

Does real-time inferencing draw on the same resources as real-time perspective taking? An individual differences approach.

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Inferencing and perspective-taking are both essential elements of understanding natural language, and both involve using or generating information beyond “what is said”. Further, both are thought to draw on certain domain-general aspects of cognition [1,2,3,4]. But to what degree do inferencing and perspective taking overlap? The current study explores this question using an individual differences approach. **Experiments 1 and 2** were conducted to validate materials and extend past findings. **Experiment 1** (N=36) measured bridging inferences during self-paced reading. Short stories contained target sentences that were either congruent or incongruent with inferences that could be drawn from corresponding preceding sentences. We also varied the number of intervening lines between the preceding sentence and target sentence (0 or 3). Results replicated findings from studies using similar materials [5] showing that readers readily make bridging inferences during reading (longer average RTs for incongruent target sentences; this was stable regardless of the amount of intervening text). **Experiment 2** (N=72) measured linguistic perspective-taking in self-paced reading using a task in which a story character interprets a written message as either sarcastic or sincere [6]. Critically, the “correct” interpretation hinges on whether the reader effectively monitors characters’ knowledge states as conveyed by earlier text. Results showed perspective taking was effortful (relative to a baseline condition where perspective information was not required) but occurred spontaneously during reading (longer average RTs for perspective-incongruent vs. perspective-congruent). Interestingly, these results partly contradicted previous work suggesting readers do not engage in spontaneous perspective taking with these kinds of narratives [6,7]. A subset of the materials for each task was then used in a large-scale pre-registered correlational study (**Experiment 3**). Here, participants (N=200) read a series of intermixed stories testing either bridging inferencing or perspective taking. We first confirmed that the results for each of these subtasks replicated the patterns found in Expts 1&2. Next, for each subtask, we calculated a single composite measure per participant ($\text{incongruentRT}_{\text{avg}} - \text{congruentRT}_{\text{avg}}$). We then confirmed that these scores showed sufficient variance to warrant a correlational analysis. Intriguingly, the analysis provided no evidence for a relationship between inference and perspective-taking ($r = -0.06$, $p = 0.44$), despite the considerable experimental power, suggesting the mechanisms underlying these two abilities are comparatively distinct. We relate the outcomes to a growing literature that reconsiders traditional ideas about how domain-general cognitive systems support language.

References. [1] Cain et al. 2004, *Journal of Educational Psychology* [2] Daneman & Merikle, 1996. *Psychonomic Bulletin & Review*. [3] Brown-Schmidt 2009, *Psychonomic Bulletin & Review*. [4] Nilsen & Graham, 2009. *Cognitive Psychology*. [5] Singer et al.1992, *Memory & Cognition*, [6] Weingartner & Klin, 2005. *Memory & Cognition*. [7] Keysar, 1994. *Cognitive Psychology*. [8] Ferreira & Clifton, 1986. *Journal of Memory & Language*.

Example sentences (NOTE: these sentences occur within passages of 12 lines).

i. Bridging Inference (used in Expt 1 and Expt 3)

Antecedent	Carol had forgotten about the bread she was baking in the oven. (Inference → oven is still on; bread is still inside)
Target (congruent)	But, coming downstairs, Carol then saw smoke coming from the oven.
Target (incongruent)	Coming downstairs, Carol decided she had better heat up the oven.

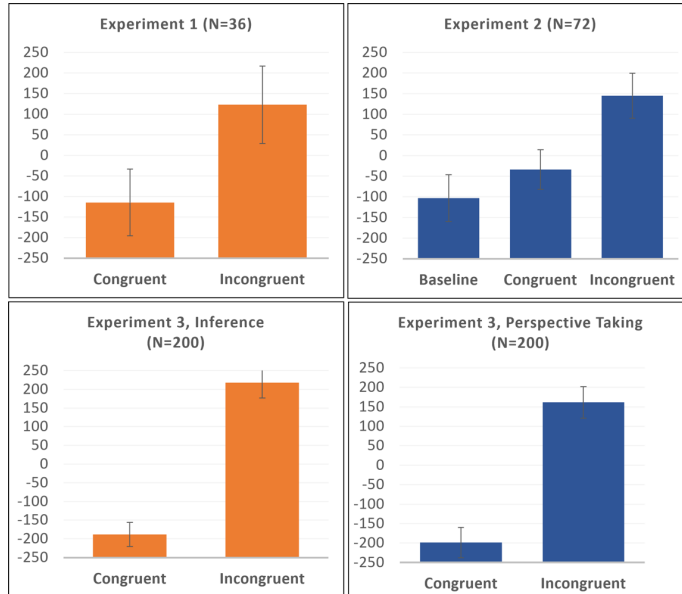
ii. Perspective Taking Task (used in Expt 2 and Expt3)

Background ...Susan had a bad experience watching Kurt's dog for him...
 ...She left a note on Kurt's door saying, 'Wonderful dog sitting experience.'...
 After she left, a delivery man came to the door and saw the note.
 (*Correct perspective* → *naïve delivery man should NOT perceive note as sarcastic*)

Target (congruent) He was happy this dog sitter had really enjoyed the experience.

Target (incongruent) He felt sorry that this dog sitter had not enjoyed the experience.

Effects Across Conditions for Expt 1, 2 & 3



All studies were implemented online using Gorilla. Data screening procedures: [i] eliminated inattentive participants; [ii] addressed outlier RTs; [iii] calculated residualized reading times to control for sentence length effects and baseline reading speed (see [8]); and [iv] eliminated participants who had no observations for at least one condition. RTs were analyzed using LME models with crossed/nested factors for participants/items (maximal random effects structure).

Fixed Effects for Linguistic Inference Task in **Experiment 1**

Effect	Estimate	SE	df	t	p
(Intercept)	3.52	49.32	4.91	0.07	0.946
Congruency	115.88	44.83	7.65	2.59	0.034
Location (Near/Far)	-3.07	57.61	5.07	-0.05	0.96
Congruency X Location	35.49	38.78	4.96	0.92	0.402

Fixed Effects for Linguistic Perspective Taking Task in **Experiment 2**

Effect	Estimate	SE	df	t	p
(Intercept)	146.02	68.2	8.13	2.14	0.064
Incongruent vs. Baseline	245.09	54.22	375.12	4.52	<.001
Incongruent vs. Congruent	169.34	55.2	375.37	3.07	0.002

Fixed Effects for **Experiment 3**

Subtask: Linguistic Inference

Effect	Estimate	SE	df	t	p
(Intercept)	20.31	40.26	4.00	0.50	0.641
Congruency	205.18	41.03	4.31	5.00	0.006
Location (Near/Far)	40.75	50.87	4.00	0.80	0.468
Congruency x Location	-54.78	50.87	4.00	-1.08	0.342

Subtask: Linguistic Perspective Taking

Effect	Estimate	SE	df	t	p
(Intercept)	-17.9	40.71	3.99	-0.44	0.683
Congruency	178.37	41.15	4.16	4.34	0.011