



**Cory Shain**  
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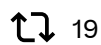
New preprint! "Robust effects of working memory demand during naturalistic language comprehension in language-selective cortex" with @IbanDlank @ev\_fedorenko @LanguageMIT and William Schuler

[biorxiv.org/content/10.110...](https://biorxiv.org/content/10.110...)

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	<p>biorxiv.org Robust effects of working memory demand during naturali... A standard view of human language processing is that comprehenders build richly structured mental ...</p>
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9:06 AM · Sep 19, 2021



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Background: A standard view of human lang proc is that people (1) build rich syntactic structures word by word (2) via computationally intensive ops in working memory (WM) (3) implemented in domain-general WM resources. But there's debate about all this.

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(1) incremental lang proc may typically be more shallow/approximate than is often assumed, especially in naturalistic settings (e.g. Frank & Bod 11), ...

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(2) the main driver of sentence comprehension difficulty may be \*surprisal\* rather than WM demand (e.g. Levy, 08), and ...

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(3) the neural WM resources used for lang proc may be specialized (not shared with other domains, e.g. Caplan & Waters 99).

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Given these objections, to determine if domain-general WM is central to lang proc, it's important to (a) control for surprisal as an alternative explanation and (b) determine if the same regions (in each brain) support WM in lang and other domains.

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Our study looked at theory-driven signatures of WM demand in an existing dataset of fMRI responses to naturalistic story listening (Shain, Blank, et al. 20). We used rigorous surprisal controls, including a cognitively-motivated RNN developed by [@marty\\_with\\_an\\_e](#) & [@tallinzen](#).

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In each participant, we functionally localized a language-selective network (LANG) and a multiple demand network (MD), which prior work strongly associates with domain-general WM.

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Our design involved an exploratory phase and a generalization phase.

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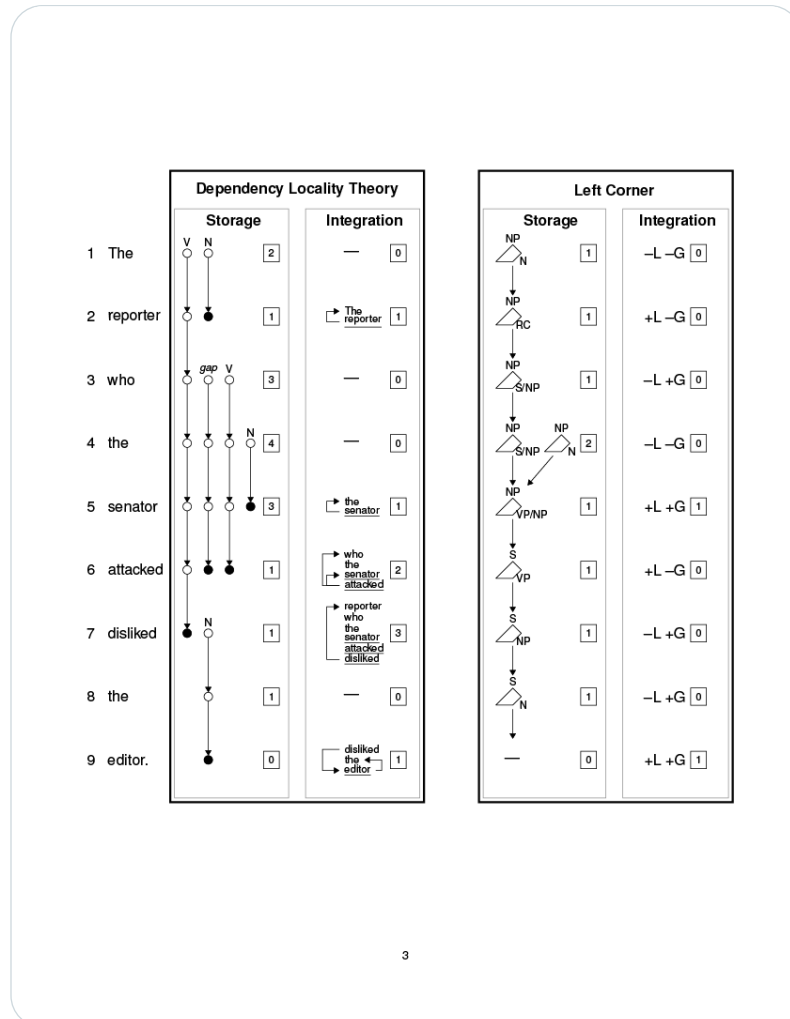


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In the exploratory phase, we considered a total of 21 different WM estimates derived from broad-coverage psycholinguistic theories: the Dependency Locality Theory (Gibson 00), ACT-R (Lewis & Vasishth 05), and left-corner parsing (Rasmussen & Schuler 18).

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In the generalization phase, we took pre-trained models selected by the exploratory procedure and evaluated them on unseen data.

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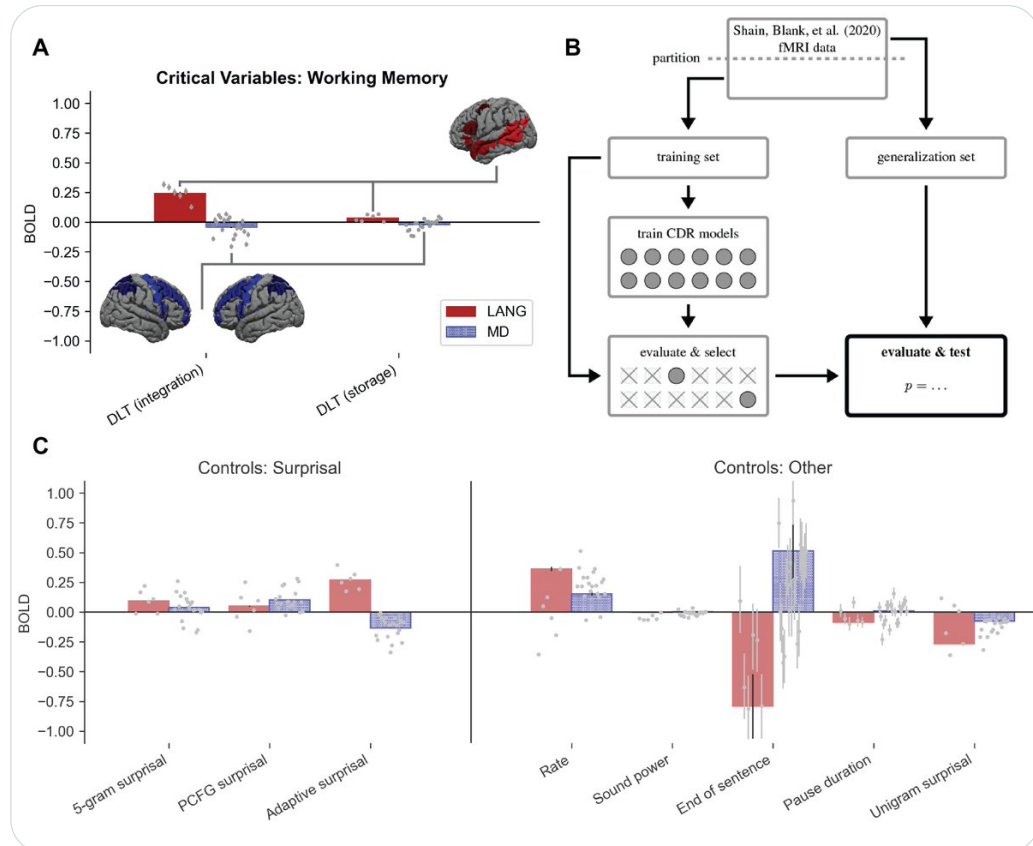


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Results in brief: LANG showed robust effects of integration cost (WM retrieval) over strong surprisal controls that generalized to unseen data, but MD showed no evidence for any of the estimates of WM demand that we considered.

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Conclusion: Results support a core role for WM in incremental structure building but locate these WM operations within the language network, not in domain-general WM regions.

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Data on OSF: [osf.io/ah429/](https://osf.io/ah429/)

Code on Github: [github.com/coryshain/cdr/](https://github.com/coryshain/cdr/)

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	github.com GitHub - coryshain/cdr: A framework for nonlinear ... A framework for nonlinear continuous-time regression - GitHub - coryshain/cdr: A framework ...
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