

1 **Scene grammar shapes the way we interact with objects,**  
2 **strengthens memories, and speeds search.**

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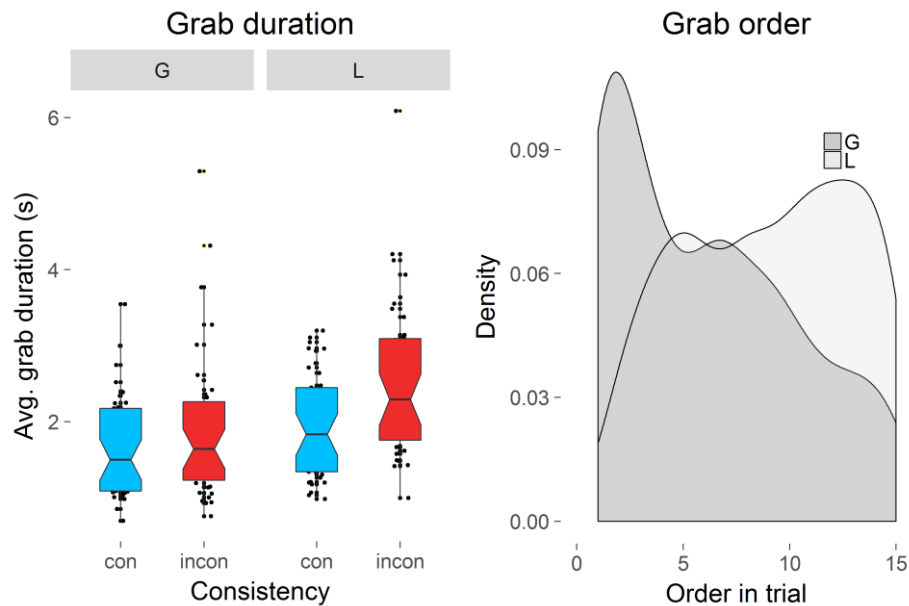
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21 **Keywords:** *Virtual reality; Scene grammar; Episodic memory; Semantic memory; Object*  
22 *interaction; Object handling; Visual search; Eye movements*

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## Supplementary Materials



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25 **Supplementary Figure 1:** The effects in Experiment 2 of Consistency (consistent = con vs. inconsistent =  
 26 incon), Object type (global =G vs. local = L) and experimental Phase (build vs. recall) on the average grab  
 27 duration (left). The central mark is the median of each boxplot. The notches indicate 95% confidence  
 28 intervals for the medians. The right graph depicts computed density estimates (Gaussian smoothing kernel)  
 29 (y-axis) for first object grabs during a trial (x-axis) as a function of Object type (global =G vs. local = L).

30

31 **Supplementary Table 1:** Results of the Experiment 2 LMM for grab duration including estimated regression  
 32 coefficients together with the *t* statistic, as well as a Tukey corrected break down of significant interactions  
 33 (left columns). On the right, the statistics of the ANOVA for mean grab order are listed.

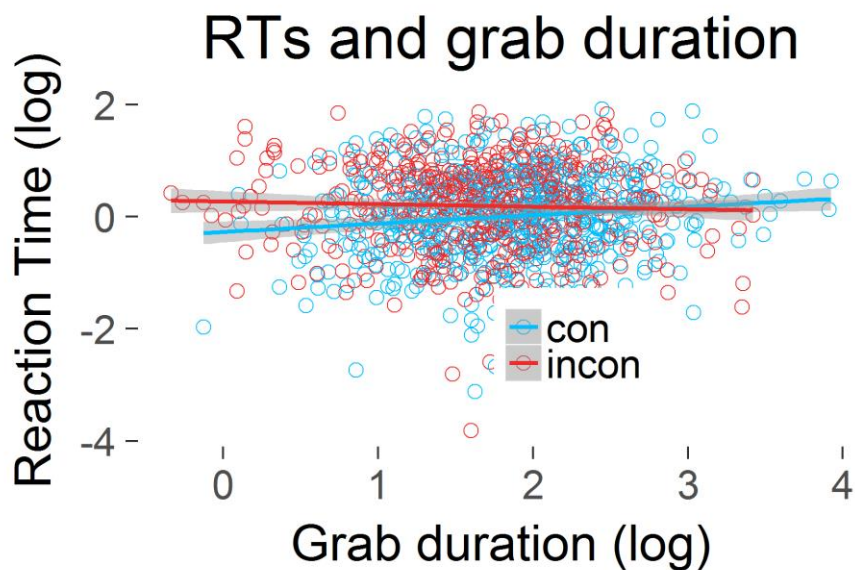
	Grab duration LMM		Grab order ANOVA				
	Estimate	<i>t</i>	df	<i>F</i>	<i>p</i>	$\eta^2_G$	
<b>(Intercept)</b>	0.120	1.280					
<b>Condition (con vs. incon)</b>	-0.080	-6.583	1,9	0.916	0.363	0.003	
<b>Object type (global vs. local)</b>	-0.095	-4.036	1,9	29.000	0.001	0.684	
<b>Condition × Object type</b>	0.054	4.506	1,9	0.793	0.396	0.018	
	Tukey contrasts of LMM interaction						
	Estimate	<i>z</i>	<i>p</i>				
<b>con (global) vs. incon (global)</b>	-0.052	-1.543	0.412				
<b>con (global) vs. con (local)</b>	-0.083	-1.628	0.363				
<b>con (global) vs. incon (local)</b>	-0.350	-6.578	0.001				
<b>incon (global) vs. con (local)</b>	-0.031	-0.586	0.936				
<b>incon (global) vs. incon (local)</b>	-0.298	-5.444	0.001				
<b>con (local) vs. incon (local)</b>	-0.267	-7.778	0.001				

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35 The effect of grab duration on reaction times

36 To investigate the predictive properties of grab and gaze duration, we included them as  
 37 covariates in a LMM (Supplementary Figure 2). The LMM was performed on a subset of the data  
 38 – only rooms which participants actually built were included. Visual exposure duration was  
 39 not a significant predictor of search times. Even though object interaction time did not predict  
 40 search times either, longer interaction time with the objects neutralized the reaction time  
 41 benefit of consistent compared to inconsistent environments.

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44 **Supplementary Figure 2:** The graph displays partial effects. Reaction times on the y-axis against log  
 45 transformed grab duration per object on the x-axis as a function of Consistency (consistent = con vs.  
 46 inconsistent = incon). Shaded areas represent 95 % confidence intervals.

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48 **Supplementary Table 2:** Results of the Experiment 2 LMM with covariates for search times including  
 49 estimated regression coefficients together with the *t* statistic.

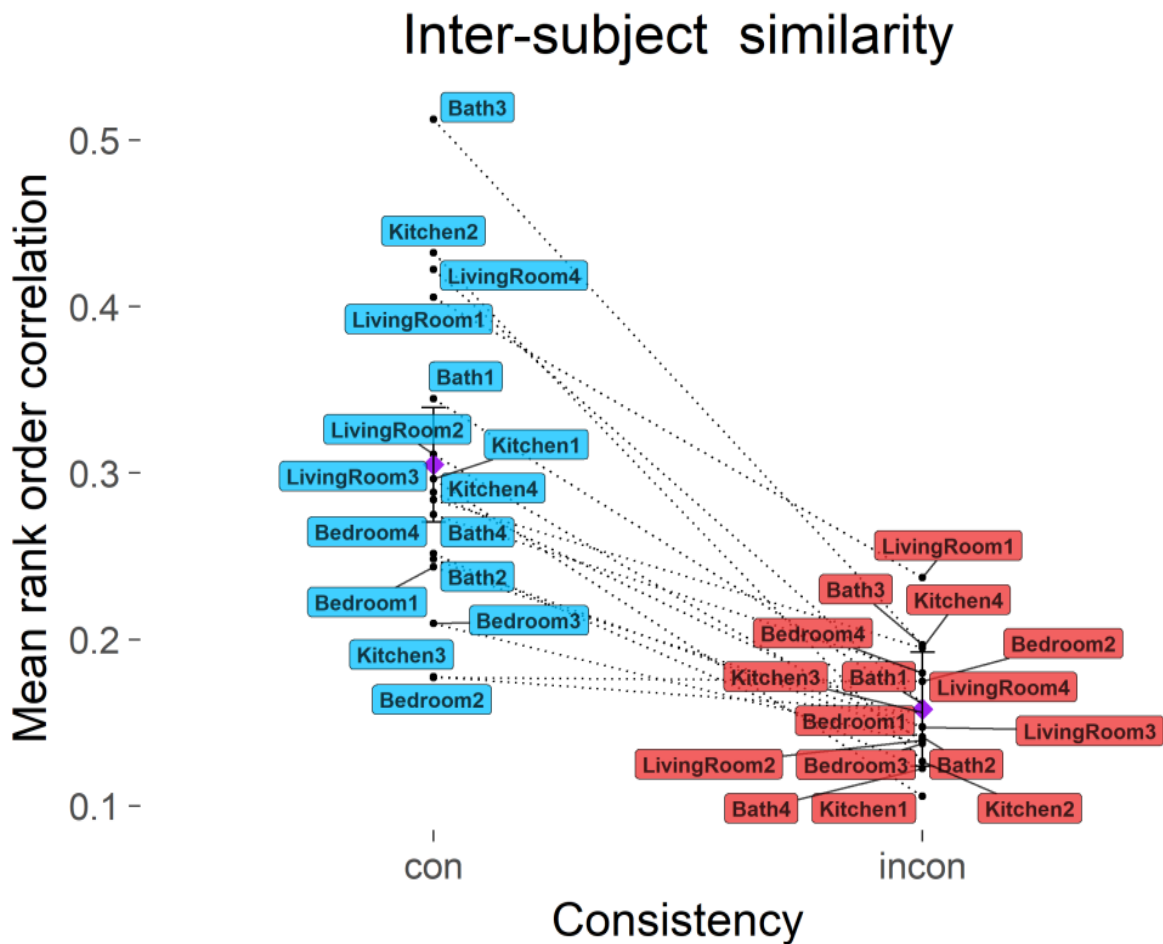
	RT LMM * covariates	
	Estimate	<i>t</i>
(Intercept)	-0.029	-0.259
Condition (con vs. incon)	-0.270	-3.084
Object type (global vs. local)	0.068	0.766
Grab duration (log)	0.052	0.989
Gaze duration (log)	-0.063	-1.589
Condition × Object type	0.051	0.587
Condition × Grab duration (log)	0.098	2.286
Object type × Grab duration (log)	-0.066	-1.550
Condition × Object type × Grab duration (log)	-0.044	-1.043

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51 Inter-subject similarity in object placement

52 To investigate the generative contextual consistency of object placement within virtual  
 53 environments we calculated the similarity of spatial arrangements between participants in  
 54 both experiments (Supplementary Figure 3). We computed the per participant distance between  
 55 each object to all other objects in a room and the Spearman rank order correlation between  
 56 those distances. The resulting correlation matrix was averaged yielding a single correlation  
 57 value for each room in each condition. Room arrangements were more similar to each other  
 58 across participants in the consistent compared to the inconsistent condition,  $F(1, 15) = 41.7$ ,  $p$   
 59  $< 0.001$ ,  $\eta^2_G = 0.53$ .

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62 **Supplementary Figure 3: The effect of Consistency (consistent = con vs. inconsistent = incon) on the average**  
 63 **rank order correlation (y-axis) for each room. The purple diamonds mark the mean values per condition and**  
 64 **the error bars represent 95% confidence intervals. Rooms are connected with dotted lines to represent the**  
 65 **directionality of the difference between the Consistency conditions.**