Supplementary materials for the journal article entitled "Distorted estimates of implicit and explicit learning in applications of the process-dissociation procedure to the SRT task"

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Author note

This work was funded by Deutsche Forschungsgemeinschaft grants STA-1269/1-1 and HA-5447/8-1.

We analysed our data using a modified version of Rouder, Lu, Morey, Sun, & Speckman (2008)'s three-level hierarchical process-dissociation model.

The first level is the process-dissociation model:

$$I_{ijk} = C_{ijk} + (1 - C_{ijk})A_{ijk}$$

and

$$E_{ijk} = (1 - C_{ijk})A_{ijk}$$

where i and j index participants and items, and k indexes the experimental condition. The parameters A and C represent probabilities that range between zero and one; they are transformed via a probit link to the reals, where a and c denote the transformed parameters:

$A_{ijk} = \Phi(a_{ijk})$ and $C_{ijk} = \Phi(c_{ijk})$

The second level is a main effects models on transformed parameters a and c:

$$c_{ijk} = \alpha_i^{(c)} + \beta_j^{(c)} + \mu_k^{(c)}$$

and

$$a_{ijk} = \alpha_i^{(a)} + \beta_j^{(a)} + \mu_k^{(a)}$$

where α denotes participant effects, β denotes item effects, and μ denotes condition effects that lead to conscious or unconscious contributions to task performance.

Participant and item effects are modeled as draws from bivariate normals whose covariance matrices were estimated from the data:

$\left(\frac{\alpha_i^{(c)}}{\alpha_i^{(a)}}\right) \sim N_2(0, \sum_\alpha), i = 1, \cdots, I.$

and
$\begin{pmatrix} \beta_i^{(c)} \\ \beta_i^{(a)} \end{pmatrix} \sim N_2(0, \sum_\beta), j = 1, \cdots, J.$

This model was estimated within a Bayesian modeling framework using MCMC sampling. For further detail, refer to Rouder et al. (2008).

Results

For each group, we sampled three chains of 50,000 iterations, discarding the first 20,000 as burn-in. Mixing was monitored by $\hat{R}$ which was below 1.2. Table 1 shows estimates of the posterior distribution of the grand-mean parameters μ_k of the model. Table 2 shows the estimates equivalent to C and A from traditional analyses. As can be seen, the results corroborated the findings obtained with the traditional analyses reported above (i.e., $C > 0$, $A > .2$, and the ordering of A estimates across conditions).

Table 1

Parameter estimates from the hierarchical process-dissociation model. Parameters $\mu_k^{(c)}$ and $\mu_k^{(a)}$ refer to estimates of the grand-mean

		Full dataset				Reversals excluded			
		$\mu_k^{(a)}$		$\mu_k^{(c)}$		$\mu_k^{(a)}$		$\mu_k^{(c)}$	
No-learning	Free	-0.82	-0.96, -0.67	-6.11	[-8.61, -4.18]	-0.75	-0.90, -0.61	-8.58	-12.95, -5.51
No-learning	Cued	-0.82	-1.02, -0.62	-5.13	[-7.38, -3.44]	-0.74	-0.94, -0.55	-5.88	-7.97, -4.11
Permuted	Free	-0.71	-0.87, -0.55	-6.30	[-9.92, -3.70]	-0.64	-0.79, -0.48	-7.48	-10.98, -4.61
Permuted	Cued	-0.88	-1.04, -0.71	-6.62	[-10.59, -3.62]	-0.77	-0.94, -0.61	-7.14	-9.56, -4.64
Random	Free	-0.88	-1.04, -0.73	-6.40	[-12.02, -3.66]	-0.78	-0.94, -0.62	-6.88	-11.43, -3.61
Random	Cued	-0.78	-0.95, -0.61	-4.06	[-5.79, -2.69]	-0.68	-0.85, -0.52	-4.39	-6.12, -2.86

Note. 95% credible intervals are in parentheses.

Table 2
Parameter estimates from the hierarchical PD model. Parameters A and C denote the Bayesian equivalent to parameter estimates obtained from classical analyses

		Full dataset				Reversals excluded			
		A		*C*		*A*		*C*	
No-learning	Free	.21	[.21, .22]	.03	[.03, .04]	.23	[.22, .24]	.03	[.03, .04]
No-learning	Cued	.23	[.22, .24]	.04	[.03, .05]	.26	[.24, .27]	.04	[.03, .05]
Permuted	Free	.25	[.23, .26]	.03	[.03, .04]	.27	[.26, .28]	.03	[.02, .03]
Permuted	Cued	.20	[.19, .21]	.04	[.03, .05]	.23	[.22, .24]	.04	[.03, .04]
Random	Free	.20	[.19, .21]	.02	[.02, .03]	.22	[.21, .23]	.04	[.03, .04]
Random	Cued	.22	[.21, .23]	.03	[.02, .03]	.25	[.24, .26]	.03	[.02, .04]

Note. 95% credible intervals are in parentheses.

References

Rouder, J. N., Lu, J., Morey, R. D., Sun, D., & Speckman, P. L. (2008). A hierarchical process-dissociation model. *Journal of Experimental Psychology: General*, *137*(2), 370–389. doi:10.1037/0096-3445.137.2.370