The utility of vagueness

an empirical test of the cost reduction hypothesis in a reference task

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4. Interim summary (where do we stand now?)
5. Experiment three (addresses problems with E1 & E2)
6. Interpretation (what does it all mean?)

A definition of vagueness

Vagueness can be defined as the existence of borderline cases

- e.g., *tall*

Why study the effects of vagueness?

2 main reasons

1. Game theory needs an update
   - Game-theory predicts that precision always 'wins'
   - But we use vague language a lot
   - There must be some utility of vagueness that the models don't account for

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1. Game theory needs an update
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   - There must be some utility of vagueness that the models don't account for
2. NLG systems need help
   - Practical NLG systems must decide between generating vague and precise terms (e.g., Portet et al., 2009)
   - These decisions are (almost) guesswork currently
   - Data from human comprehenders would provide a better basis for these decisions
   - There isn't much data like this at the moment

Example NLG decision

Which of these is better?

1. 'Winds southwest 15 to 25 knots **becoming southeast 15** later this evening'
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- It depends quite a lot what 'better' means: speed, accuracy, recall, comprehension, effect on affect ...

Vagueness in reference

- Vagueness in reference is highly context-dependent
- Potential for vagueness is not necessarily realised

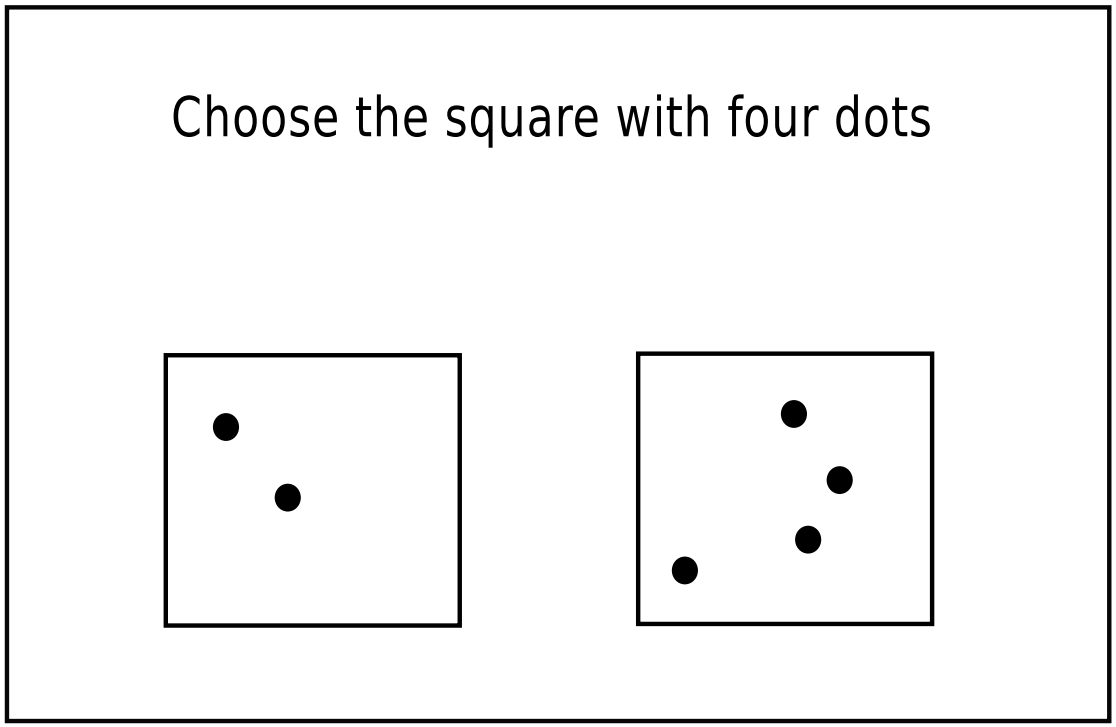
Pinning utility down

- Utility in co-operative situations is our focus
- Non-co-operative situations where vagueness has utility
  - Sales, marketing, advertising ✗
  - Politics, campaigning ✗
  - Persuasion, behaviour modification ✗
- Co-operative situations where vagueness may have utility
  - Local vagueness ✗
  - Information reduction ✗
  - Reducing cognitive load on the comprehender ✓

The cost reduction hypothesis

"For the listener, information which is too specific may require more effort to analyze" (Lipman, 2009)

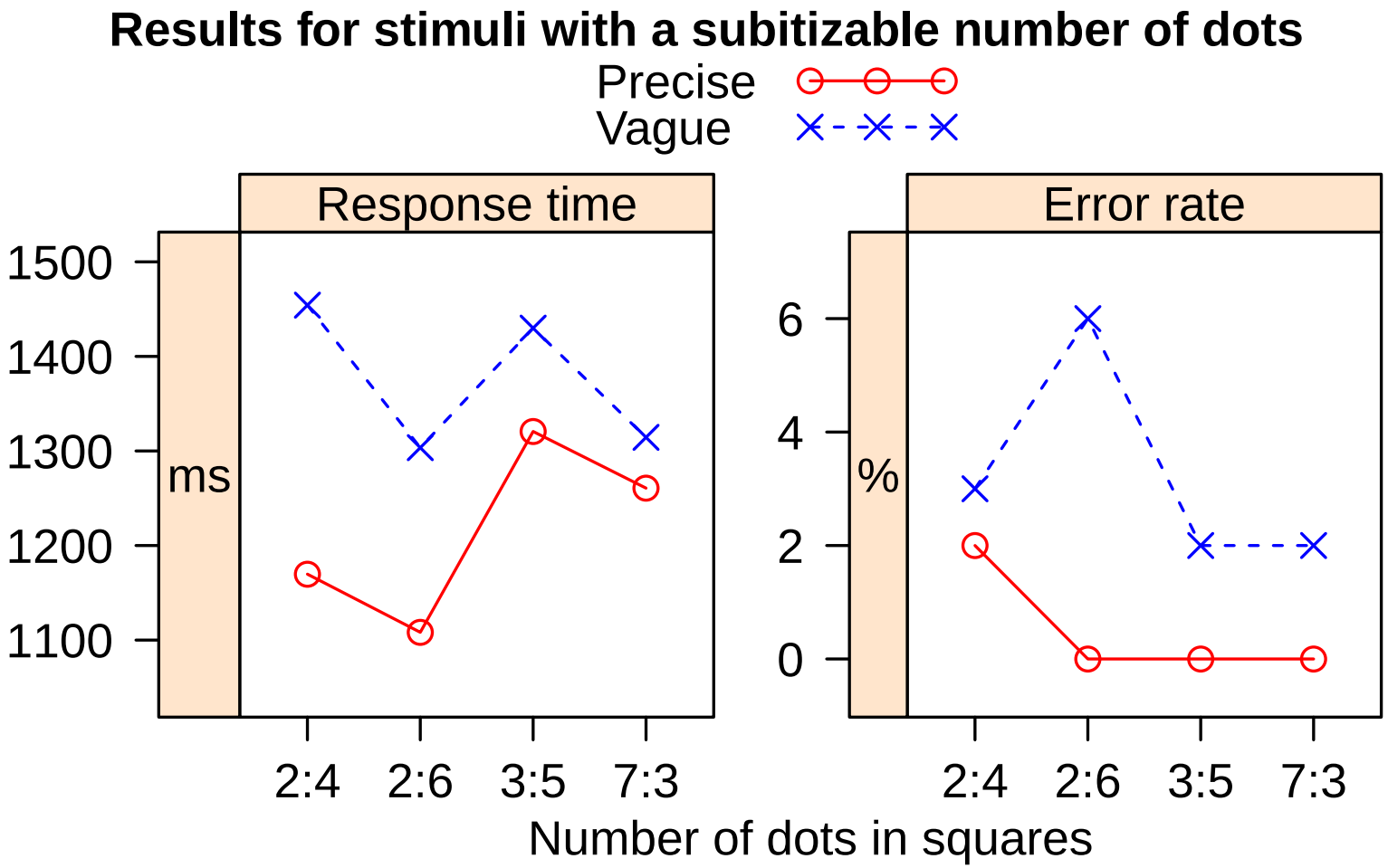
Experiment one



Experiment one

- Pilot experiment
- H_0: *No difference between vague and precise*
- H_1: *Some difference between vague and precise*
  . . . V better than P?
- Method: forced choice
- DVs: RT, errors
- IVs: Vagueness (Vague, Precise)
- Number combinations: $\{2, 4\}$, $\{2, 6\}$, $\{3, 5\}$, $\{5, 9\}$, $\{6, 8\}$, $\{7, 3\}$, $\{7, 9\}$, $\{8, 4\}$

Results, experiment one



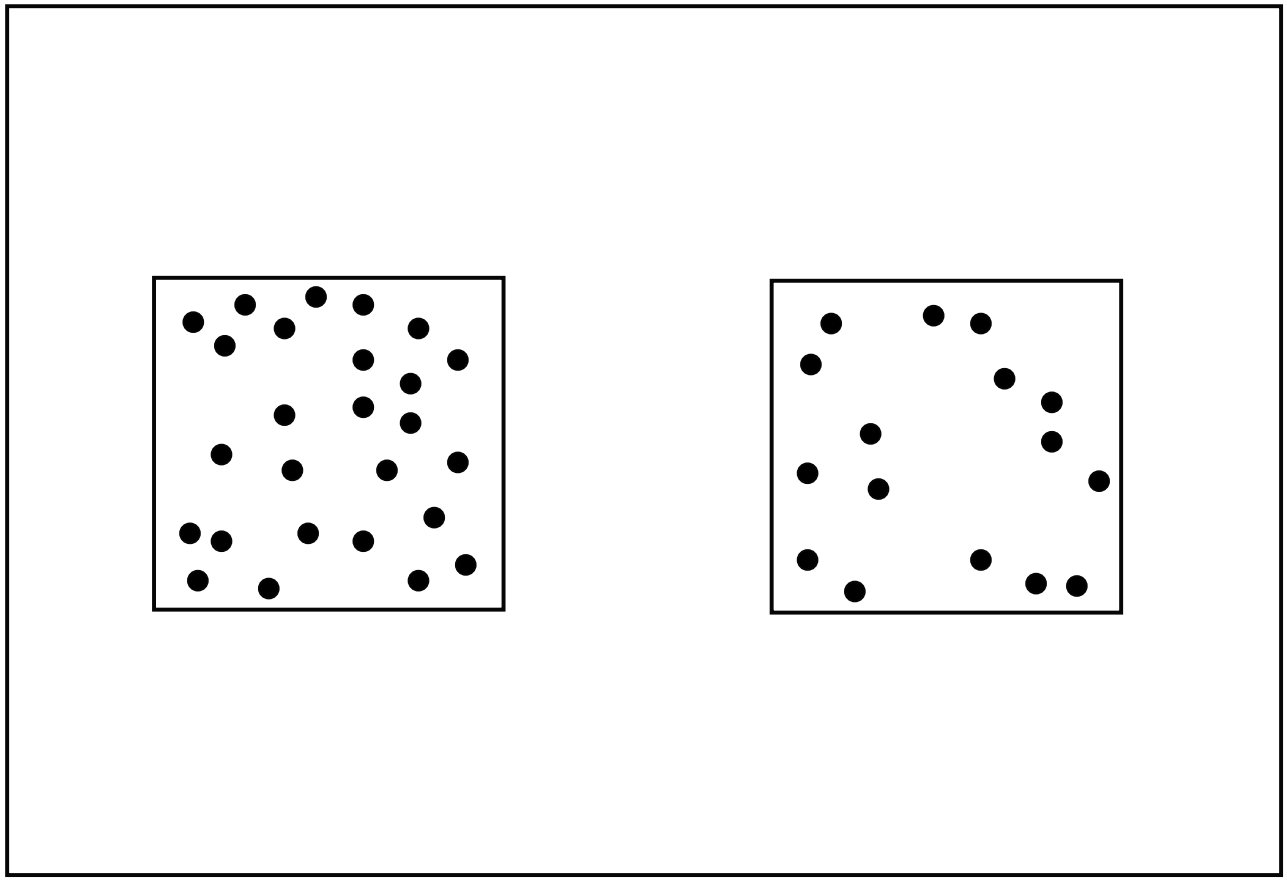
Experiment two

- Try larger numbers (not subitizable)
- H_0: *No difference between vague and precise*
- H_1: *Vagueness helps when the numbers are bigger, and when the difference between the numbers is greater*
- Number combinations: $\{5, 25\}$ $\{10, 25\}$ $\{15, 25\}$ $\{20, 25\}$ $\{30, 25\}$ $\{35, 25\}$ $\{40, 25\}$

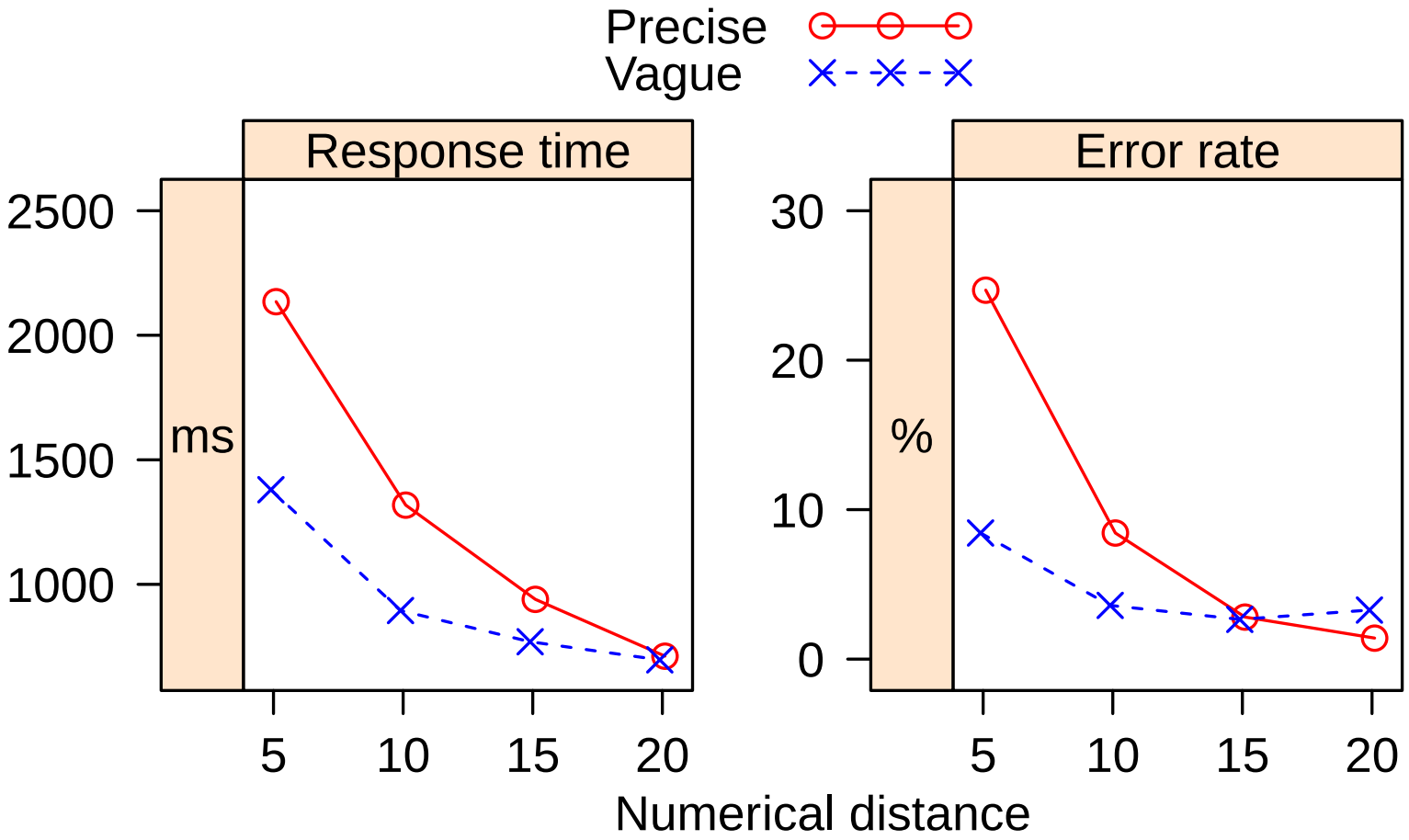
Instruction first

Choose the square with many dots

Stimulus next



Results, experiment two



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- Diminishing returns for vagueness as gap size grows very large (expt 2)

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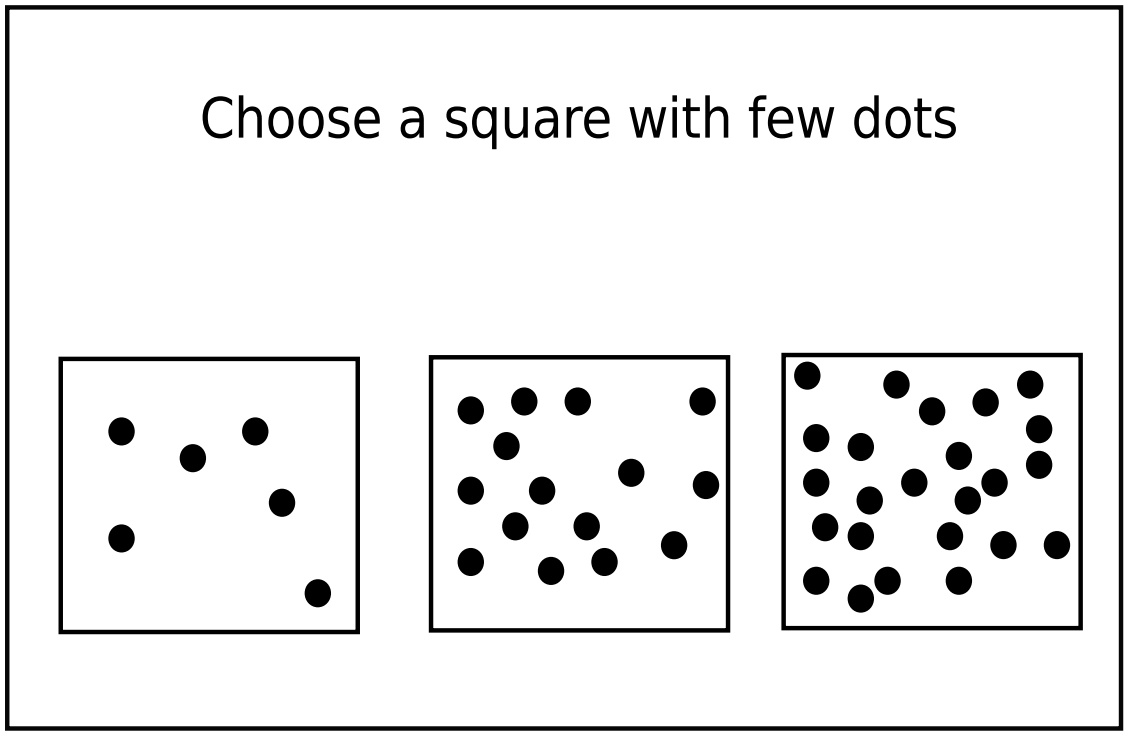
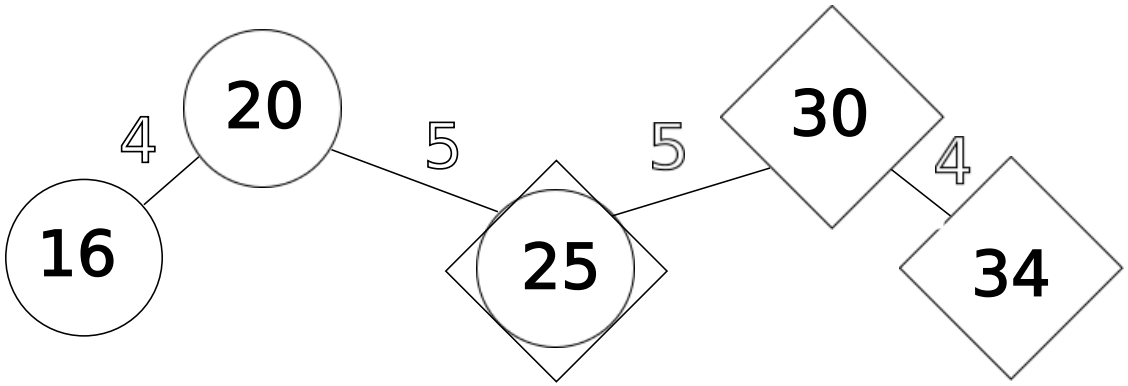
	Vague	Precise
Numerical	{about 20, about 30}	{16, 34}
Verbal	{few, many}	{fewest, most}

Stimulus, experiment three



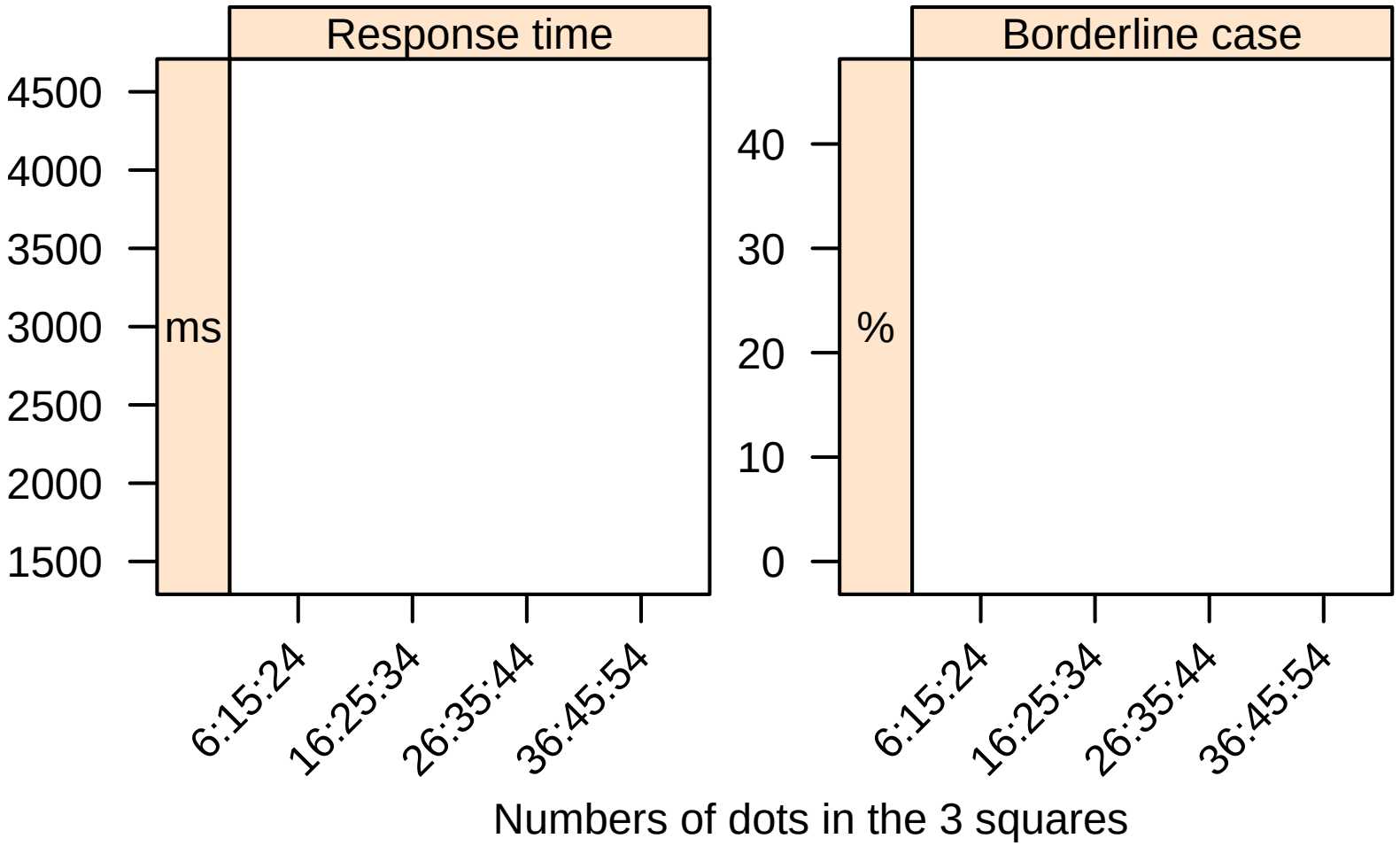
Operationalising borderline cases



Number combinations: $\{6, 15, 24\}$, $\{16, 25, 34\}$, $\{26, 35, 44\}$, $\{36, 45, 54\}$

- Numerical-precise: Choose the square with 16 dots
- Numerical-vague: Choose a square with about 20 dots
- Verbal-precise: Choose the square with fewest dots
- Verbal-vague: Choose a square with few dots

Experiment three (more squares & use indefinites)



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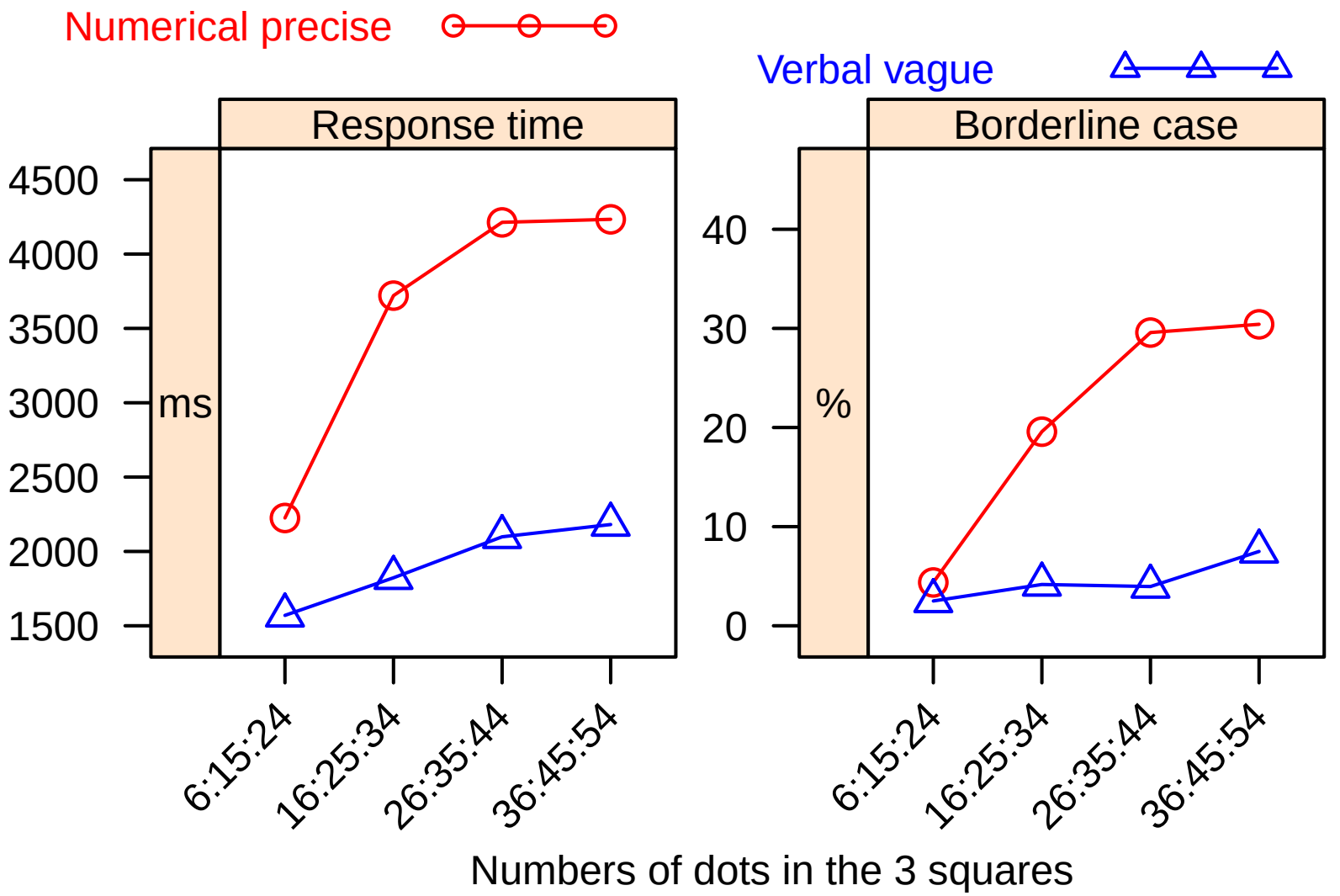

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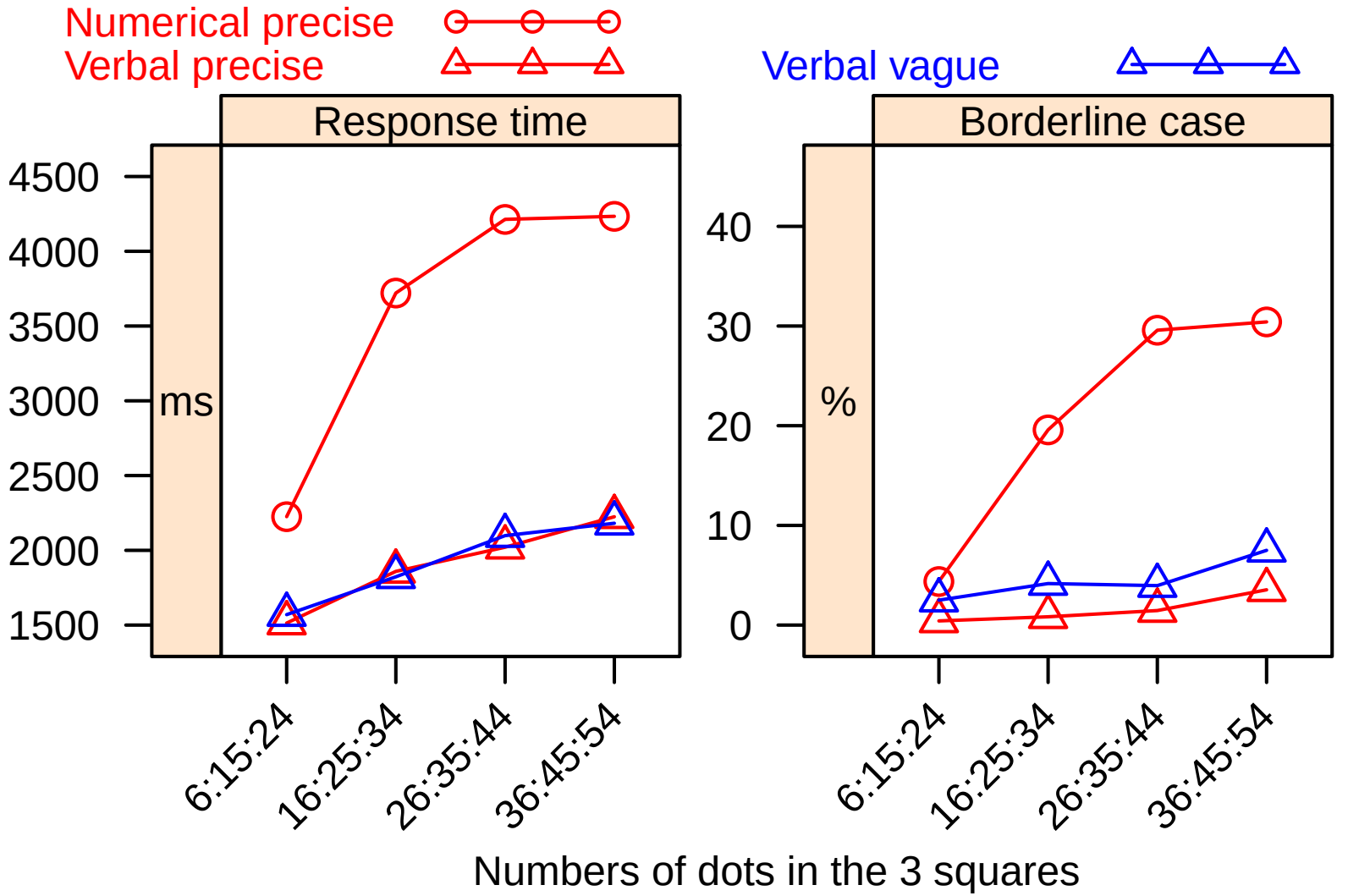

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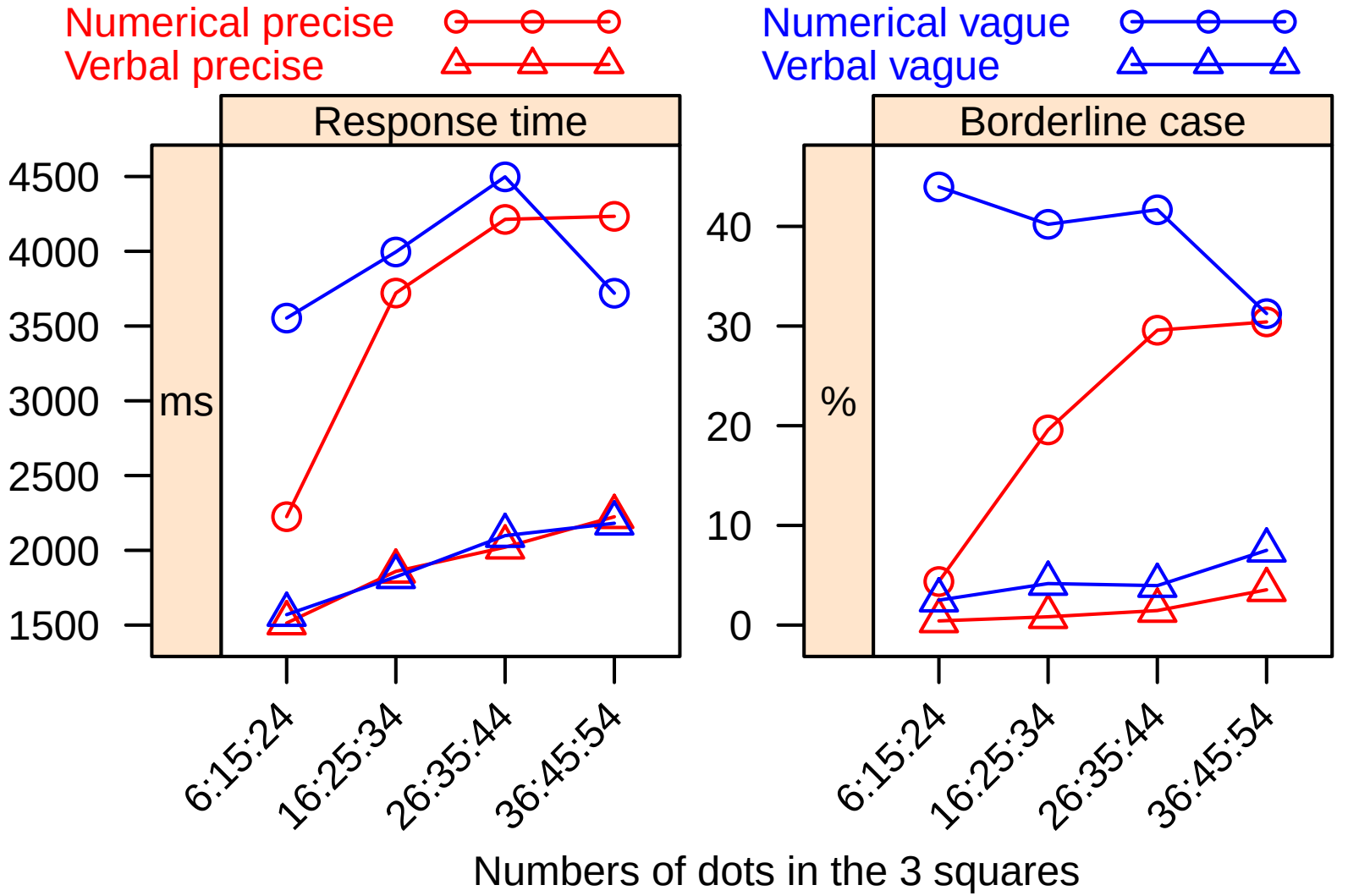

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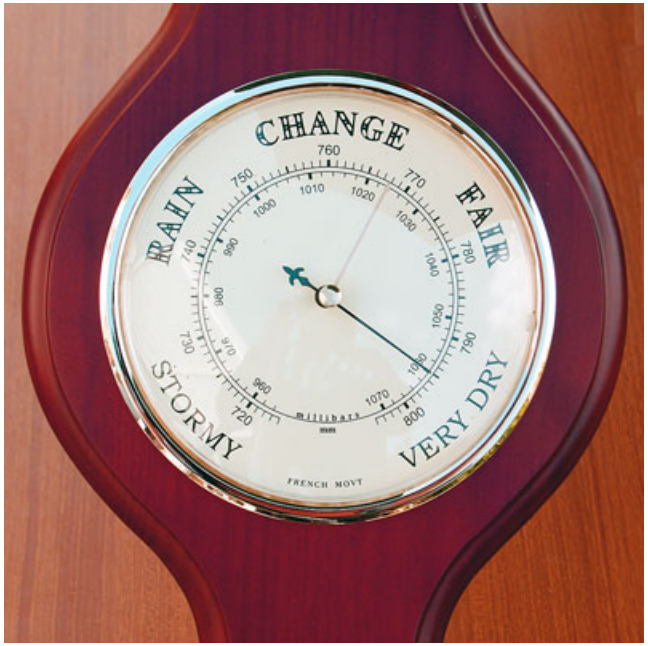
Lessons for NLG

- Data from human comprehenders can help NLG systems make better decisions
- Vagueness is really hard to pin down experimentally
- Using vague terms can make a big difference for cognitive load on comprehenders

Take home message



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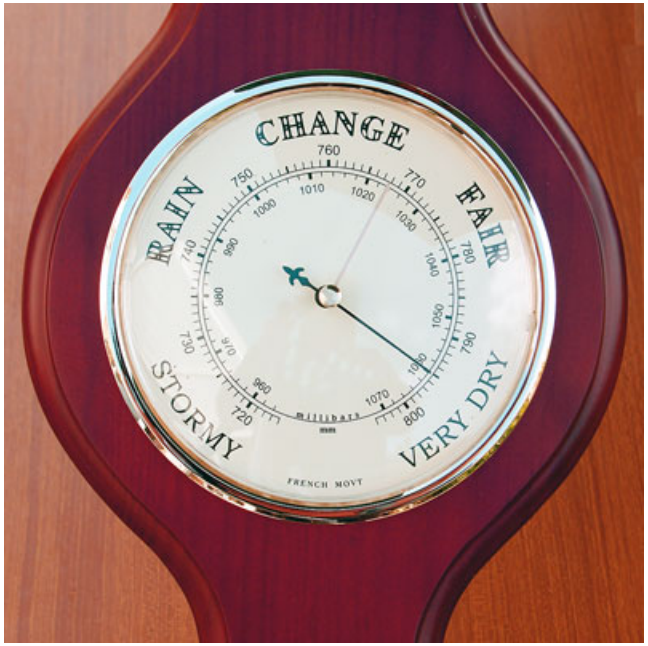

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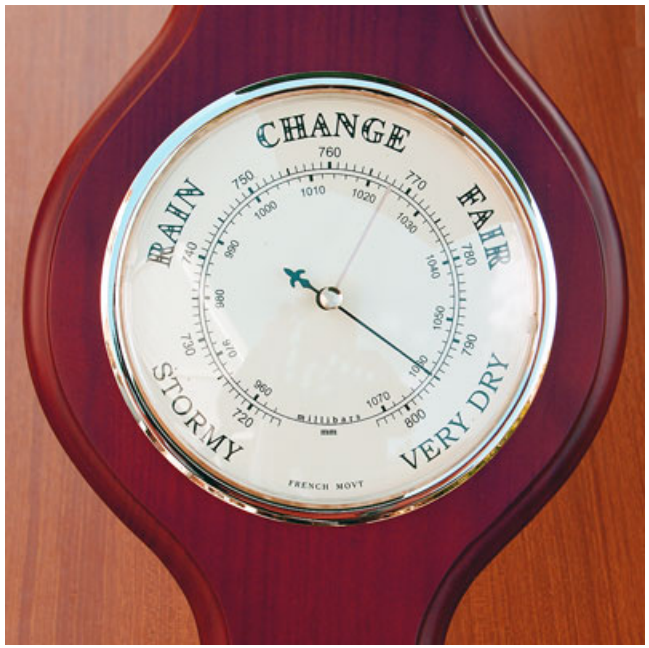

Thank you for listening. 5 mins for Q & A

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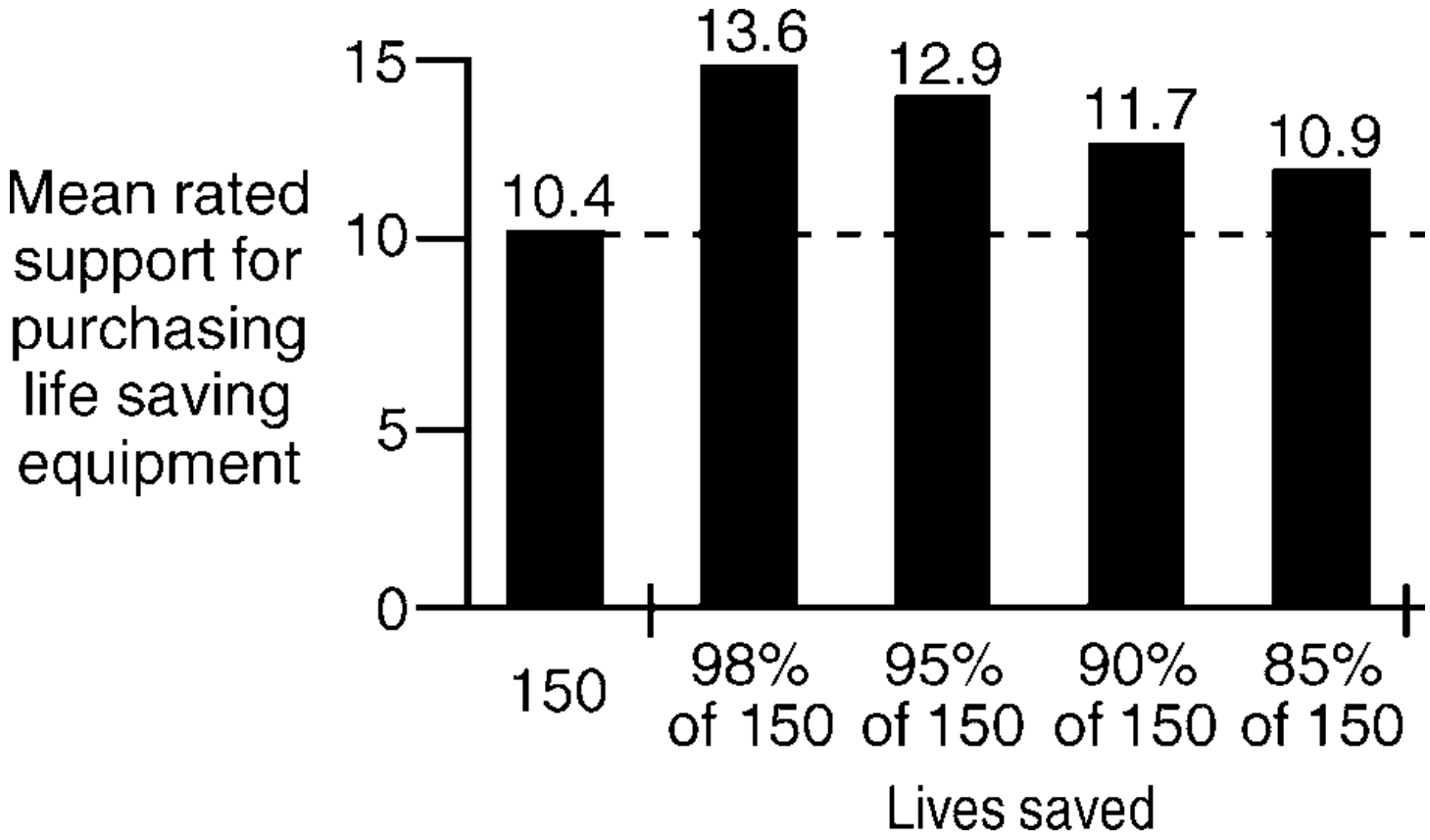

Fig. 4. Saving a percentage of 150 lives received higher support than saving 150 lives (Slovic *et al.*, 2002).

References

Lipman, B. L. (2009). *Why is Language Vague?* (unpublished draft manuscript retrieved 12 April 2011 from `http://people.bu.edu/blipman/Papers/vague5.pdf`)

Portet, F., Reiter, E., Gatt, A., Hunter, J., Sripada, S., Freer, Y., et al. (2009). Automatic generation of textual summaries from neonatal intensive care data. *Artificial Intelligence*, *173*(7-8), 789–816.