



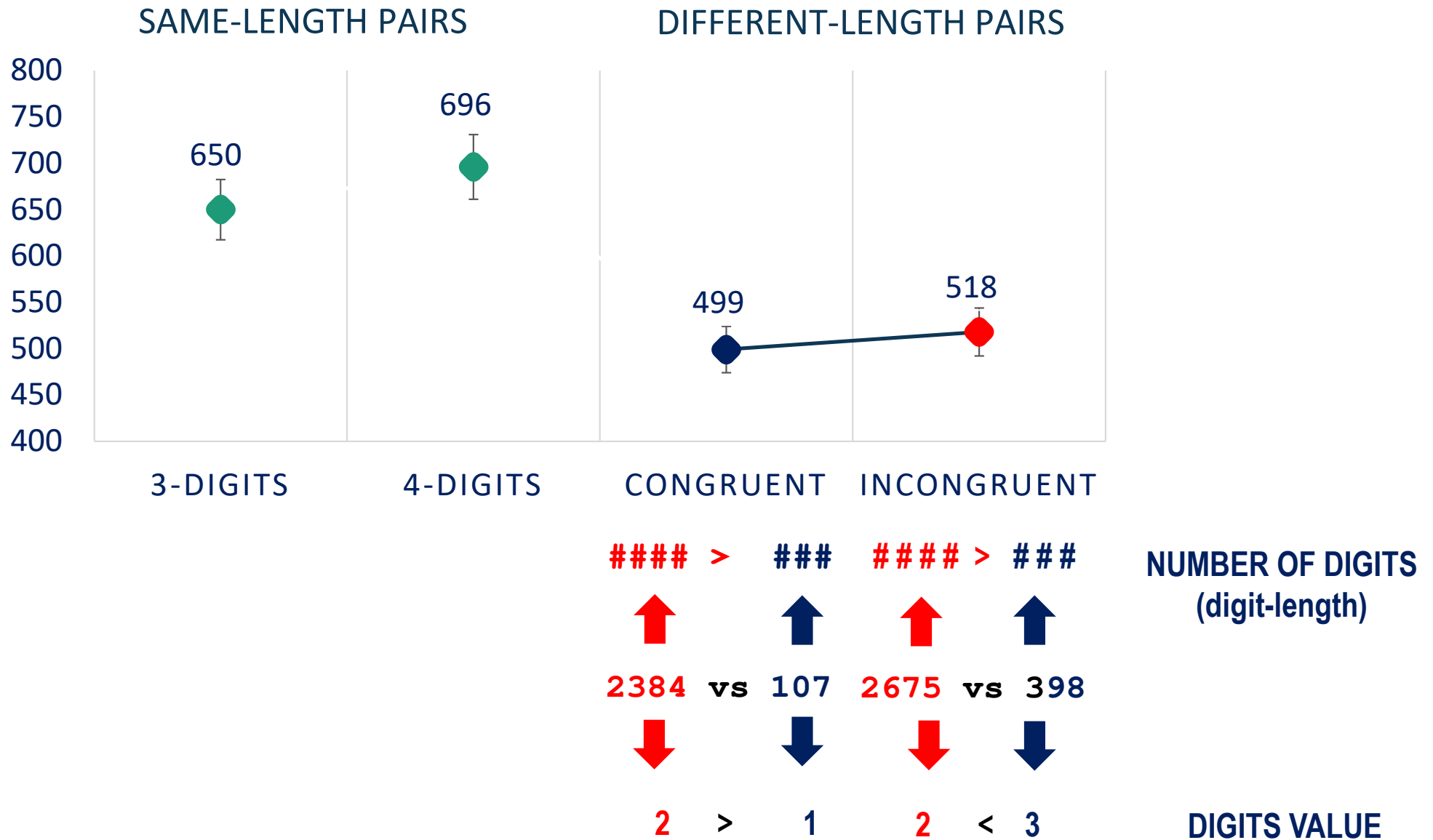
**Do we compute the exact number of digits
in the string when comparing different-
length numbers?**

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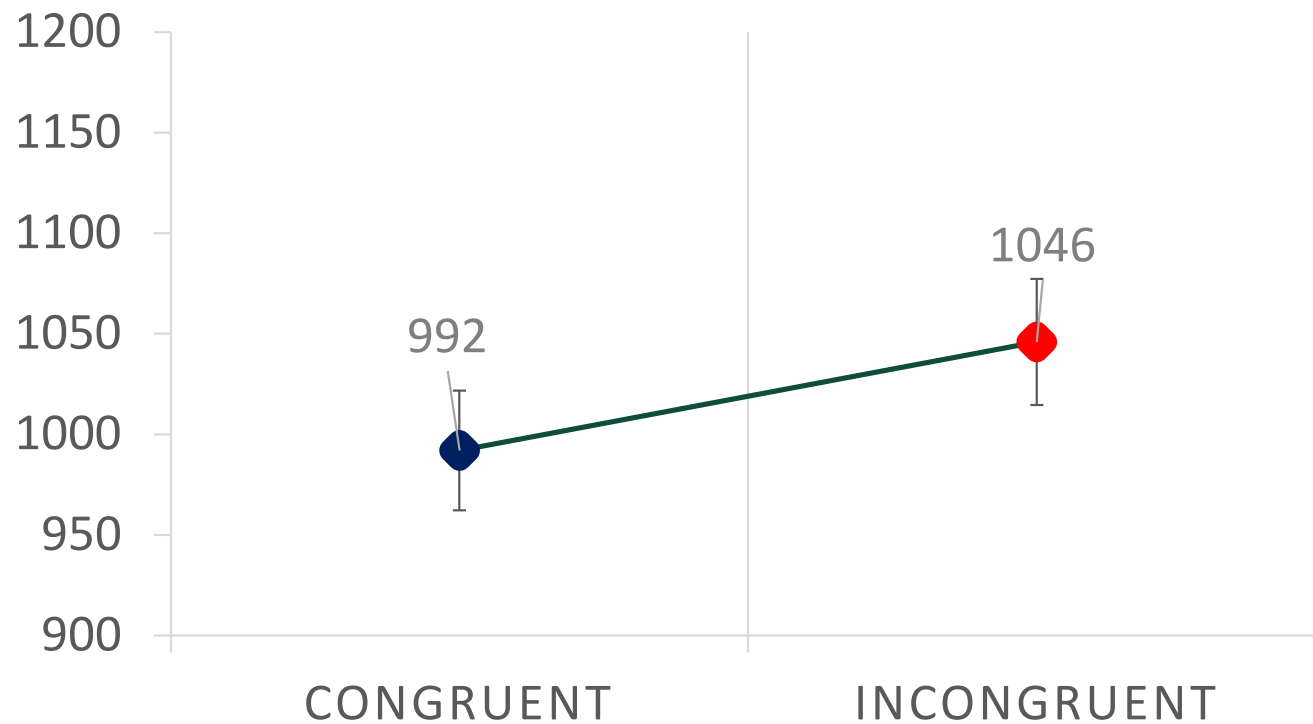
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1. Introduction / Comparing numbers with different length



1. Introduction / Automatic processing of digit-length:



> ###
↑ ↑
2384 vs 107
↓ ↓
2 > 1

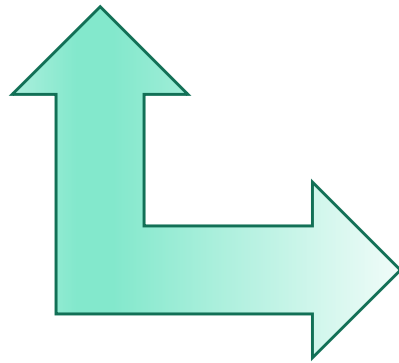
> ###
↑ ↑
2675 vs 398
↓ ↓
2 < 3

NUMBER OF DIGITS
(digit-length)

DIGITS VALUE

1. Introduction / Aim of the research

Perceptually Larger



>



2384 vs 107

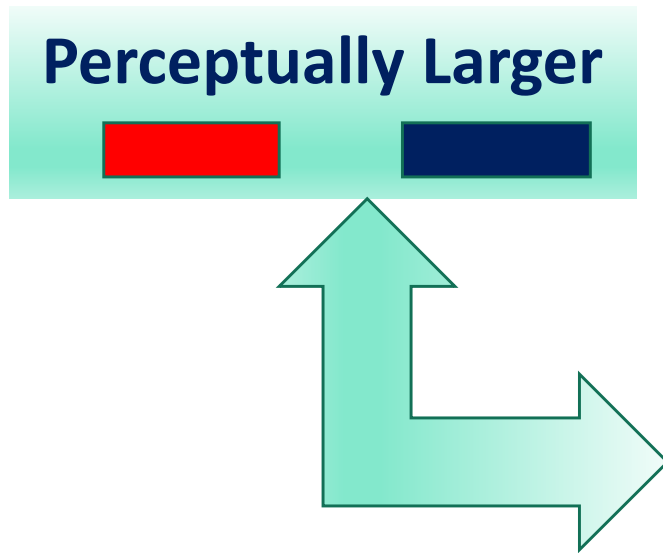
NUMBER OF DIGITS
(digit-length)



Precise:

4 vs 3 digits

1. Introduction / Obscuring perceptual differences



> ###M
↑ ↑
2384 vs 107M

NUMBER OF DIGITS
(digit-length)



Precise:
4 vs 3 digits

2. Study 1 / Leftmost digit / digit-length congruity effect

Experiment 1: Task: leftmost number comparison task

No letter: 2384–107 vs 2641–387

Letter: 2384–107M vs 2641–387M

Hypothesis I: if we use a **perceptual shortcut**, then the leftmost digit/ length congruity effect would be absent when perceptual differences are “obscured” with a letter.

Hypothesis II: if we compute **the exact number** of digits, then congruity effects should be found also in pairs with letters.

2. Study 1 / Leftmost digit comparison task

Participants: 64 undergraduate students. Age: 19-31 years

Materials:

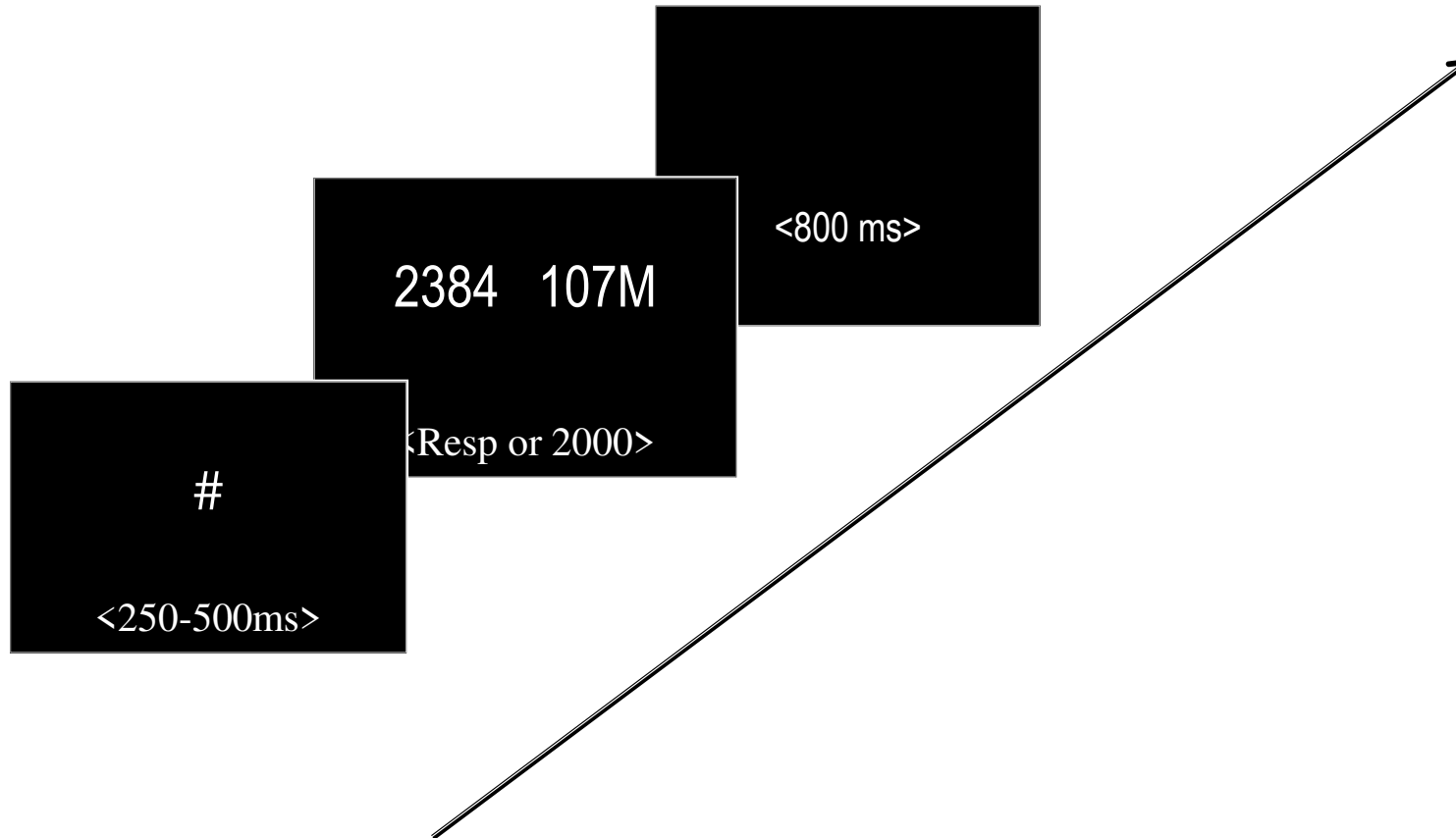
Different-length number pairs				
	Congruent		Incongruent	
Letter	2384	107L	387L	2641
	(2277)		(2277)	
Absent	2384	107	387	2641
	(2277)		(2277)	
Same-length number pairs				
	3-digit length		4-digit-length	
Letter	275H	134M	2147	3659*
	(141)		(1512)	
Absent	275	134	2147	3659
	(141)		(1512)	

Different-length trials: 24 pairs × 2 congruity conditions × 2 letter conditions × 2 sides: **192 pairs**

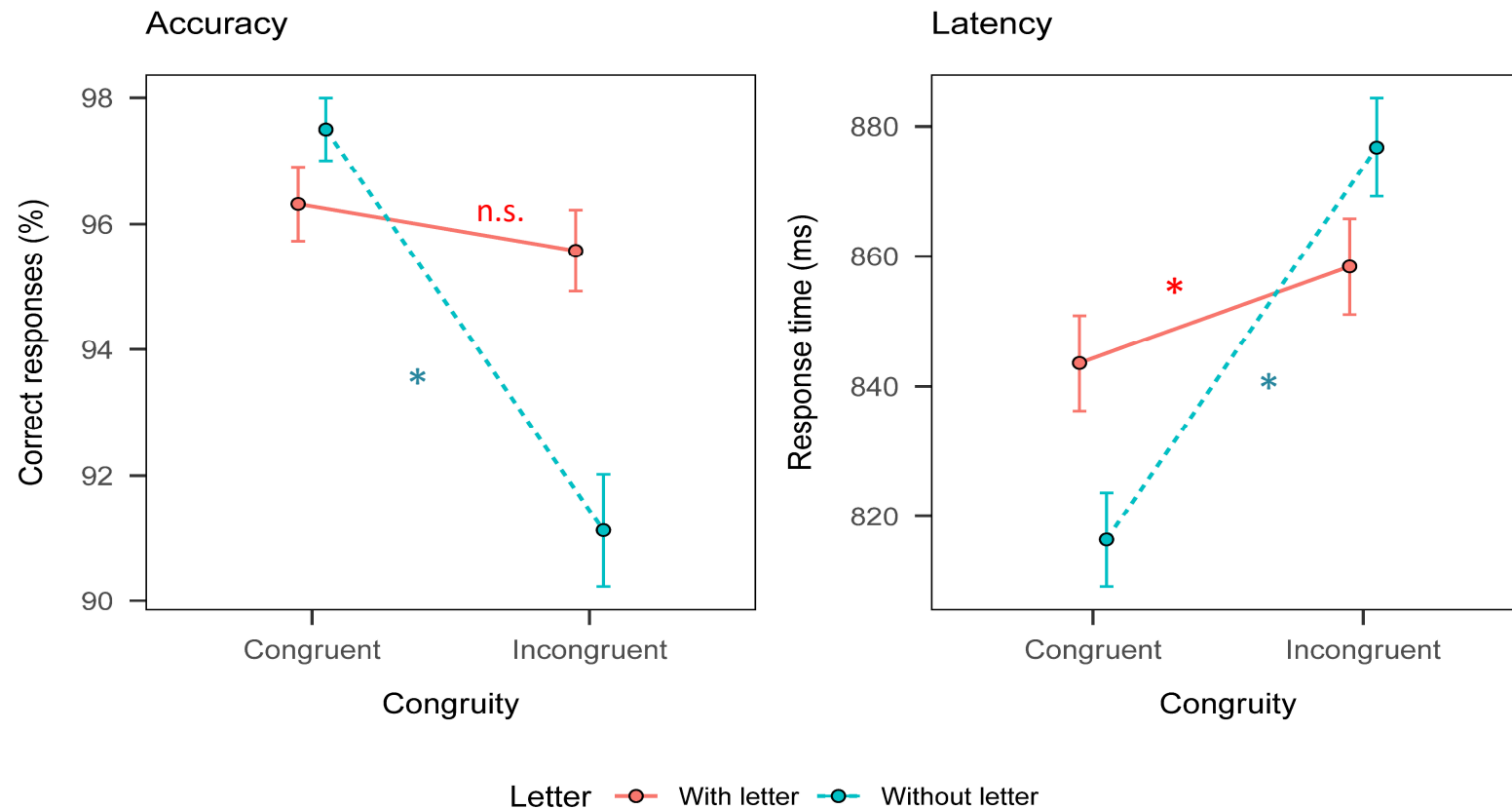
Same-length trials: 24 pairs × 2 length conditions × 2 letter conditions × 2 sides: 192pairs



2. Study 1 / Leftmost digit comparison task



2. Study 1 / Results



- Congruity x letter in Accuracy and RTs.
- RTs: bigger effect in the no-letter condition, but significant effects of congruity in both conditions.

2. Study 1 / Discussion

The existence of a strong length effect without letters together with a soft congruity effect with letters suggests:

- a) There is an exact computation of the digits involved
- b) This effect adds^{*} to the effect of the perceptual size when it is not obscured

Concern: Do focusing in the leftmost digits (discrete elements) facilitates processing the exact number of digits?

3. Study 2 / Leftmost digit / length / Size congruity effect

Experiment 2: Task: Physical size comparison (numerical Stroop)

Different-Length pairs		Size/leftmost digit	Size/digit length
2384	107M	Congruent	Congruent
2384	107M	Incongruent	Incongruent
2641	387M	Congruent	Incongruent
2641	387M	Incongruent	Congruent

Hypothesis I: if we automatically compute the exact number of digits, a size-digit length congruity effect should be observed.

Hypothesis II: if we automatically compute leftmost digit, a size-digit length congruity effect should be observed.

3. Study 2 / Leftmost digit / length / Size congruity effect

Participants: 40 students. Age: 19-29

Materials:

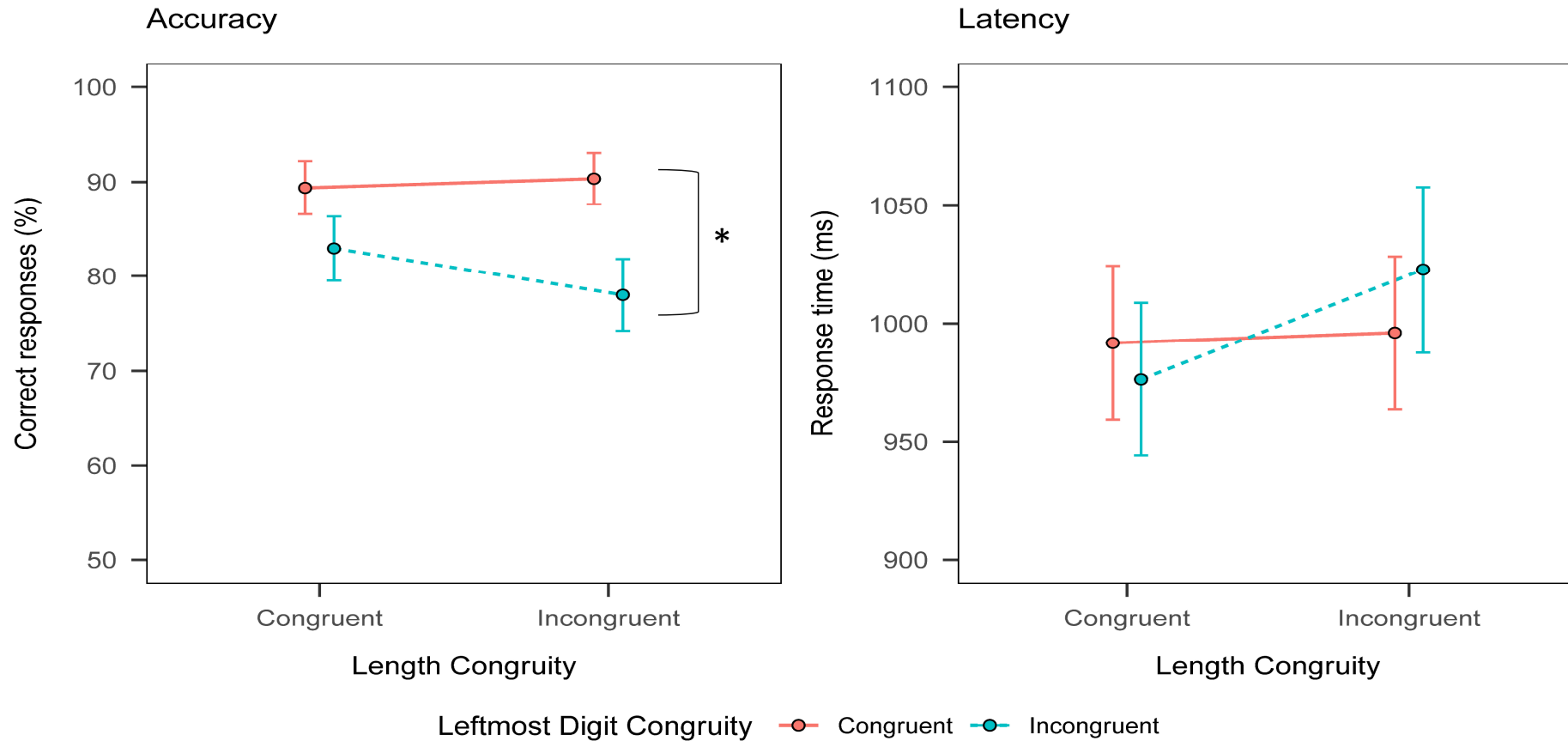
Different-Length pairs		Size/leftmost digit	Size/digit length	Same-Length pairs		Size/leftmost digit	Size/digit length
2384	107M	Congruent	Congruent	627M	514M	congruen	neutrum
2384	107M	Incongruent	Incongruent	627M	514M	Incongruent	neutrum
2641	387M	Congruent	Incongruent	5678	4132	congruen	neutrum
2641	387M	Incongruent	Congruent	4132	5678	Incongruent	neutrum

Different-length trials: 24 pairs × 2 length / size congruity × 2 leftmost digit / size congruity: **192 pairs**

Same-length trials: 24 pairs × 2 length × 2 leftmost digit / size congruity × 2 sides: 192 pairs



3. Study 2 / Results



- Accuracy:
 - a) Leftmost digit / Size Congruity effect: better responses in leftmost digit / Size congruent pairs.
 - b) No effect of Length / Size congruity.
- Rts: non-significant effects

3. Study 2 / Discussion

- The **existence of a leftmost-digit / size congruity effect** indicates an automatized processing of leftmost digits quantity, extending previous evidence in the comparison of different-length numbers.
- The absence of **digit length / size congruity effect** indicates that the exact number of items is not processed when participants are required to focus in a physical dimension (size).

4. Conclusions

Do we compute the exact number of digits in the string when comparing different-length numbers?

Study 1: Both perceptual differences and exact differences in the number of digits seem to be processed.

Study 2: The processing of the precise number of digits in the string seems to be task dependent, so it is not completely automatic.

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Thanks you for your attention