Measures of metacognitive efficiency across cognitive models of decision confidence

Supplementary Material

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Supplementary Table 1

Correlations between the parameter estimates for the seven different generative models and log(meta-d'/d')

Model	Parameter	Correlation with log(meta-d'/d') Maniscalco and Lau's model specification			Correlation with log(meta-d'/d') Fleming's model specification		
		r	*df*[1]	*p*[2]	*r*	*df*[1]	*p*[2]
Confidence boost model	α	-.37	495	< .001	-.36	495	< .001
	θ_1	.10		> .999	.10	495	> .999
	θ_2	.29		< .001	.29	495	< .001
	θ_3	-.05		> .999	-.05	495	> .999
	θ_4	-.40		< .001	-.40	495	< .001
	θ_5	-.50		< .001	-.50	495	< .001
	θ_7	.45		< .001	.46	495	< .001
	θ_8	.34		< .001	.34	495	< .001
	θ_9	.06		> .999	.06	495	> .999
	θ_{10}	-.33		< .001	-.32	495	< .001
	θ_{11}	-.01		> .999	-.01	495	> .999
	d	-.02		> .999	-.03	495	> .999
	σ_c	-.90		< .001	-.89	495	< .001
	|c|	-.01		> .999	-.02	495	> .999
response-congruent evidence model	θ_1	.00	487	> .999	.01	489	> .999
	θ_2	.00		> .999	.01	489	> .999
	θ_3	.02		> .999	.02	489	> .999
	θ_4	.00		> .999	-.01	489	> .999
	θ_5	.02		> .999	.01	489	> .999
	θ_7	-.07		> .999	-.02	489	> .999
	θ_8	-.06		> .999	.00	489	> .999
	θ_9	-.05		> .999	-.01	489	> .999
	θ_{10}	-.02		> .999	-.02	489	> .999
	θ_{11}	.04		> .999	.04	489	> .999
	d	-.45		< .001	-.48	489	< .001
	|c|	-.09		> .999	-.15	489	.038
	θ_1	.03	494	> .999	.03	494	> .999

[1] Although all models were fitted to the same data set, the estimation of meta-d'/d' did not converge for every single simulated subject, which is why the degrees of freedom slightly vary across models.

[2] *p*-values were adjusted for multiple comparisons using Holm's correction.

Independent truncated Gaussian model: truncation at the discrimination criterion c	θ_2	.05		> .999	.05	494	> .999
	θ_3	-.06		> .999	-.06	494	> .999
	θ_4	-.13		.158	-.13	494	.179
	θ_5	-.09		> .999	-.09	494	> .999
	θ_7	-.04		> .999	-.04	494	> .999
	θ_8	.02		> .999	.02	494	> .999
	θ_9	.00		> .999	.00	494	> .999
	θ_{10}	-.08		> .999	-.08	494	> .999
	θ_{11}	-.07		> .999	-.07	494	> .999
	d	.04		> .999	.03	494	> .999
	m	.90		< .001	.91	494	< .001
	$\|c\|$	.04		> .999	.03	494	> .999
Independent truncated Gaussian model: truncation at the discrimination criterion c multiplied with metacognitive efficiency m	θ_1	.04	494	> .999	.04	494	> .999
	θ_2	.04		> .999	.04	494	> .999
	θ_3	-.04		> .999	-.03	494	> .999
	θ_4	-.09		> .999	-.08	494	> .999
	θ_5	-.03		> .999	-.02	494	> .999
	θ_7	.02		> .999	.02	494	> .999
	θ_8	.05		> .999	.06	494	> .999
	θ_9	.02		> .999	.02	494	> .999
	θ_1	-.05		> .999	-.05	494	> .999
	θ_{11}	-.05		> .999	-.05	494	> .999
	d	.04		> .999	.03	494	> .999
	m	.90		< .001	.90	494	< .001
	$\|c\|$	.05		> .999	.03	494	> .999
Gaussian noise model	θ_1	.41	495	< .001	.41	495	< .001
	θ_2	.32		< .001	.32	495	< .001
	θ_3	-.02		> .999	-.01	495	> .999
	θ_4	-.37		< .001	-.36	495	< .001
	θ_5	-.55		< .001	-.55	495	< .001
	θ_7	.49		< .001	.49	495	< .001
	θ_8	.29		< .001	.30	495	< .001
	θ_9	.03		> .999	.03	495	> .999
	θ_{10}	-.34		< .001	-.34	495	< .001
	θ_{11}	-.41		< .001	-.41	495	< .001
	d	.15		.035	.14	495	.111
	σ_c	-.93		< .001	-.93	495	< .001
	$\|c\|$	.05		> .999	.02	495	> .999
Postdecisional accumulation model	a	.87	495	< .001	.87	495	< .001
	θ_1	.04		> .999	.04	495	> .999
	θ_2	.04		> .999	.03	495	> .999
	θ_3	.01		> .999	.01	495	> .999

	θ_4	.07		> .999	.07	495	> .999
	θ_5	.28		< .001	.28	495	< .001
	θ_7	-.32		< .001	-.34	495	< .001
	θ_8	-.14		.137	-.15	495	.036
	θ_9	-.05		> .999	-.07	495	> .999
	θ_{10}	-.05		> .999	-.06	495	> .999
	θ_{11}	-.01		> .999	-.01	495	> .999
	d	.14		.137	.15	495	.039
	|c|	-.07		> .999	-.03	495	> .999
Weighted evidence and visibility model	θ_1	.05	494	> .999	.06	494	> .999
	θ_2	.11		> .999	.11	494	.651
	θ_3	.06		> .999	.06	494	> .999
	θ_4	-.08		> .999	-.08	494	> .999
	θ_5	-.19		.001	-.19	494	.001
	θ_7	.14		.114	.14	494	.082
	θ_8	-.01		> .999	-.01	494	> .999
	θ_9	-.09		> .999	-.10	494	> .999
	θ_{10}	-.16		.019	-.16	494	.017
	θ_{11}	-.08		> .999	-.08	494	> .999
	d	.18		.003	.17	494	.008
	σ_c	-.53		< .001	-.54	494	< .001
	|c|	.05		> .999	.03	494	> .999
	w	-.56		< .001	-.56	494	< .001

Supplementary Table 2

Unstandardized regression slopes between the parameter estimates for the seven different generative models and log(meta-d'/d')

		Slopes with log(meta-d'/d') Maniscalco and Lau's model specification				Slopes with log(meta-d'/d') Fleming's model specification			
			95%CI				95%CI		
Model	Parameter	B	lb	ub	p^3	B	lb	ub	p^3
Confidence boost model	α	-0.34	-0.42	-0.27	<.001	-0.35	-0.43	-0.27	<.001
	θ_1	0.00	0.00	0.00	<.001	0.00	0.00	0.00	<.001
	θ_2	0.03	0.02	0.04	<.001	0.03	0.02	0.04	<.001
	θ_3	-0.01	-0.02	0.00	>.999	-0.01	-0.02	0.00	>.999
	θ_4	-0.04	-0.05	-0.03	<.001	-0.05	-0.05	-0.04	<.001
	θ_5	-0.05	-0.06	-0.04	<.001	-0.06	-0.06	-0.05	<.001
	θ_7	0.05	0.04	0.05	<.001	0.05	0.04	0.06	<.001
	θ_8	0.04	0.03	0.05	<.001	0.04	0.03	0.05	<.001
	θ_9	0.01	0.00	0.02	>.999	0.01	0.00	0.02	>.999
	θ_{10}	-0.04	-0.04	-0.03	<.001	-0.04	-0.05	-0.03	<.001
	θ_{11}	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	d	-0.04	-0.24	0.16	>.999	-0.07	-0.28	0.14	>.999
	σ_c	-0.28	-0.29	-0.27	<.001	-0.29	-0.30	-0.28	<.001
	|c|	-0.01	-0.17	0.15	>.999	-0.04	-0.21	0.13	>.999
Response-congruent evidence model	θ_1	0.00	-0.05	0.05	>.999	0.01	-0.05	0.07	>.999
	θ_2	0.00	-0.07	0.07	>.999	0.01	-0.06	0.08	>.999
	θ_3	0.02	-0.06	0.10	>.999	0.02	-0.07	0.11	>.999
	θ_4	0.00	-0.09	0.08	>.999	-0.02	-0.11	0.08	>.999
	θ_5	0.02	-0.05	0.09	>.999	0.01	-0.07	0.09	>.999
	θ_7	-0.05	-0.12	0.01	>.999	-0.02	-0.09	0.05	>.999
	θ_8	-0.05	-0.14	0.03	>.999	0.00	-0.09	0.08	>.999
	θ_9	-0.04	-0.12	0.04	>.999	-0.01	-0.10	0.07	>.999
	θ_{10}	-0.02	-0.08	0.05	>.999	-0.02	-0.09	0.06	>.999
	θ_{11}	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	d	-1.43	-1.68	-1.17	<.001	-1.69	-1.96	-1.41	<.001
	|c|	-0.18	-0.35	-0.01	>.999	-0.33	-0.51	-0.14	.037
Independent truncated Gaussian model: truncation at the discrimination criterion c	θ_1	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	θ_2	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	θ_3	-0.05	-0.12	0.02	>.999	-0.05	-0.12	0.02	>.999
	θ_4	-0.14	-0.24	-0.05	.155	-0.14	-0.24	-0.05	.176
	θ_5	-0.12	-0.24	0.00	>.999	-0.12	-0.24	0.00	>.999
	θ_7	-0.05	-0.17	0.06	>.999	-0.05	-0.17	0.07	>.999
	θ_8	0.02	-0.07	0.11	>.999	0.02	-0.07	0.11	>.999

[3] *p*-values were adjusted for multiple comparisons using Holm's correction.

	θ_9	0.00	-0.06	0.07	>.999	0.00	-0.06	0.07	>.999
	θ_{10}	-0.04	-0.09	0.01	>.999	-0.04	-0.09	0.01	>.999
	θ_{11}	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	d	0.12	-0.15	0.38	>.999	0.08	-0.19	0.35	>.999
	m	1.41	1.35	1.47	<.001	1.46	1.40	1.52	<.001
	|c|	0.10	-0.10	0.30	>.999	0.07	-0.14	0.27	>.999
Independent truncated Gaussian model: truncation at the discrimination criterion c multiplied with metacognitive efficiency m	θ_1	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	θ_2	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	θ_3	-0.03	-0.09	0.04	>.999	-0.03	-0.09	0.04	>.999
	θ_4	-0.09	-0.18	0.00	>.999	-0.09	-0.18	0.01	>.999
	θ_5	-0.03	-0.14	0.08	>.999	-0.03	-0.14	0.09	>.999
	θ_7	0.02	-0.09	0.13	>.999	0.03	-0.09	0.14	>.999
	θ_8	0.05	-0.03	0.14	>.999	0.06	-0.03	0.14	>.999
	θ_9	0.01	-0.05	0.08	>.999	0.02	-0.05	0.08	>.999
	θ_1	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	θ_{11}	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	d	0.13	-0.13	0.39	>.999	0.09	-0.18	0.36	>.999
	m	1.38	1.32	1.44	<.001	1.43	1.37	1.49	<.001
	|c|	0.11	-0.09	0.31	>.999	0.07	-0.14	0.28	>.999
Gaussian noise model	θ_1	0.07	0.05	0.08	<.001	0.07	0.05	0.08	<.001
	θ_2	0.07	0.05	0.09	<.001	0.07	0.05	0.09	<.001
	θ_3	0.00	-0.03	0.02	>.999	0.00	-0.03	0.02	>.999
	θ_4	-0.11	-0.13	-0.08	<.001	-0.11	-0.13	-0.08	<.001
	θ_5	-0.15	-0.17	-0.13	<.001	-0.15	-0.17	-0.13	<.001
	θ_7	0.12	0.10	0.13	<.001	0.12	0.10	0.14	<.001
	θ_8	0.08	0.06	0.10	<.001	0.08	0.06	0.10	<.001
	θ_9	0.01	-0.01	0.03	>.999	0.01	-0.02	0.03	>.999
	θ_{10}	-0.08	-0.09	-0.06	<.001	-0.08	-0.1	-0.06	<.001
	θ_{11}	-0.07	-0.08	-0.05	<.001	-0.07	-0.08	-0.06	<.001
	d	0.27	0.12	0.42	.034	0.25	0.09	0.40	.109
	σ_c	-0.48	-0.50	-0.46	<.001	-0.50	-0.51	-0.48	<.001
	|c|	0.07	-0.06	0.20	>.999	0.03	-0.10	0.16	>.999
Postdecisional accumulation model	a	0.66	0.62	0.69	<.001	0.70	0.67	0.74	<.001
	θ_1	0.00	0.00	0.01	>.999	0.00	0.00	0.01	>.999
	θ_2	0.00	-0.01	0.01	>.999	0.00	-0.01	0.01	>.999
	θ_3	0.00	-0.01	0.01	>.999	0.00	-0.01	0.01	>.999
	θ_4	0.01	0.00	0.03	>.999	0.01	0.00	0.03	>.999
	θ_5	0.04	0.03	0.06	<.001	0.05	0.03	0.06	<.001
	θ_7	-0.05	-0.06	-0.03	<.001	-0.05	-0.07	-0.04	<.001
	θ_8	-0.02	-0.04	-0.01	0.134	-0.03	-0.04	-0.01	0.036
	θ_9	-0.01	-0.02	0.00	>.999	-0.01	-0.02	0.00	>.999
	θ_{10}	0.00	-0.01	0.00	>.999	-0.01	-0.02	0.00	>.999
	θ_{11}	0.00	0.00	0.00	>.999	0.00	0.00	0.00	>.999
	d	0.08	0.03	0.13	0.135	0.09	0.04	0.14	0.038
	|c|	-0.04	-0.08	0.01	>.999	-0.02	-0.06	0.03	>.999
	θ_1	0.02	-0.01	0.06	>.999	0.03	-0.01	0.07	>.999

	θ_2	0.06	0.01	0.11	>.999	0.07	0.02	0.12	.640
	θ_3	0.04	-0.02	0.11	>.999	0.05	-0.02	0.12	>.999
	θ_4	-0.08	-0.16	0.01	>.999	-0.07	-0.15	0.01	>.999
	θ_5	-0.18	-0.26	-0.10	.001	-0.18	-0.26	-0.10	.001
	θ_7	0.13	0.05	0.21	.112	0.13	0.05	0.21	.080
	θ_8	-0.01	-0.08	0.07	>.999	-0.01	-0.08	0.07	>.999
	θ_9	-0.07	-0.14	0.00	>.999	-0.07	-0.14	-0.01	>.999
	θ_{10}	-0.09	-0.15	-0.04	.019	-0.10	-0.15	-0.05	.017
	θ_{11}	-0.03	-0.07	0.00	>.999	-0.04	-0.07	0.00	>.999
	d	0.50	0.26	0.74	.003	0.48	0.24	0.72	.008
Weighted	σ_c	-0.91	-1.04	-0.78	<.001	-0.93	-1.06	-0.8	<.001
evidence and	|c|	0.12	-0.08	0.33	>.999	0.08	-0.12	0.28	>.999
visibility model	w	-1.16	-1.32	-1.01	<.001	-1.18	-1.34	-1.03	<.001