Supplementary materials: The evolution of superstitious and superstition-like behaviour

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Multiple priors and multiple latter events

Tables S1 and S2 show equivalent calculations to Table 2 for the case where there are two prior and two latter events (Figure 3b). With two latter events, however, one must make the distinction between whether the errors in discrimination are caused by incorrectly assigning probabilities (p and q) to the two causal relations (Table S1) versus errors in identifying the prior events (P1 and P2) (Table S2). The first case leads to equivalent solutions to the model in the main text, while the second has some differences. The differences occur because misidentifying the prior event in this case will lead the actor to perform the wrong response. To make this distinction more concrete. Consider a case where there are two types of disease that have each become culturally associated with a different traditional medicine, but only one medicine is a cure for its disease. If an individual confuses which medicine is a cure, this corresponds to Table S1. If an individual confuses the two diseases, this corresponds to Table S2.

Table S1: Two prior and two latter events. Actor correctly identifies P1 and P2 but may incorrectly assign *p* and *q*.

Actual Event	Assign probability of event:	Frequency	Survival probability			
			No response	Respond when *p* assigned	Respond when *q* assigned	Respond to all events
None	None	$(1-f)(1-g)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$
P1	P1	$f(1-g)(1-a_{21})$	$(1-pb_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$	$(1-pb_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$
P2	P1	$(1-f)ga_{12}$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-c_2)$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-c_2)$
P2	P2	$(1-f)g(1-a_{12})$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-c_2)$	$(1-rb_1)(1-c_2)$
P1	P2	$f(1-g)a_{21}$	$(1-pb_1)(1-sb_2)$	$(1-pb_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$
Both	P1	$fg(1-a_{21})a_{12}$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-c_2)$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-c_2)$
Both	P2	$fga_{21}(1-a_{12})$	$(1-pb_1)(1-qb_2)$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-c_2)$	$(1-c_1)(1-c_2)$
Both	Switch	$fga_{21}a_{12}$	$(1-pb_1)(1-qb_2)$	$(1-pb_1)(1-c_2)$	$(1-c_1)(1-qb_2)$	$(1-c_1)(1-c_2)$
Both	Correct	$fg(1-a_{21})(1-a_{12})$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$	$(1-pb_1)(1-c_2)$	$(1-c_1)(1-c_2)$

This is qualitatively similar to the single latter event model, and is identical for the focal conditions i.e. $fg = 0$, $q = r = s = 0$, $c_1 = c_2$, where s is the probability that the second latter event occurs in the absence of any prior events. This identity is intuitive: with no causal association between P2 and L2 ($q = 0$, Figure 3), there is in effect only one latter event.

Table S2: Two prior and two latter events, actor may incorrectly assign prior events P1 and P2.

Actual Event	Assigned Event	Frequency	Survival probability			
			No response	Respond P1	Respond P2	Respond both
None	None	$(1-f)(1-g)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$	$(1-rb_1)(1-sb_2)$
P1	P1	$f(1-g)(1-a_{21})$	$(1-pb_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$	$(1-pb_1)(1-sb_2)$	$(1-c_1)(1-sb_2)$
P2	P1	$(1-f)ga_{12}$	$(1-rb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$	$(1-rb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$
P2	P2	$(1-f)g(1-a_{12})$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-qb_2)$	$(1-rb_1)(1-c_2)$	$(1-rb_1)(1-c_2)$
P1	P2	$f(1-g)a_{21}$	$(1-pb_1)(1-sb_2)$	$(1-pb_1)(1-sb_2)$	$(1-pb_1)(1-c_2)$	$(1-pb_1)(1-c_2)$
Both	P1	$fg(1-a_{21})a_{12}$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$
Both	P2	$fga_{21}(1-a_{12})$	$(1-pb_1)(1-qb_2)$	$(1-pb_1)(1-qb_2)$	$(1-pb_1)(1-c_2)$	$(1-pb_1)(1-c_2)$
Both	Both	$fg(1-a_{21})(1-a_{12}) + fga_{21}a_{12}$	$(1-pb_1)(1-qb_2)$	$(1-c_1)(1-qb_2)$	$(1-pb_1)(1-c_2)$	$(1-c_1)(1-c_2)$

This differs from the single latter event model for $fg = 0$, $q = r = s = 0$, $c_1 = c_2$.