

SUPPLEMENTAL INFORMATION

The influence of object location on identity: A “spatial congruency bias”

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Supplemental Tables

Expt 1					
Iden Task		Same Loc	Diff Loc	Iden Effect (rel dim)	Loc Effect (irrel dim)
RT (s)	Same Iden	0.952	1.028	p=0.211	p=0.002
	Diff Iden	0.978	1.030		
Accuracy	Same Iden	0.839	0.723	p=0.003	p=0.265
	Diff Iden	0.618	0.692		
p("Same")	Same Iden	0.839	0.723	p<0.001	p=0.001
	Diff Iden	0.382	0.308		
d-prime		1.401	1.154	--	p=0.097
Bias		-0.375	-0.044	--	p=0.001

Table S1. Mean measures of performance for Expt 1 by condition. P-values from ANOVA F-tests (RT, Accuracy, p("Same")) and paired t-tests (d-prime, bias). Effect size estimates are given in the text. (N=16).

Expt 2		Same Loc	Diff	Diff	Diff	Diff	Diff	Iden Effect	Loc Effect
Iden Task		(0°)	(1°)	(2°)	(4°)	(10°)	(14°)	(rel dim)	(irrel dim)
RT (s)	Same Iden	0.792	0.815	0.812	0.811	0.846	0.852	p=0.141	p<0.001
	Diff Iden	0.829	0.839	0.838	0.806	0.851	0.861		
Accuracy	Same Iden	0.826	0.785	0.786	0.750	0.731	0.696	p=0.121	p=0.049
	Diff Iden	0.699	0.722	0.701	0.693	0.704	0.754		
p("Same")	Same Iden	0.825	0.780	0.784	0.749	0.729	0.693	p<0.001	p<0.001
	Diff Iden	0.294	0.272	0.299	0.304	0.293	0.243		
d-prime		1.631	1.491	1.462	1.303	1.261	1.308	--	p=0.015
Bias		-0.242	-0.100	-0.172	-0.085	-0.050	0.100	--	p<0.001

Table S2. Mean measures of performance for Expt 2 by condition. P-values from ANOVA F-tests. Effect size estimates are given in the text. (N=16).

Expt 4 Iden Task		Same Loc	Diff Loc	Iden Effect (rel dim)	Loc Effect (irrel dim)
RT (s)	Same Iden	0.622	0.674	p<0.001	p=0.001
	Diff Iden	0.682	0.683		
Accuracy	Same Iden	0.879	0.812	p<0.001	p=0.579
	Diff Iden	0.612	0.662		
p("Same")	Same Iden	0.879	0.812	p<0.001	p=0.018
	Diff Iden	0.388	0.338		
d-prime		1.539	1.422	--	p=0.305
Bias		-0.466	-0.258	--	p=0.029

Table S3. Mean measures of performance for Expt 4 – Identity Task by condition. P-values from ANOVA F-tests (RT, Accuracy, p("Same")) and paired t-tests (d-prime, bias). Effect size estimates are given in the text. (N=22).

Expt 4 Loc Task		Same Iden	Diff Iden	Loc Effect (rel dim)	Iden Effect (irrel dim)
RT (s)	Same Loc	0.624	0.653	p=0.567	p=0.006
	Diff Loc	0.638	0.649		
Accuracy	Same Loc	0.821	0.782	p=0.295	p=0.378
	Diff Loc	0.765	0.771		
p("Same")	Same Loc	0.794	0.768	p<0.001	p=0.980
	Diff Loc	0.202	0.229		
d-prime		1.794	1.620	--	p=0.242
Bias		-0.021	-0.042	--	p=0.800

Table S4. Mean measures of performance for Expt 4 – Location Task by condition. P-values from ANOVA F-tests (RT, Accuracy, p("Same")) and paired t-tests (d-prime, bias). Effect size estimates are given in the text. (N=22).

Expt 5					
Color Task		Same Loc	Diff Loc	Color Effect (rel dim)	Loc Effect (irrel dim)
RT (s)	Same Color	0.702	0.811	p=0.761	p<0.001
	Diff Color	0.731	0.774		
Accuracy	Same Color	0.879	0.639	p=0.056	p<0.001
	Diff Color	0.687	0.691		
p("Same")	Same Color	0.879	0.639	p<0.001	p<0.001
	Diff Color	0.313	0.309		
d-prime		1.764	0.898	--	p<0.001
Bias		-0.388	0.082	--	p<0.001

Table S5. Mean measures of performance for Expt 5 by condition. P-values from ANOVA F-tests (RT, Accuracy, p("Same") and paired t-tests (d-prime, bias). Effect size estimates are given in the text. (N=16).

Expt 6								
Shape Task		Same Color Same Loc	Same Color Diff Loc	Diff Color Same Loc	Diff Color Diff Loc	Shape Effect (rel dim)	Color Effect (irrel dim)	Loc Effect (irrel dim)
RT (s)	Same Shape	0.810	0.837	0.811	0.854	p=0.014	p=0.021	p=0.012
	Diff Shape	0.851	0.846	0.852	0.890			
Accuracy	Same Shape	0.832	0.724	0.659	0.664	p=0.071	p=0.413	p=0.041
	Diff Shape	0.810	0.797	0.704	0.679			
p("Same")	Same Shape	0.841	0.710	0.800	0.671	p<0.001	p=0.183	p<0.001
	Diff Shape	0.364	0.304	0.345	0.292			
d-prime		1.499	1.236	1.358	1.113	--	p=0.160	p=0.032
Bias		-0.333	-0.030	-0.230	0.040	--	p=0.237	p<0.001

Table S6. Mean measures of performance for Expt 6 – Shape Task by condition. P-values from ANOVA F-tests. Effect size estimates are given in the text (N=21).

Expt 6								
Color Task		Same Shape Same Loc	Same Shape Diff Loc	Diff Shape Same Loc	Diff Shape Diff Loc	Color Effect (rel dim)	Shape Effect (irrel dim)	Loc Effect (irrel dim)
RT (s)	Same Color	0.728	0.723	0.754	0.747	p=0.044	p=0.005	p=0.769
	Diff Color	0.753	0.759	0.763	0.771			
Accuracy	Same Color	0.841	0.710	0.636	0.695	p=0.004	p=0.030	p=0.044
	Diff Color	0.800	0.671	0.655	0.708			
p("Same")	Same Color	0.832	0.724	0.810	0.797	p<0.001	p=0.757	p=0.039
	Diff Color	0.341	0.335	0.296	0.321			
d-prime		1.493	1.171	1.608	1.433	--	p=0.036	p=0.053
Bias		-0.291	-0.092	-0.203	-0.192	--	p=0.815	p=0.020

Table S7. Mean measures of performance for Expt 6 – Color Task by condition. P-values from ANOVA F-tests. Effect size estimates are given in the text (N=21).

Supplemental Analyses

Accuracy by congruency

In the main text we report a spatial congruency bias: subjects are more biased to judge two objects as having same identity when they were presented in the same location. We can also conceptualize these data in another way: a corollary of the spatial congruency bias is that subjects are more accurate on trials where location information is congruent with the task-relevant feature. Figure S1 plots task accuracy as a function of congruency for each of the experiments in which this analysis was possible (Expts 1, 4, 5, and 6).

In Experiment 1, accuracy was significantly higher when identity and location were congruent (both same or both different) than when they were incongruent with each other ($t(15)=4.34$, $p=0.001$, $d=1.08$). In Experiment 5 (Color Task), accuracy was similarly greater in congruent than incongruent conditions ($t(15)=7.70$, $p<0.001$, $d=1.93$).

Experiment 4 involved subjects performing two tasks: an Identity Task and a Location Task. In the Identity Task, accuracy was again higher for congruent than incongruent ($t(21)=2.53$, $p=0.020$, $d=0.54$). However, there was no significant congruency benefit in the Location Task ($t(21)=1.59$, $p=0.128$, $d=0.34$; Task x Congruency interaction: $F(1,21)=3.03$, $p=0.097$, $\eta p^2=0.13$). This difference is particularly striking given that the definitions (and stimuli) for congruent and incongruent conditions were the same across tasks. Yet, it was only in the Identity Task that incongruent location information interfered with task performance; in the Location Task subjects were able to successfully ignore the irrelevant identity information.

Cumulative Congruency?

In Experiments 1, 4, and 5 we only varied two object dimensions at a time (location and shape or location and color), so our conditions were simply broken down into congruent vs incongruent. In Experiment 6, however, the presence of multiple irrelevant dimensions allowed us to explore different levels and combinations of congruency to test for cumulative effects.

Congruency was defined in terms of the irrelevant dimensions' congruency with the relevant dimension. Thus, for the Shape Task, we could compare cases where both location and color were congruent with shape (all three "same" or all three "different"), where location but not color was congruent with shape, where color but not location was congruent with shape, or where neither was congruent with shape. Analogously, for the Color Task, we looked at different combinations of location and shape congruency with color.

We found no reliable evidence for cumulative or combinatorial effects of congruency. Although in both tasks numerically the highest accuracy was found when all three dimensions were congruent, accuracy was not significantly greater than when only location was congruent with the relevant dimension (Shape Task: $t(20)=1.03$, $p=0.314$, $d=0.23$; Color Task: $t(20)=0.98$, $p=0.337$, $d=0.21$). ANOVAs revealed significant main effects of location congruency in both tasks (Shape Task: $F(1,20)=23.39$, $p<0.001$, $\eta^2=0.54$; Color Task: $F(1,20)=5.19$, $p=0.034$, $\eta^2=0.21$), with the effect more pronounced in the Shape Task (location congruency x task interaction: $F(1,20)=13.35$, $p=0.002$, $\eta^2=0.40$). In contrast, there were no significant main effects or interactions of other-irrelevant-dimension congruency (Shape Task: color congruency $F(1,20)=2.01$, $p=0.172$, $\eta^2=0.09$; color x location congruency $F<1$; Color Task: shape congruency $F<1$, shape x location congruency $F<1$).

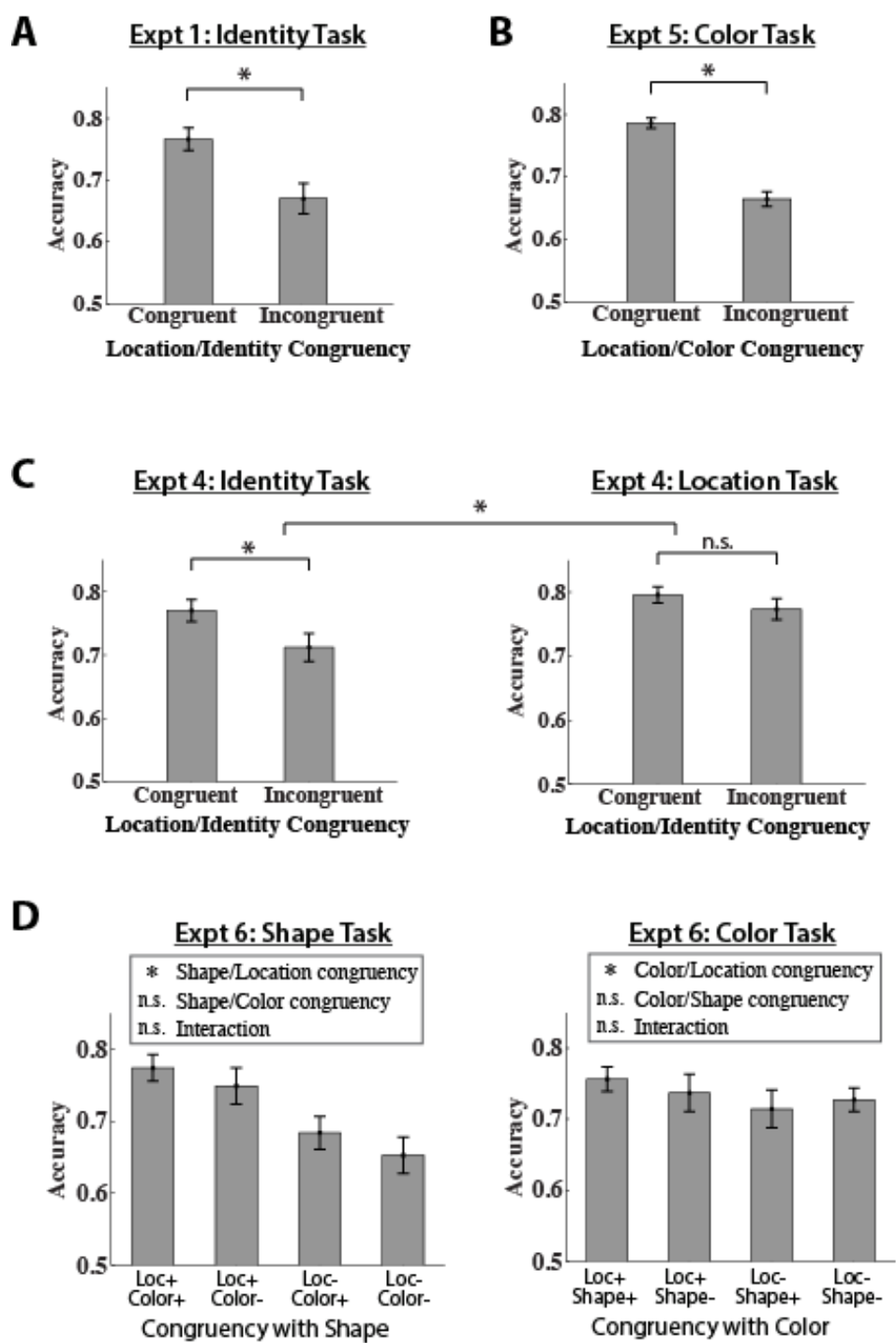


Figure S1

Supplemental Experiments

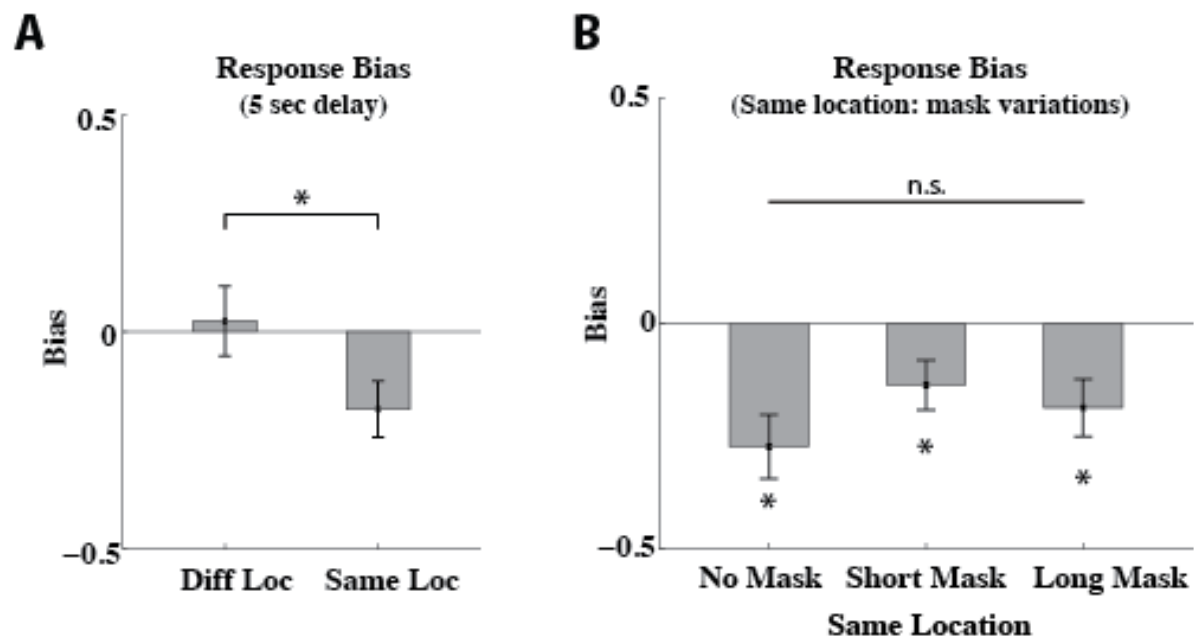


Figure S2. Supplemental experiments.

A, Long delay experiment. Subjects performed the same task as Experiment 1 (main text) but with a longer inter-stimulus interval (5 sec instead of ~1 sec). Response bias (criterion) on the Identity Task is plotted for same and different location. Error bars are standard error of the mean (SEM), asterisk indicates $p < 0.05$ (paired t-test); $N = 14$. *The results replicate the significant spatial congruency bias reported in the main text, and show it persists over a several second delay.*

B, Mask manipulation experiment. Subjects again performed the same Identity task, but stimuli were always presented in the same location. A 1 sec delay was used, during which there was either no mask present, a mask briefly presented for 150ms followed by a blank period (similar to Experiment 1, main text), or a mask presented for the entire 1 sec inter-stimulus interval. Response bias (criterion) on the Identity Task is plotted for each mask condition. Error bars are SEM, asterisks below bars indicate a significant difference from 0 ($p < 0.05$), n.s. line above indicates lack of significant difference across conditions (1-way ANOVA); $N = 18$.

The results demonstrate that the bias did not depend on mask presence / duration during the delay. (RT and d-prime were both significantly influenced by the mask, with slower RTs and lower d-primes the longer the mask.)