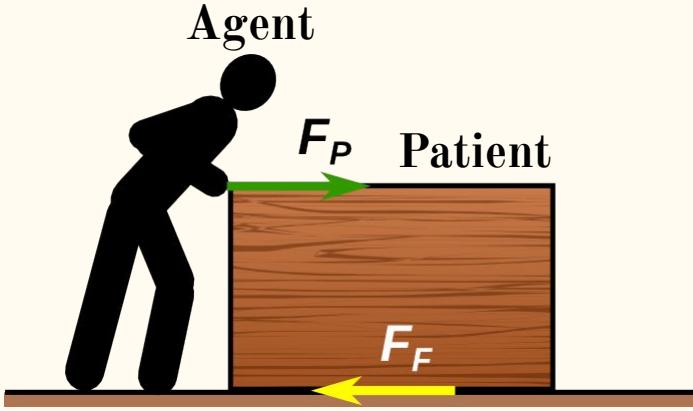
Question: To what extent do people represent implicit instruments in their models of events?

Roadmap

1. Background
2. Experiments
3. Discussion:
 - a. **Implicit instrument representation is robust in event modeling!**

1. Background

Event roles



While Agent and Patient are salient, distinct categories (Rissman & Majid 2019) ...

- Kids disambiguate them (cf. R&M 2019)
 - Adults quickly extract them from visual events (Hafi, Papafragou, & Trueswell 2013; R&M 2019)
- ...Instrument is not
- Might be part of Agent (Schlesinger 1989)
 - Might be part of Patient (R&M 2019)

Event modeling

Intersecting Object Histories:

(Altmann & Ekves 2019)

Event = interactions of entities in space and time



Altmann & Ekves 2019

Subevents (Koenig et al. 2008):

1. Agent acts on Instrument,
2. Instrument acts on Patient,
3. Patient changes

Force vectors (Gärdenfors 2024):

Forces exerted by Agent and modifications imposed by Instrument form a “force vector”

Event models track the interactions of Agents, Instruments, and Patients

Open questions

1. How detailed are event models?
2. What *is* the implicit instrument?



Event:
The chef chopped an onion.



2. Experiments

Experiment 1: with

Read the sentence below and select one of the options to continue it by clicking the black box or the word.

The chef chopped an onion. Then, with the same ___

knife



Closed box task:

- Read an event description
- Complete a follow-up sentence

Primary instrument:

knife

Object:

onion

Secondary instrument:

bowl

Associated item:

oven

The chef chopped an onion.

Then, with {the same, a different} . . .

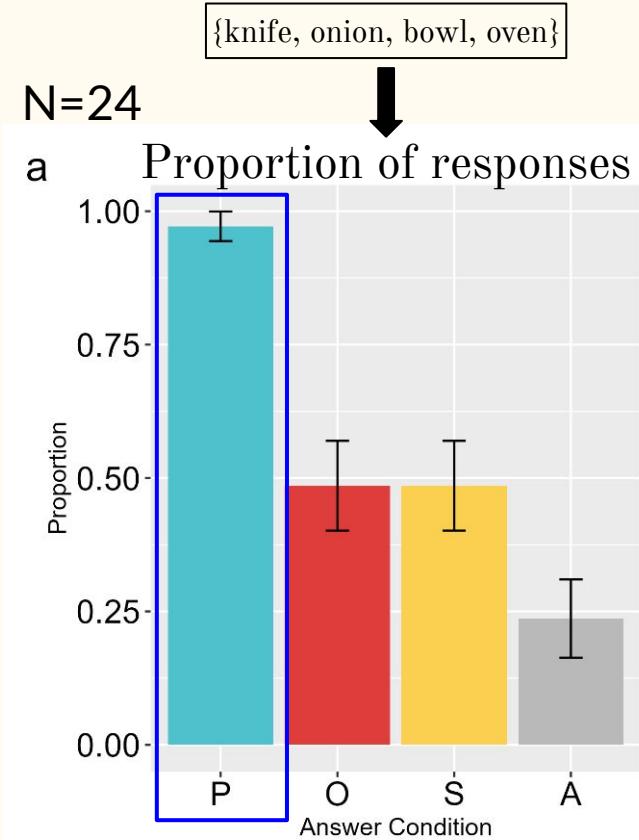
knife (P)

onion (O)

bowl (S)

oven (A)

Experiment 1: with

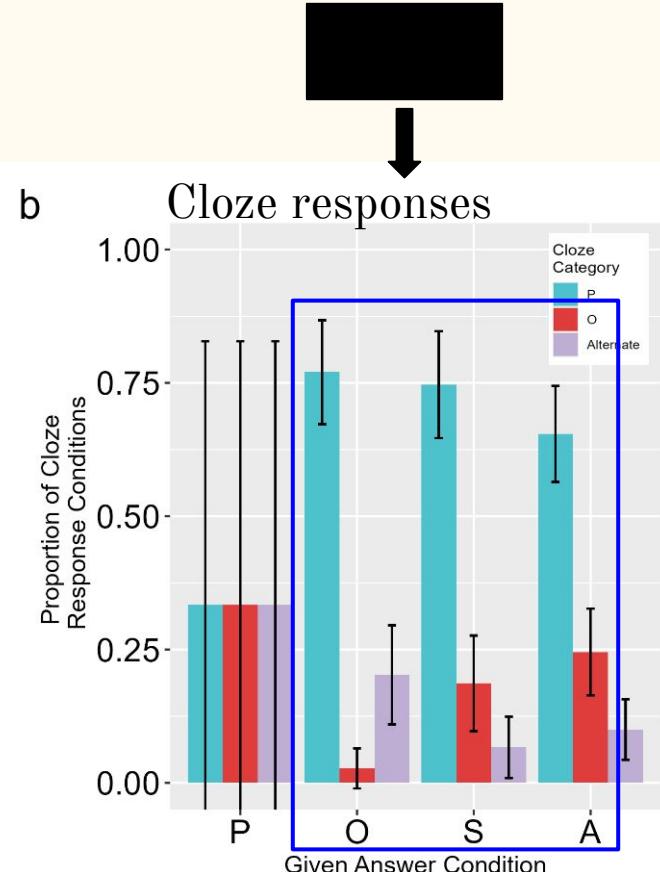
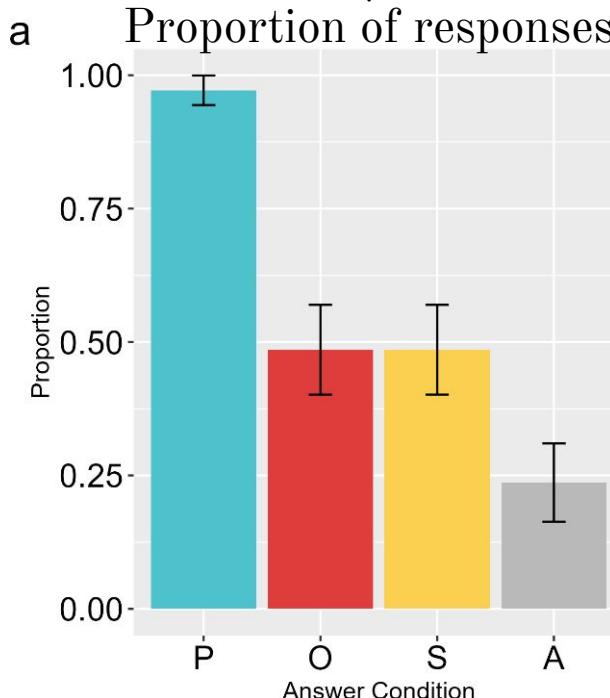


- Takeaways:
1. People pick the instrument

Experiment 1: with

{knife, onion, bowl, oven}

N=24



Takeaways:

1. People pick the instrument
2. When discarding other choices, people write in the instrument

with



Experiment 2: *use* vs. *take*

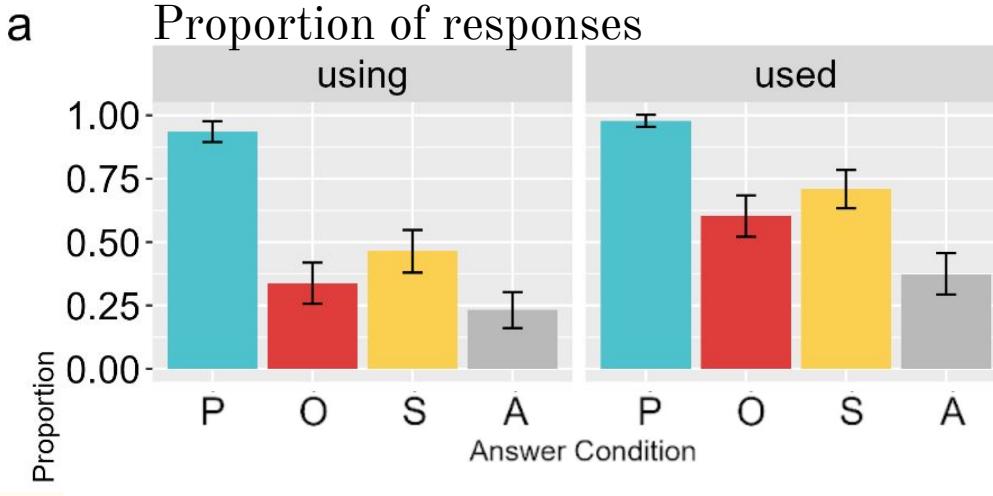
- *with* implies instruments (Rissman & Majid 2019) → let's try verbs!
- *use* vs. *take*
 - ◆ *use* also implies instruments (Rissman & Majid 2019); *take* isn't known to
- Manipulate aspect to change event completion

The chef chopped an onion.

	the chef used	knife (P)
Then,	the chef took	onion (o)
	using	bowl (s)
	taking	oven (A)

Experiment 2: use vs. take

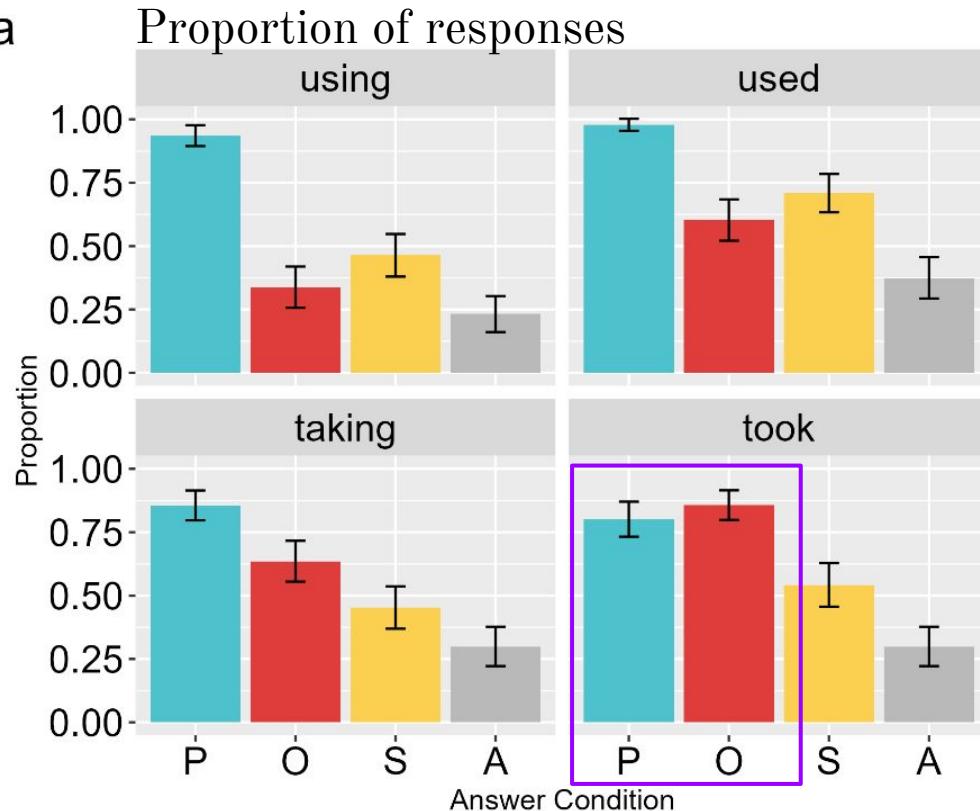
N=96



Experiment 2: use vs. take

N=96

a

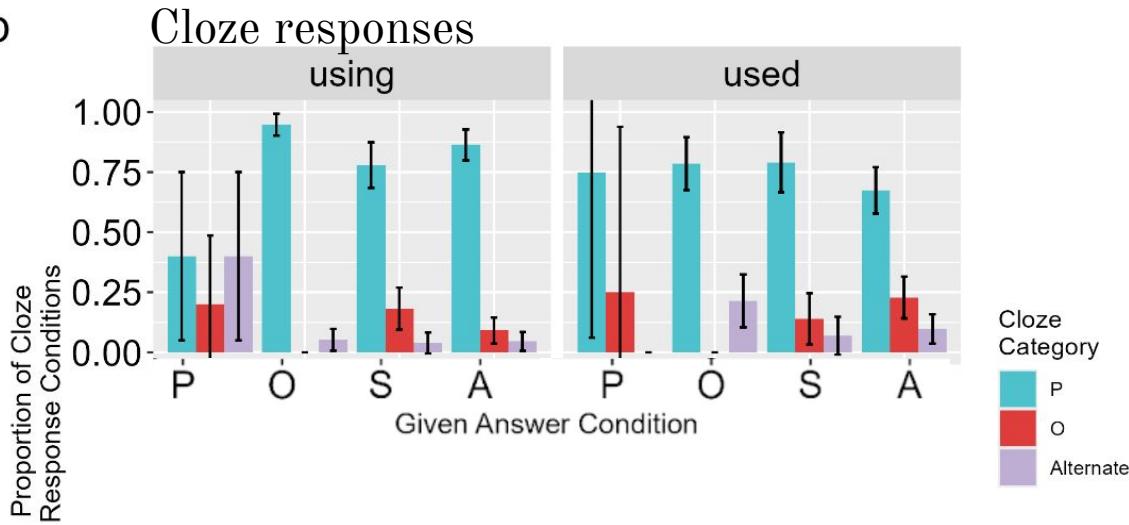


Takeaways:

1. People pick the instrument
2. In *take-past*, they pick the object more - but they **still pick the instrument!**

Experiment 2: *use* vs. *take*

b

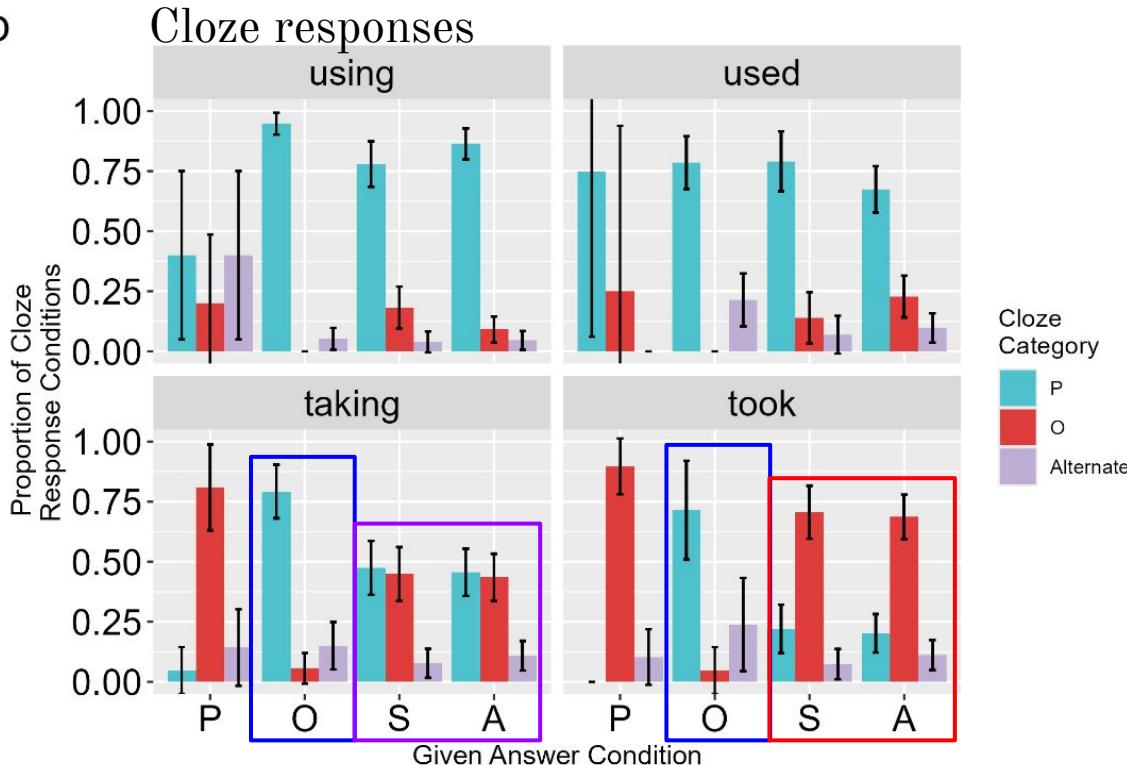


Takeaways:

1. For *use*, people write in the instrument

Experiment 2: use vs. take

b



Takeaways:

1. For *use*, people **write in the instrument**
2. For *take*, people write in the instrument if they discarded the object
3. For *take-prog*, people **write in instrument or object** if they discarded S/A
4. For *take-past*, people **write in the object** if they discarded S/A

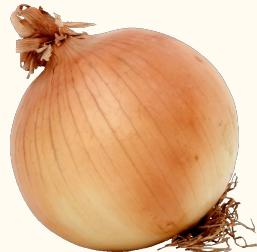
with



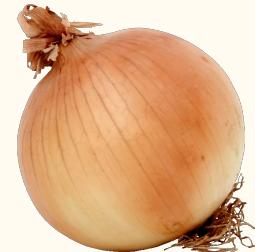
with, using, used



taking



took



3. Discussion

Summary of experimental results

with & use bias for instrument; take does not

Experiment 1: with

- People pick the instrument, or write it in if they discarded something else

Experiment 2: use vs. take

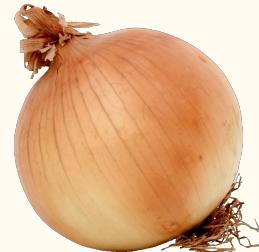
- People pick the instrument for *use* and for *take-prog*; they pick the object a little more for *take-past*
- People write in the instrument for *use*
- People write in the instrument or object for *take-prog*
- People write in the object for *take-past*

Overall: If participants discarded the object, they wrote in the instrument

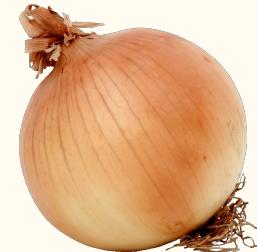
with, using, used



taking



took



Takeaways

1. People represent implicit instruments in their event models
2. Instrument representation resists object priming
3. The Instrument is distinct at least from the Patient

Read the sentence below and select one of the options to continue it by clicking the black box or the word.

The chef chopped an onion. Then, with the same ___



knife

4. Aspect/event completion affects implicit instrument availability



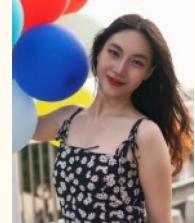
C.PSYD



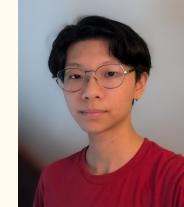
Thank you!



John R. Starr



Yifan Wu



Lucas Li



Marten van Schijndel



Questions?

Fillers

Sentence	Answer	AnsCond	Sentence	Answer	AnsCond
The man saw a dog.	dog	Obj	The lady in the red dress saw a statue.	lady	Sub
The librarian read a book.	librarian	Sub	The patient in the neighboring room read a newspaper.	newspaper	Obj
The boy threw a ball.	ball	Obj	The camper on the sinking raft threw a rope.	camper	Sub
The husband tasted a wine.	husband	Sub	The hunter in the smelly van tasted a cheese.	cheese	Obj
The student recited a poem.	poem	Obj	The ghost in the old mansion recited a speech.	ghost	Sub
The child heard a shout.	child	Sub	The bartender in the shaky elevator heard a siren.	siren	Obj
The doctor felt a lump.	lump	Obj	The biker near the aggressive hive felt a sting.	biker	Sub
The botanist smelled a flower.	botanist	Sub	The clerk between the heavy boxes smelled an odor.	odor	Obj
The professor remembered a phrase.	phrase	Obj	The researcher at the messy desk remembered a passage.	researcher	Sub
The girl grabbed a frog.	girl	Sub	The musician under the bright stage grabbed a stand.	stand	Obj
The farmer held a pitchfork.	pitchfork	Obj	The rancher on the wooden fence held a bell.	rancher	Sub
The psychic sensed a spirit.	psychic	Sub	The zookeeper behind the shaky cage sensed a trap.	trap	Obj

Stimuli Pt 1

Sentence	Answers	Sentence	Answers	Sentence	Answers
The chef chopped an onion.	knife	The lawyer signed a contract.	pen	The waiter carried a meal.	tray
The chef chopped an onion.	bowl	The lawyer signed a contract.	desk	The waiter carried a meal.	glass
The chef chopped an onion.	oven	The lawyer signed a contract.	book	The waiter carried a meal.	chair
The chef chopped an onion.	onion	The lawyer signed a contract.	contract	The waiter carried a meal.	meal
The plumber tightened a bolt.	wrench	The jeweler fixed a watch.	gear	The soldier shot a target.	rifle
The plumber tightened a bolt.	washer	The jeweler fixed a watch.	link	The soldier shot a target.	clip
The plumber tightened a bolt.	bathtub	The jeweler fixed a watch.	gem	The soldier shot a target.	bench
The plumber tightened a bolt.	bolt	The jeweler fixed a watch.	watch	The soldier shot a target.	target
The gardener dug a hole.	shovel	The tailor sewed a shirt.	thread	The fisherman caught a fish.	rod
The gardener dug a hole.	glove	The tailor sewed a shirt.	thimble	The fisherman caught a fish.	lure
The gardener dug a hole.	hose	The tailor sewed a shirt.	ruler	The fisherman caught a fish.	boat
The gardener dug a hole.	hole	The tailor sewed a shirt.	shirt	The fisherman caught a fish.	fish
The real estate agent locked a door.	key	The housekeeper dried a plate.	towel	The woman walked a dog.	leash
The real estate agent locked a door.	porch	The housekeeper dried a plate.	cupboard	The woman walked a dog.	shoe
The real estate agent locked a door.	mat	The housekeeper dried a plate.	cup	The woman walked a dog.	hat
The real estate agent locked a door.	door	The housekeeper dried a plate.	plate	The woman walked a dog.	dog

Stimuli Pt 2

Sentence	Answers	Sentence	Answers	Sentence	Answers
The assistant typed a transcript.	keyboard	The barista brewed a coffee.	machine	The landscaper pruned a hedge.	trimmer
The assistant typed a transcript.	recording	The barista brewed a coffee.	mug	The landscaper pruned a hedge.	ladder
The assistant typed a transcript.	paperclip	The barista brewed a coffee.	pastry	The landscaper pruned a hedge.	wheelbarrow
The assistant typed a transcript.	transcript	The barista brewed a coffee.	coffee	The landscaper pruned a hedge.	hedge
The mom lit a birthday candle.	match	The potter made a vase.	clay	The worker mined a diamond.	pickaxe
The mom lit a birthday candle.	cake	The potter made a vase.	paint	The worker mined a diamond.	cart
The mom lit a birthday candle.	knife	The potter made a vase.	hammer	The worker mined a diamond.	helmet
The mom lit a birthday candle.	candle	The potter made a vase.	vase	The worker mined a diamond.	diamond
The nurse gave a vaccine.	needle	The artist painted a mural.	brush	The cleaner washed a window.	squeegee
The nurse gave a vaccine.	flu	The artist painted a mural.	palette	The cleaner washed a window.	bucket
The nurse gave a vaccine.	stethoscope	The artist painted a mural.	easel	The cleaner washed a window.	door
The nurse gave a vaccine.	vaccine	The artist painted a mural.	mural	The cleaner washed a window.	window
The teacher graded an exam.	answer key	The janitor swept a floor.	broom	The carpenter measured a plank.	tape measure
The teacher graded an exam.	marker	The janitor swept a floor.	dustpan	The carpenter measured a plank.	pencil
The teacher graded an exam.	whiteboard	The janitor swept a floor.	mop	The carpenter measured a plank.	saw
The teacher graded an exam.	exam	The janitor swept a floor.	floor	The carpenter measured a plank.	plank

Future plans

Question 1: How do we know people are *really* tracking the instrument?

Question 2: How can we disambiguate the Instrument from the Agent?

Future plans

Question 1: How do we know people are *really* tracking the instrument?

New task: SPR

The chef chopped onions. Then, with [the same, a different] knife, ...



- If “knife” is not surprising, people won’t slow down

Future plans

Question 1: How do we know people are *really* tracking the instrument?

New task: SPR

The chef chopped onions. Then, with [the same, a different] knife, ...



- If “knife” is not surprising, people won’t slow down

The chef chopped **metal**. Then, with [the same, a different] knife, ...

- If people are representing a knife *and* tracking changes to it, they'll slow down after "the same"



Challenges: Damaging all the instruments used in the stimuli