Supplementary Materials

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Table SM.1. Estimation of error rates in the first test of RBI of Experiment 2, and two other replicated choices testing majority rule against expected value (MR-EV). Chi-Squares test the fit of the true and error model (TE) and the fit of response independence (Indep) to the same data.

Choice Type	Choice		Replication Pattern					Parameter estimates		TE	Indep
(XY)	*X*	*Y*	*XX**	*XY**	*YX**	*YY**	*% Y*	*p*	*e*	$\chi^2(1)$	$\chi^2(1)$
SR	(1, 4, 6)	(1, 1, 9)	235	18	21	38	0.18	0.14	0.07	0.23	234.91
S'R'	(5, 4, 6)	(5, 1, 9)	188	24	34	65	0.30	0.25	0.11	1.71	187.48
S"R"	(9, 4, 6)	(9, 1, 9)	110	20	62	120	0.52	0.52	0.17	20.59	106.54
MR-EV	(5, 5, 5)	(6, 1, 6)	245	12	11	45	0.18	0.15	0.04	0.04	176.9
MR-EV	(2, 3, 5)	(6, 2, 4)	27	16	19	248	0.86	0.91	0.06	0.26	90.8

Table SM.2. Analysis of response patterns in first test of restricted branch independence of Experiment 2. Probabilities of response patterns are estimated from the fit of the true and error model, using error rates estimated from preference reversals between repetitions of the same choice problems (Table SM.1).

Choice Pattern			Observed Frequency			Estimated probabilities
SR	*S′R′*	*S″R″*	Rep 1	Rep 2 (reflected)	Both	
S	*S′*	*S″*	103	139	83	0.46
S	*S′*	*R″*	90	58	33	0.23
S	*R′*	*S″*	10	17	3	0.00
S	*R′*	*R″*	47	39	22	0.15
R	*S′*	*S″*	9	12	4	0.02
R	*S′*	*R″*	9	12	1	0.00
R	*R′*	*S″*	8	3	0	0.00
R	*R′*	*R″*	33	29	17	0.13
Totals			309	309	163	1

Table SM.3. Number of response patterns in the first and second replicates of the *ABC* design (Experiment 4), as in Table 7.

Response Pattern First Rep	Response Pattern on Second Replicate *ABC*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	1	5	0	0	0	4	1	0
112	3	116	1	4	1	32	2	4
121	3	0	3	3	1	0	5	1
122	1	12	4	9	1	3	3	4
211	3	2	0	0	4	1	2	1
212	5	37	1	5	6	34	2	5
221	4	2	5	0	4	2	18	4
222	0	5	1	2	5	2	6	10

Table SM.4. Number of response patterns on the first and second replicate of the *A'B'C'* design (Experiment 4).

Response Pattern First Rep	Response Pattern on Second Replicate *A'B'C'*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	11	7	3	2	0	0	3	0
112	9	161	0	11	2	35	0	4
121	3	1	2	0	2	0	4	1
122	1	8	1	2	1	2	1	2
211	2	0	1	0	6	5	2	1
212	3	32	0	2	3	27	1	2
221	2	1	3	1	0	0	16	4
222	0	2	1	3	0	4	2	0

Table SM.5. Number of preference patterns observed in *ABC* and *A'B'C'* designs. The pattern *222111*, predicted by majority rule, was observed 18 times. The opposite pattern, *111222*, predicted by regret theory, was observed 4 times (Experiment 4).

Response Pattern on *ABC*	Response Pattern on *A'B'C'*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	2	10	0	3	2	8	2	4
112	8	261	2	13	3	48	3	4
121	3	4	5	3	4	3	6	3
122	4	24	6	5	6	9	3	3
211	2	13	0	0	2	9	5	4
212	10	92	1	10	1	53	2	4
221	10	12	5	3	9	4	33	2
222	18	18	5	2	4	9	2	2

Table SM.6. Number of preference patterns observed in *A''B''C''* designs. (Experiment 4)

Response Pattern First Rep	Response Pattern on Second Replicate *A"B"C"*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	1	5	2	1	1	1	0	1
112	9	149	1	5	5	29	1	2
121	2	0	2	3	0	0	2	5
122	1	8	0	3	0	0	1	1
211	1	3	1	0	2	0	6	0
212	3	45	1	5	6	29	3	4
221	2	0	4	1	3	2	21	8
222	0	3	2	2	0	2	2	3

Table SM.7. Number of preference patterns observed in *ABC* design of Experiment 6, as in Table SM.3. Data are summed over two blocks.

Response Pattern First Rep	Response Pattern on Second Replicate *ABC*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	1	0	0	0	2	0	0	1
112	2	29	0	4	0	7	0	0
121	0	0	0	2	1	1	2	2
122	0	1	1	0	0	0	1	0
211	1	0	0	0	0	0	1	0
212	1	9	0	1	0	6	0	0
221	0	0	6	0	0	0	11	0
222	0	0	0	0	0	2	1	0

Table SM.8. Number of preference patterns observed in *A'B'C'* design of Experiment 6, as in Table SM.4. Data are summed over blocks.

Response Pattern First Rep	Response Pattern on Second Replicate *A'B'C'*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	0	1	0	2	1	1	0	0
112	0	37	0	3	1	5	0	0
121	0	0	2	1	0	0	2	1
122	1	1	0	2	1	1	0	1
211	0	0	1	0	0	0	0	1
212	1	8	0	1	0	7	0	0
221	0	1	2	0	1	0	11	0
222	0	0	1	0	0	0	0	1

Table SM.9. Number of preference patterns observed in *A''B''C''* design in Experiment 6, as in Table SM.6. Data are summed over blocks.

Response Pattern First Rep	Response Pattern on Second Replicate *A"B"C"*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	1	1	0	0	0	2	0	0
112	0	32	0	1	1	8	0	2
121	0	0	3	0	2	1	1	0
122	1	1	0	0	0	0	0	0
211	0	1	0	0	0	0	1	0
212	0	7	0	0	0	8	0	1
221	0	0	1	0	1	1	16	2
222	0	0	0	0	1	2	1	0

Table SM.10. Number of preference patterns observed in new *IJK* design, summed over blocks. (Experiment 5). Here $I = (90, 50, 10)$, $J = (10, 90, 50)$, $K = (50, 10, 90)$. Regret aversion implies the intransitive pattern, *111 111*, and advantage seeking (including majority rule) implies the opposite, *222 222*. Instead, the two most common response patterns are to choose the gamble with the better consequence in the first position (Red), *122 122*, or to choose the gamble presented first, *111 222*.

Response Pattern First Rep	Response Pattern on Second Replicate *IJK*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	19	9	14	23	8	7	8	120
112	7	23	10	28	4	6	5	9
121	17	8	32	33	8	4	16	23
122	24	37	30	141	12	11	10	19
211	6	4	11	11	18	4	12	6
212	7	6	7	6	3	5	2	6
221	7	4	13	5	13	4	60	15
222	31	12	10	13	6	10	10	66

Table SM.11. Number of preference patterns observed in new *IJK* design, summed over blocks. (Experiment 6, Design 2). Again, the most common response patterns are *122 122* and *111 222*.

Response Pattern First Rep	Response Pattern on Second Replicate *IJK*							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	4	0	2	3	1	1	0	17
112	0	5	2	2	0	1	0	1
121	0	1	1	2	1	0	1	3
122	1	2	3	17	1	0	0	0
211	0	1	0	1	5	0	0	2
212	1	0	0	0	1	1	0	0
221	1	1	0	1	0	0	8	1
222	1	1	0	1	0	0	0	1

Table SM.12. Number of preference patterns observed in new $I'J'K'$ design, summed over blocks. Here $I' = (15, 35, 85)$, $J' = (85, 15, 35)$ and $K' = (35, 85, 15)$. (Experiment 6, Design 2). The most common response patterns are to choose the gamble presented first, *111 222*, or to choose the gamble with the better outcome in the first position (Red), *211 211*.

Response Pattern First Rep	Response Pattern on Second Replicate $I'J'K'$							
	111	*112*	*121*	*122*	*211*	*212*	*221*	*222*
111	0	0	1	3	3	0	4	20
112	1	8	0	2	1	1	1	1
121	0	0	2	0	0	1	0	0
122	0	1	0	2	0	0	0	0
211	0	0	1	0	17	2	0	2
212	2	0	0	0	1	2	3	2
221	1	0	1	2	1	2	3	0
222	0	0	1	1	0	0	1	3

Table SM.13. Estimation of error rates and true probabilities in four tests of restricted branch independence (Experiment 5, first block).

Choice Type	Choice		Response Pattern					Parameter estimates		Statistical Tests	
										TE	Indep
	X	*Y*	*XX**	*XY**	*YX**	*YY**	*% Y*	*p*	*e*	$\chi^2(1)$	$\chi^2(1)$
SR	(5, 30, 40)	(5, 10, 90)	38	4	12	45	0.54	0.54	0.10	3.81	46.62
S'R'	(95, 30, 40)	(95, 10, 90)	14	9	12	65	0.75	0.84	0.12	0.43	18.88
SR	(5, 35, 45)	(5, 10, 90)	42	25	10	22	0.40	0.31	0.25	6.25	8.58
S'R'	(95, 35, 45)	(95, 10, 90)	25	5	7	62	0.69	0.71	0.07	0.33	51.20
SR	(5, 40, 50)	(5, 10, 90)	48	5	16	31	0.41	0.39	0.13	5.49	34.54
S'R'	(95, 40, 50)	(95, 10, 90)	24	15	11	49	0.63	0.68	0.16	0.61	19.31
SR	(5, 45, 55)	(5, 10, 90)	64	8	7	20	0.28	0.23	0.08	0.07	38.38
S'R'	(95, 45, 55)	(95, 10, 90)	32	21	11	35	0.52	0.52	0.21	3.08	13.33

Table SM.14. Estimation of error rates and true probabilities in four tests of restricted branch independence (Experiment 5, last block).

Choice Type	Choice		Response Pattern					Parameter estimates		Statistical Tests	
										TE	Indep
	X	*Y*	*XX**	*XY**	*YX**	*YY**	*% Y*	*p*	*e*	$\chi^2(1)$	$\chi^2(1)$
SR	(5, 30, 40)	(5, 10, 90)	30	5	9	53	0.62	0.64	0.08	1.12	47.17
S'R'	(95, 30, 40)	(95, 10, 90)	19	6	2	72	0.77	0.79	0.05	1.90	60.07
SR	(5, 35, 45)	(5, 10, 90)	42	5	6	46	0.52	0.52	0.06	0.09	59.86
S'R'	(95, 35, 45)	(95, 10, 90)	21	9	6	63	0.71	0.75	0.08	0.60	39.62
SR	(5, 40, 50)	(5, 10, 90)	45	11	7	35	0.45	0.44	0.10	0.88	39.09
S'R'	(95, 40, 50)	(95, 10, 90)	33	7	5	54	0.61	0.62	0.07	0.33	55.23
SR	(5, 45, 55)	(5, 10, 90)	56	3	7	33	0.38	0.37	0.07	1.90	61.74
S'R'	(95, 45, 55)	(95, 10, 90)	36	8	10	45	0.55	0.56	0.11	0.28	39.79

Table SM.15. Estimation of error rates and true probabilities in four tests of restricted branch independence (Experiment 6, Design 2).

Choice Type	Choice		Response Pattern					Parameter estimates		Statistical Tests TE	Statistical Tests Indep
	X	*Y*	*XX**	*XY**	*YX**	*YY**	*% Y*	*p*	*e*	$\chi^2(1)$	$\chi^2(1)$
SR	(5, 30, 40)	(5, 10, 90)	59	8	4	28	0.34	0.32	0.07	1.30	53.43
S'R'	(95, 30, 40)	(95, 10, 90)	33	9	5	52	0.60	0.61	0.08	1.12	49.81
SR	(5, 35, 45)	(5, 10, 90)	66	4	5	24	0.29	0.27	0.05	0.11	60.01
S'R'	(95, 35, 45)	(95, 10, 90)	45	9	8	38	0.46	0.46	0.09	0.06	43.36
SR	(5, 40, 50)	(5, 10, 90)	70	5	7	17	0.23	0.19	0.07	0.33	43.31
S'R'	(95, 40, 50)	(95, 10, 90)	59	3	1	36	0.38	0.38	0.02	0.95	82.97
SR	(5, 45, 55)	(5, 10, 90)	77	5	4	13	0.18	0.14	0.05	0.11	46.88
S'R'	(95, 45, 55)	(95, 10, 90)	61	10	7	21	0.30	0.25	0.10	0.53	34.64