

Supplemental Materials

Sentence Materials

Table S1

Forward and Backward Sentence Versions for Each Target Meaning.

Target	Sentence Versions
Bananas	The monkey's favorite food is doffs Doffs are the monkey's favorite food
Bowl	If you want cereal for breakfast, you'll need to get a spoon and a modi You'll need to get a modi and a spoon if you want cereal for breakfast
Dog	You need to feed and walk your bink every day Your bink needs to be fed and walked every day
Clouds	It's probably going to rain if you look at the sky and see mels If you see mels in the sky, it's probably going to rain
Tissue	If you need to blow your nose, grab a krat Grab a krat if you need to blow your nose
Cows	I learned today that milk comes from zavs I learned today that zavs are where milk comes from
Sink	The dirty dishes were piling up in the lep The lep was piling up with dirty dishes
Ears	We see with our eyes and hear with our derds We use our derds to hear and our eyes to see
Pillows	I want my bed to be comfy so I got a blanket and some zebs I got some zebs and a blanket to make my bed comfy
Shoes	At You're going to hurt your feet running around outside if you don't wear noops You need noops so that you don't hurt your feet when you run around outside
Cake	At Jessie's birthday party they had a yummy fimp The fimp at Jessie's birthday party was yummy
Window	If you want to look outside, go to the bedroom gaz Go to the gaz in the bedroom if you want to look outside
Teeth	If you don't brush them twice a day, you might get cavities in your kivs Your kivs might get cavities if you don't brush them twice a day
Chairs	If everyone's going to sit at the table, we're going to need more daxes We're going to need more daxes so that everyone can sit at the table
Road	When cars are driving by, keep out of the jefa Keep out of the jefa when cars are driving by
Soap	After dinner he washed his hands with ratch He used ratch to wash his hands after dinner

Table S2

Sentence Measures.

Target	Version	Reading Ease	Total Length	Mean Word Length
Bananas	Forward	78.87	6	4.67
Bananas	Backward	78.87	6	4.83
Bowl	Forward	84.84	15	3.73
Bowl	Backward	84.84	15	3.73
Dog	Forward	95.2	10	3.6
Dog	Backward	86.7	10	3.7
Clouds	Forward	90.09	14	3.43
Clouds	Backward	89.52	12	3.42
Tissue	Forward	112.09	10	3.2
Tissue	Backward	103.62	10	3.2
Cows	Forward	92.97	8	4.25
Cows	Backward	95.17	10	4.2
Sink	Forward	84.9	9	3.78
Sink	Backward	92.97	8	3.88
Ears	Forward	112.09	10	3.5
Ears	Backward	111.07	11	3.09
Pillows	Forward	95.73	15	2.93
Pillows	Backward	95.96	12	3.25
Shoes	Forward	84.84	14	4.57
Shoes	Backward	90.13	15	4.07
Cake	Forward	78.25	9	4.22
Cake	Backward	75.5	8	4.5
Window	Forward	95.69	11	3.55
Window	Backward	89.52	13	3.38
Teeth	Forward	95.42	15	3.8
Teeth	Backward	95.94	13	4
Chairs	Forward	68.98	14	3.93
Chairs	Backward	78.81	14	3.93
Road	Forward	95.17	10	3.6
Road	Backward	95.17	10	3.6
Soap	Forward	92.97	8	4.5
Soap	Backward	94.3	9	4

* Reading Ease is measured as the Flesch-Kincaid reading ease score on a 0-100 scale, with higher scores indicating greater reading ease.

Table S3

Assignment of Sentences to Blocks and the Pairing of Target Meanings in Test Trials.

Block	Targets and Test Trial Pairing
1	Bananas - Clouds
	Bowl - Dog
2	Tissue - Sink
	Cows - Ears
3	Pillows - Shoes
	Cake - Window
4	Teeth - Chairs
	Street - Soap

Word Learning Mixed Effects Model Results

This section presents the full results of the Bayesian mixed effects model analyses of word learning across Experiments 1 - 3. From these models, it can be inferred that a variable or interaction influenced word learning when the 95% credible interval for the effect does not contain 0. In Table S4, such effects are highlighted in bold.

Table S4

Outcomes of Word Learning Bayesian Mixed Effects Model Analyses.

Experiment	Control Variable	Variable	Beta	SE	95%CI lower	95%CI upper
1	<i>na</i>	WM	3.64	1.7	0.34	7.01
2	<i>na</i>	WM	3.63	0.82	2.08	5.33
3	BIS Incongruent	WM	2.02	0.67	0.68	3.36
3	BIS All Trials	WM	2.01	0.65	0.78	3.33
1	<i>na</i>	Route	-0.27	0.73	-1.69	1.16
2	<i>na</i>	Route	0.66	0.59	-0.5	1.83
3	BIS Incongruent	Route	-0.05	0.14	-0.07	0.26
3	BIS All Trials	Route	-0.04	0.14	-0.32	0.23
1	<i>na</i>	Route*WM	0.38	1.05	-1.7	2.44
2	<i>na</i>	Route*WM	-0.79	0.82	-2.39	0.8

Experiment 1: Gaze Results

Table S5 presents descriptive statistics for Initial and Revisit gaze durations in the Context and Novel Word AOIs in the Backward and Forward Route conditions. Tables S6 - S8 present the results of Bayesian mixed effects models. As above, effects that influenced gaze are shown in bold.

Table S5

Means and SDs of Gaze Durations in Experiment 1.

	Backward		Forward	
	Initial	Revisit	Initial	Revisit
Context	112 (50.7)	139 (129)	121 (51.6)	139 (102)
Novel	111 (82.9)	414 (201)	164 (201)	371 (449)

Table S6

Outcomes of Omnibus Bayesian Mixed Effects Model Analyses of Gaze.

AOI	Variable	Beta	SE	lower	upper
Novel	Gaze Type	-9.92	96.56	-199.85	177.14
Novel	Route	-60.25	92.53	-239.55	118.45
Novel	WM	27.62	112.09	-190.95	245.42
Novel	Gaze Type*Route	212.46	138.7	-62.35	476.39
Novel	Gaze Type*WM	445.94	132.57	187.28	709.52
Novel	Route*WM	162.51	126.06	-82.79	408.52
Novel	Gaze Type*Route*WM	-445.71	190.42	-813.47	-73.77
Context	Gaze Type	35.39	32.4	-28.76	98.42
Context	Route	12.67	31.45	-48.66	74.87
Context	WM	16.05	34.72	-52.27	83.51
Context	Gaze Type*Route	-52.6	44.63	-138.59	34.63
Context	Gaze Type*WM	-11.95	44.51	-97.6	75.32
Context	Route*WM	-7.74	42.34	-91.18	76.05
Context	Gaze Type*Route*WM	64.54	61.26	-57.36	183.32

Table S7

Outcomes of Bayesian Mixed Effects Model Analyses of Route and WM Effects within Initial and Revisit Gaze.

Gaze Type	Variable	Beta	SE	lower	upper
Initial	Route	-49.18	46.64	-140.87	41.1
Initial	WM	39.07	55.46	-69.96	146.83
Initial	Route*WM	150.01	63.79	27.44	276.76
Revisit	Route	146.14	143.78	-137.34	435.42
Revisit	WM	466.66	185.19	102.28	830.23
Revisit	Route*WM	-282.35	193.12	-666.75	94.92

Table S8

Outcomes of Bayesian Mixed Effects Model Analyses of WM Effects on Initial Gaze within Forward and Backward Routes.

Route	Variable	Beta	SE	lower	upper
Backward	WM	43.35	28.59	-9.81	102.43
Forward	WM	178.09	81.44	16.07	339.15

Experiment 1: Power Analysis

The key gaze results in Experiment 1 came from an analysis of the effects of three factors (Gaze Type, WM capacity and Route condition) on gaze to novel words, and consisted of that yielded complex effects and interactions. To address possible concerns that these results may be spurious, we used a simulation approach to conduct a post-hoc power analysis of the effects observed in the Gaze to Novel Word data. The key patterns in these data were effects of WM capacity on all gaze durations to the novel word that took place after participants had observed the context. Specifically, an effect of WM capacity was present for initial gaze in the Forward but not Backward Route condition, and revisit gaze in both the Forward and Backward Route conditions.

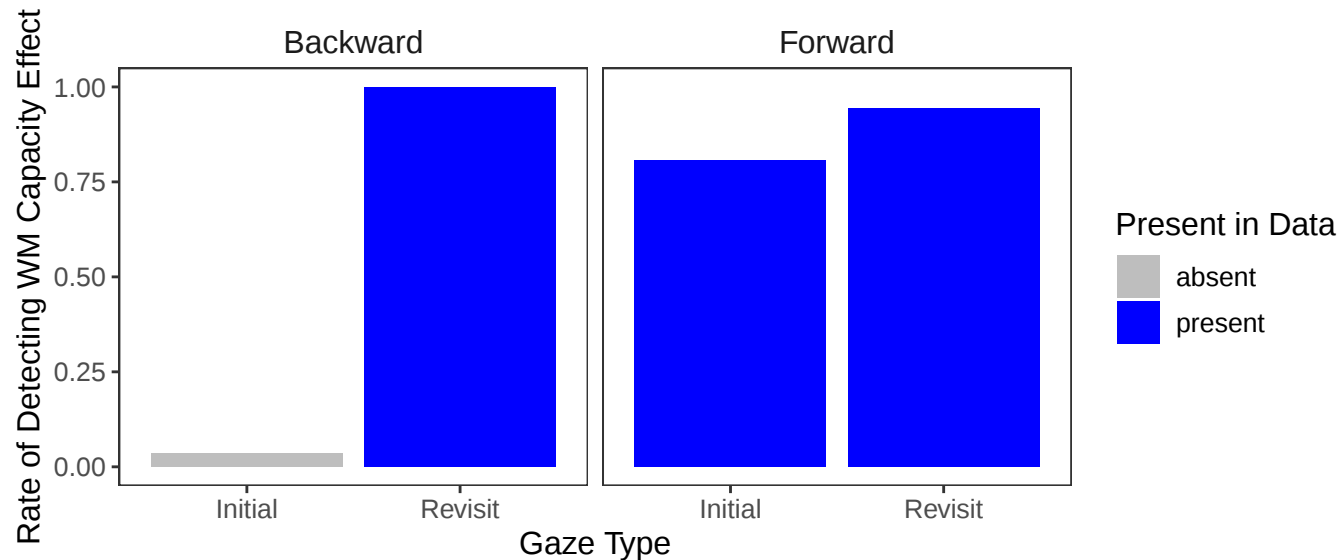


Figure S1. Results of post-hoc power analysis of WM effects on gaze within the Novel word AOI. This figure shows the rate at which 1,000 simulated datasets detected an effect of WM within Initial and Revisit gaze in the Backward and Forward condition. The color of the bars indicates whether the effect of WM was present or absent in the observed data. The results of this analysis indicate that WM effects observed in the data were frequently observed in simulated datasets, whereas the WM effect that was not observed in the data was rarely observed in the simulated datasets.

In our simulation approach, we used the frequentist versions of analyses in the manuscript to estimate effects, including the fixed effects of WM Capacity, Route condition and their interaction within initial and revisit gaze, and random effects of participant and pseudoword (as noted in the main text, the results of frequentist analyses mirrored those of Bayesian analyses). We then used the faux package in R [REF] to use these estimates to simulate 1,000 datasets with the same sample size and number of sentences as in Experiment 1. Finally, we tested each dataset for the key patterns described above. The figure [FIGURE X] below shows the rate at which the patterns were detected across simulated datasets. As illustrated in this figure, the effects of WM capacity that were present in the original data were frequently detected in simulated data (rate 80.6% –100%), and the effect of WM capacity that was absent in the original data was rarely detected in simulated data (rate

= 3.6%). We infer from these results that the outcomes of original analyses were unlikely to have been spurious.

Experiment 3: Flanker Inhibition

From the Flanker inhibition task, we calculated RT and Balanced Integration Scores (BIS) for Incongruent trials, all trials, and the difference between Congruent and Incongruent trials. Distributions of these values are shown in Figure S2. BIS metrics calculated for Incongruent trials and for all trials were associated with word learning performance.

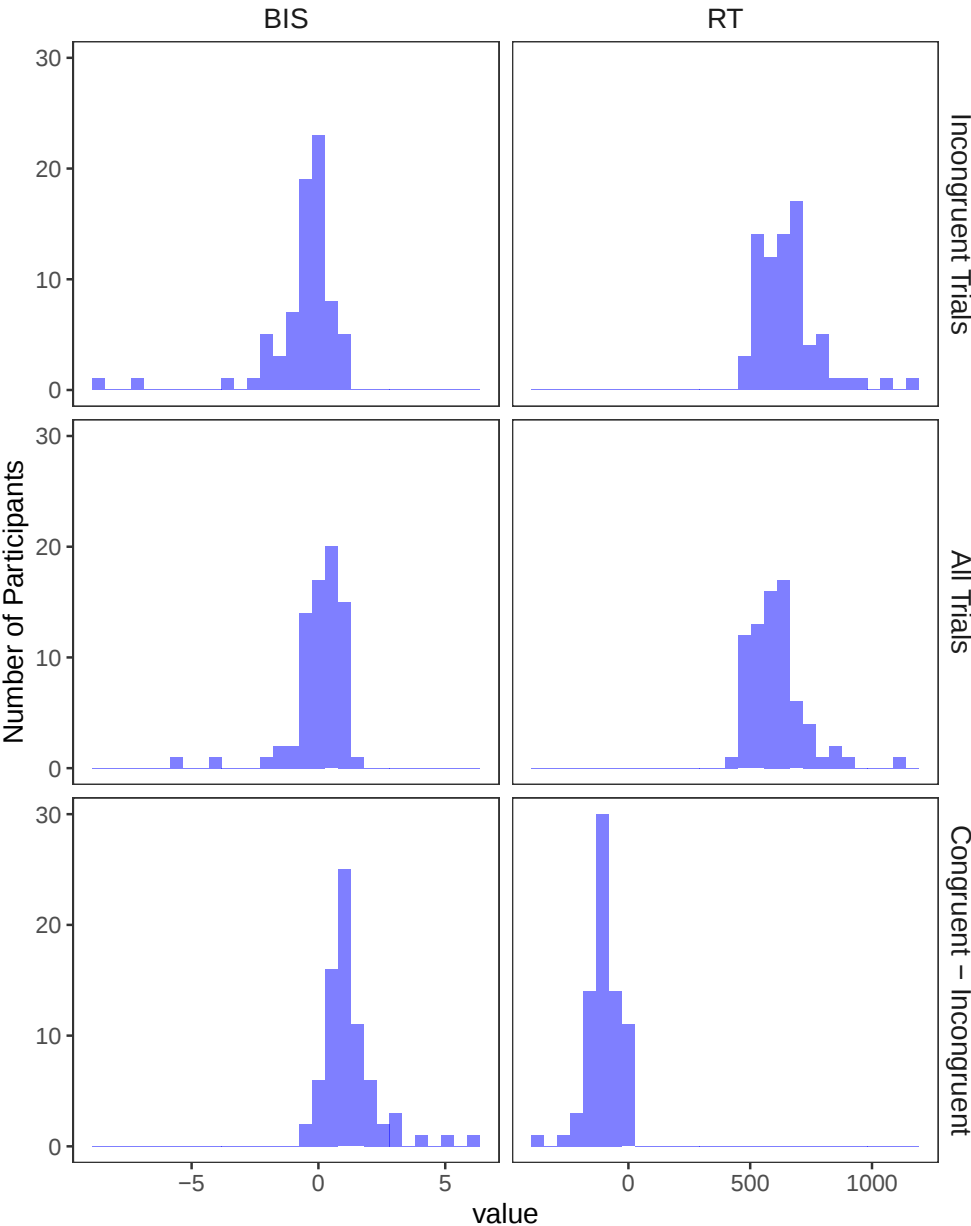


Figure S2. Distributions of Balanced Integration Score (BIS) and reaction time (RT) performance metrics on the Flanker inhibition task