How category learning affects object discrimination: Not all morphspaces stretch alike

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Supplementary Materials

Supplemental Methods

Tables S1-S4 give the exact contributions of each parent to each stimulus in the factorial and blended morphspaces in Experiment 1. Each row of the table represents a separate stimulus in either the 8x8 stimulus space (used for category learning) or the 4x4 stimulus space (used for perceptual discrimination). The first two columns indicate the row (x dimension) and column (y dimension) of the stimulus within the space. Each of the final four columns give the percentage contribution of each parent to the stimulus. Each table is accompanied by a figure showing the corresponding space. The figures and tables are color coded so that a subset of table rows can be easily mapped onto the morphspaces shown in the figures.

Tables S5 and S6 give the exact contributions of each parent to each stimulus in the factorial and blended morphspaces in Experiment 2. Because the octagonal arrangement of the objects in Experiment 2 is too complicated to express in terms of rows and columns, we simply assign a unique stimulus number to each row of the tables. Each table is accompanied by a flat figure showing the location of each stimulus number in the morphspace and its proximity to each parent.

Figure S7 shows the full set of boundary orientations used during Phase 1 and Phase 2 of Experiment 2. For each of the two columns of the figure, each row represents the sequence of boundary orientations used for each subject.

Figure S1. Color coded positions of the 4x4 factorial space within the tetrahedron. Colored dots correspond to like-colored rows in table S1 above. For instance, red dots correspond to the positions of the rows with red text.

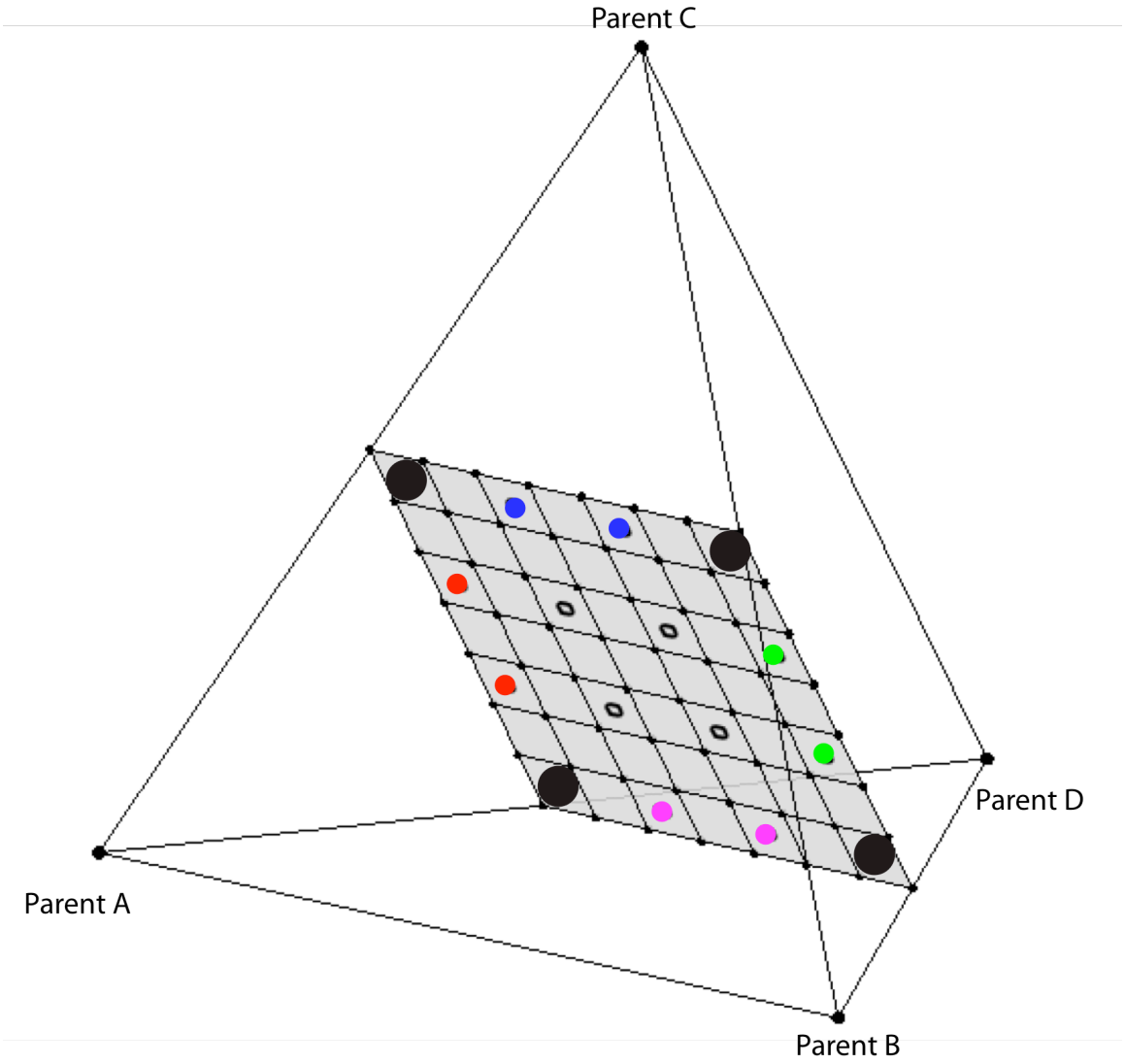

Table S1 4x4 factorial space, Experiment 1

column	row	% Parent A	% Parent B	% Parent C	% Parent D
1	1	**46**	**4**	**46**	**4**
1	2	46	4	32	18
1	3	46	4	18	32
1	4	**46**	**4**	**4**	**46**
2	1	32	18	46	4
2	2	32	18	32	18
2	3	32	18	18	32
2	4	32	18	4	46
3	1	18	32	46	4
3	2	18	32	32	18
3	3	18	32	18	32
3	4	18	32	4	46
4	1	**4**	**46**	**46**	**4**
4	2	4	46	32	18
4	3	4	46	18	32
4	4	**4**	**46**	**4**	**46**

Figure S2. Color coded positions of stimuli with the 8x8 factorial space.

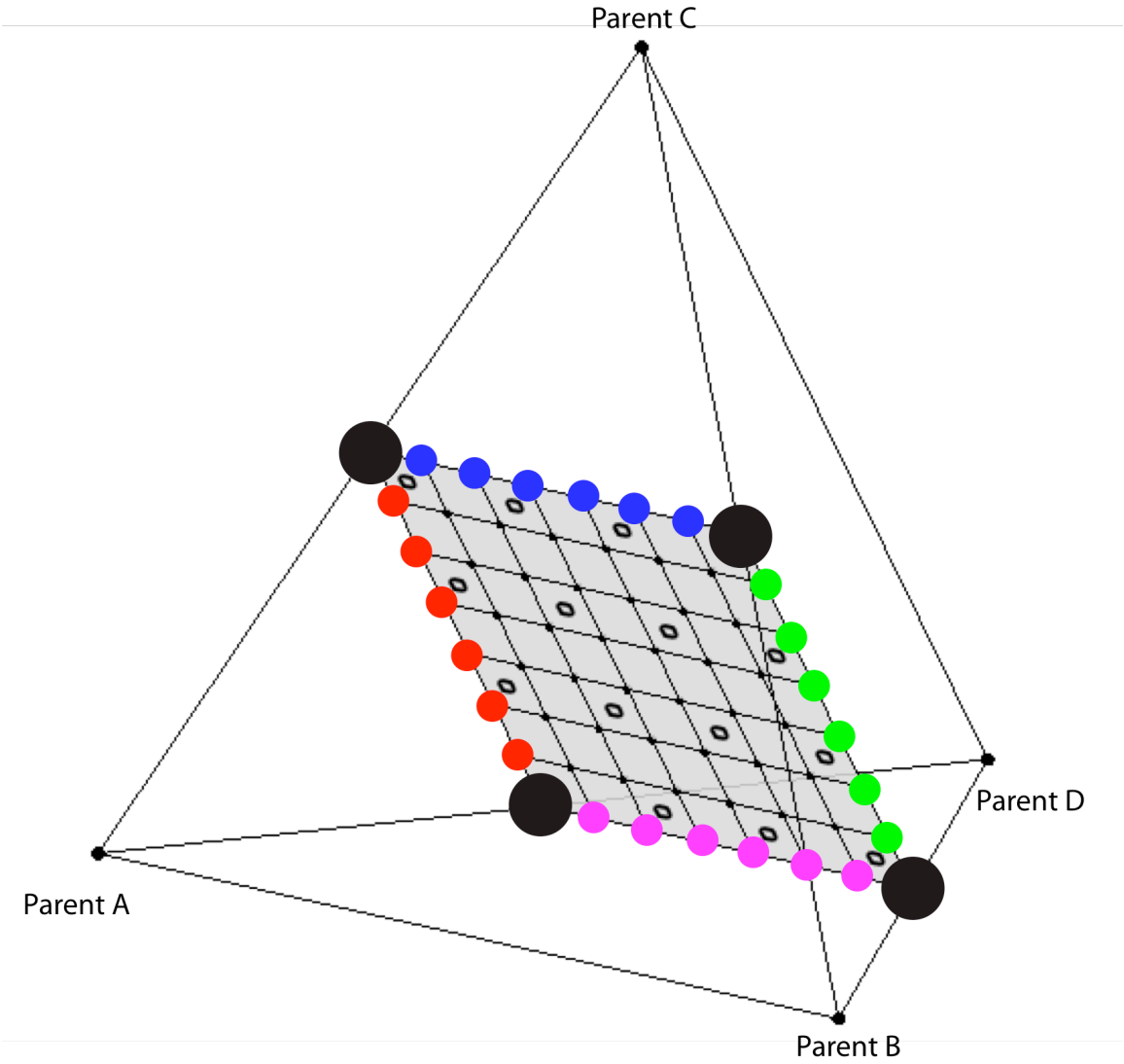

Table S2 8x8 factorial space, Experiment 1

column	row	% Parent A	% Parent B	% Parent C	% Parent D
1	**1**	**50**	**0**	**50**	**0**
1	2	50	0	43	7
1	3	50	0	36	14
1	4	50	0	29	21
1	5	50	0	21	29
1	6	50	0	14	36
1	7	50	0	7	43
1	**8**	**50**	**0**	**0**	**50**
2	1	43	7	50	0
2	2	43	7	43	7
2	3	43	7	36	14
2	4	43	7	29	21
2	5	43	7	21	29
2	6	43	7	14	36
2	7	43	7	7	43
2	8	43	7	0	50
3	1	36	14	50	0
3	2	36	14	43	7
3	3	36	14	36	14
3	4	36	14	29	21
3	5	36	14	21	29
3	6	36	14	14	36
3	7	36	14	7	43
3	8	36	14	0	50
4	1	29	21	50	0
4	2	29	21	43	7
4	3	29	21	36	14
4	4	29	21	29	21
4	5	29	21	21	29
4	6	29	21	14	36
4	7	29	21	7	43
4	8	29	21	0	50
5	1	21	29	50	0
5	2	21	29	43	7
5	3	21	29	36	14
5	4	21	29	29	21
5	5	21	29	21	29

5	6	21	29	14	36
5	7	21	29	7	43
5	8	21	29	0	50
6	1	14	36	50	0
6	2	14	36	43	7
6	3	14	36	36	14
6	4	14	36	29	21
6	5	14	36	21	29
6	6	14	36	14	36
6	7	14	36	7	43
6	8	14	36	0	50
7	1	7	43	50	0
7	2	7	43	43	7
7	3	7	43	36	14
7	4	7	43	29	21
7	5	7	43	21	29
7	6	7	43	14	36
7	7	7	43	7	43
7	8	7	43	0	50
8	**1**	**0**	**50**	**50**	**0**
8	2	0	50	43	7
8	3	0	50	36	14
8	4	0	50	29	21
8	5	0	50	21	29
8	6	0	50	14	36
8	7	0	50	7	43
8	**8**	**0**	**50**	**0**	**50**

Figure S3 Color coded positions of stimuli within the 4x4 blended space

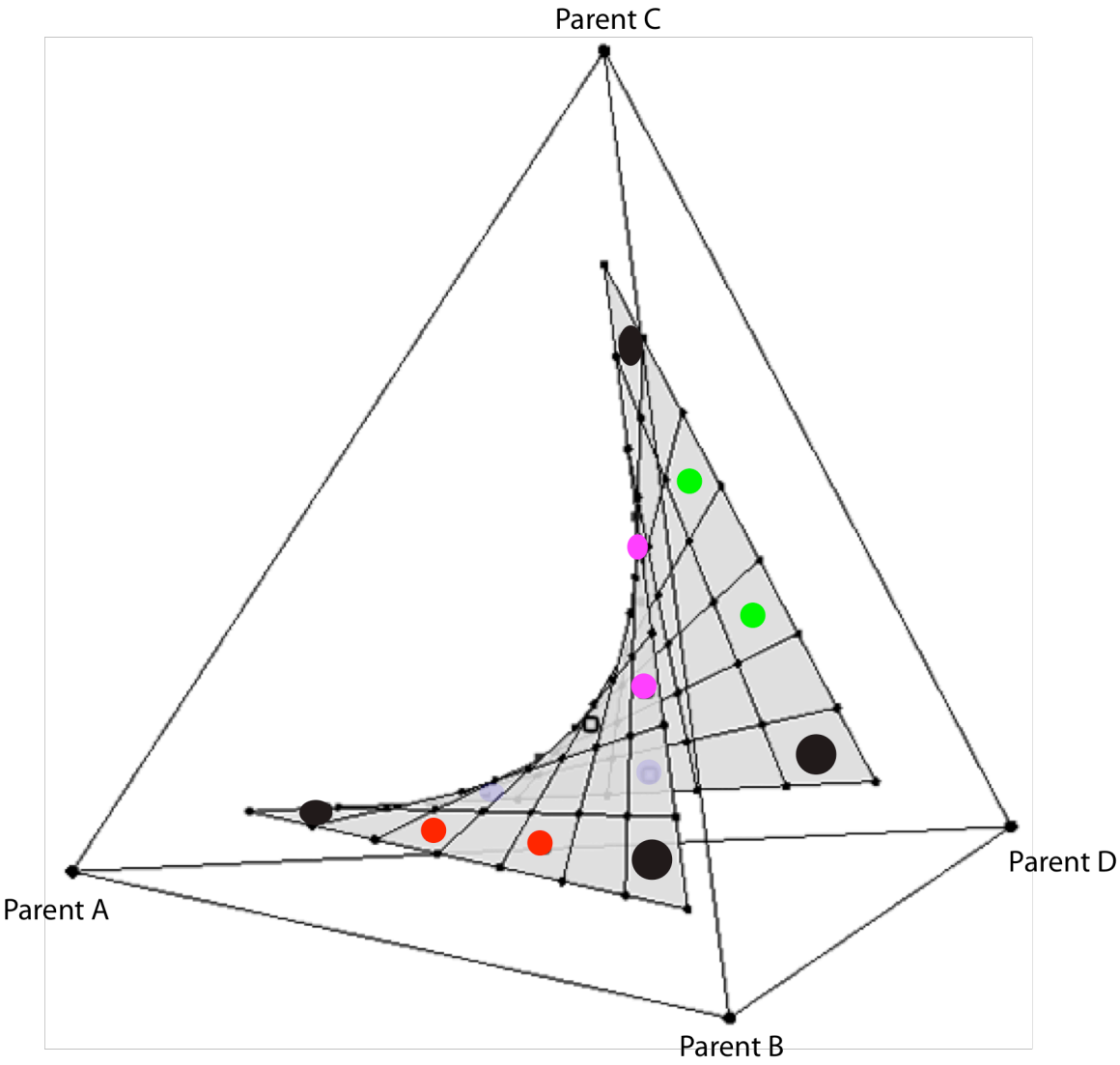

Table S3 4x4 blended space, Experiment 1

column	row	% Parent A	% Parent B	% Parent C	% Parent D
1	1	**66**	**13**	**9**	**13**
1	2	48	30	10	11
1	3	30	48	11	10
1	4	**13**	**66**	**13**	**9**
2	1	48	11	10	30
2	2	36	24	17	24
2	3	24	36	24	17
2	4	11	48	30	10
3	1	30	10	11	48
3	2	24	17	24	36
3	3	17	24	36	24
3	4	10	30	48	11
4	1	**13**	**9**	**13**	**66**
4	2	11	10	30	48
4	3	10	11	48	30
4	4	**9**	**13**	**66**	**13**

Figure S4 Color coded positions of stimuli within the 8x8 blended space

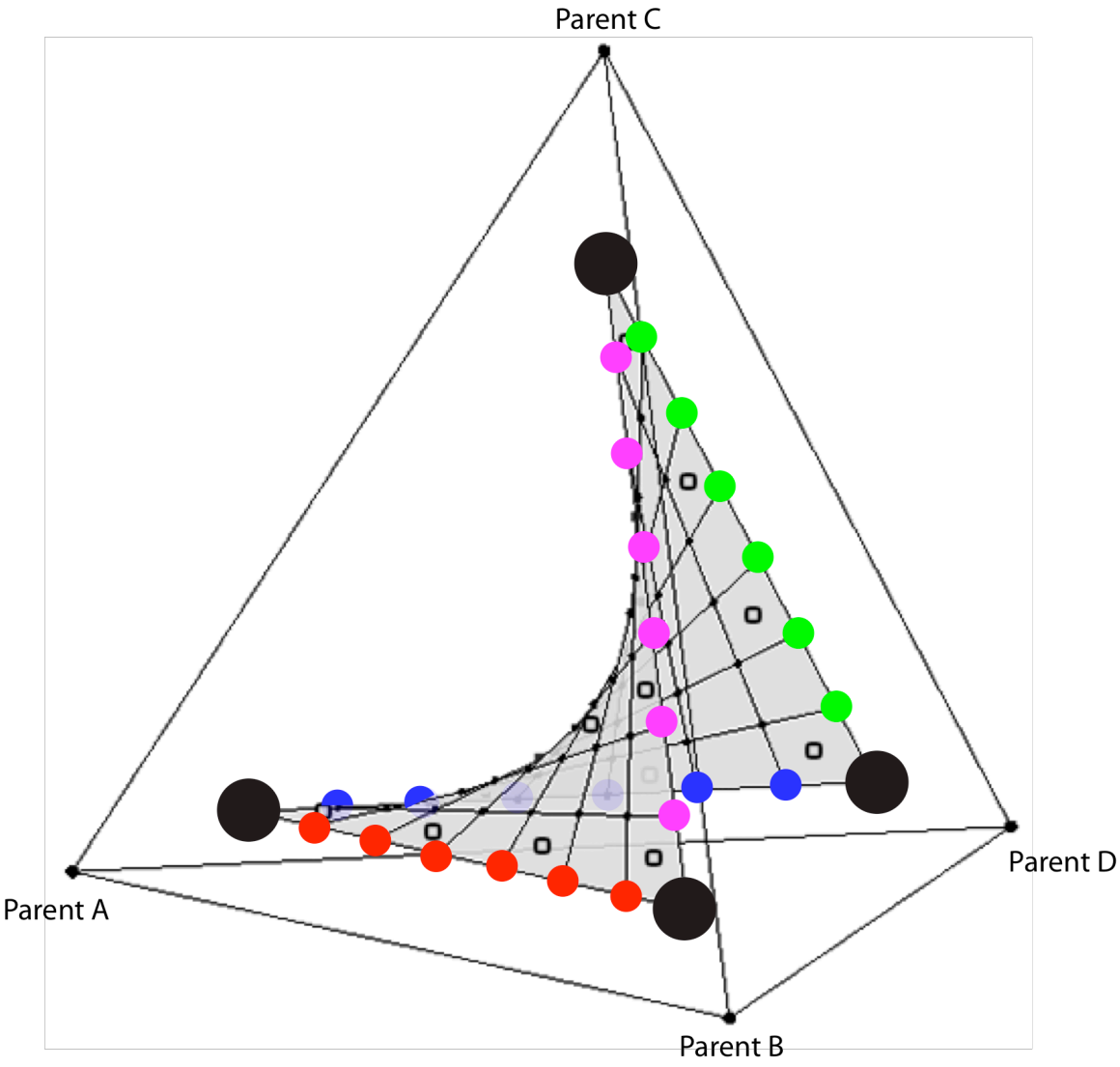

Table S4 8x8 blended space, Experiment 1

column	row	% Parent A	% Parent B	% Parent C	% Parent D
1	1	**75**	**8**	**8**	**8**
1	2	65	18	8	8
1	3	56	27	8	8
1	4	46	37	8	8
1	5	37	46	8	8
1	6	27	56	8	8
1	7	18	65	8	8
1	8	**8**	**75**	**8**	**8**
2	1	65	8	8	18
2	2	57	16	10	16
2	3	49	25	11	15
2	4	41	33	12	14
2	5	33	41	14	12
2	6	25	49	15	11
2	7	16	57	16	10
2	8	8	65	18	8
3	1	56	8	8	27
3	2	49	15	11	25
3	3	42	22	14	22
3	4	36	29	16	19
3	5	29	36	19	16
3	6	22	42	22	14
3	7	15	49	25	11
3	8	8	56	27	8
4	1	46	8	8	37
4	2	41	14	12	33
4	3	36	19	16	29
4	4	30	25	21	25
4	5	25	30	25	21
4	6	19	36	29	16
4	7	14	41	33	12
4	8	8	46	37	8
5	1	37	8	8	46
5	2	33	12	14	41
5	3	29	16	19	36

5	4	25	21	25	30
5	5	21	25	30	25
5	6	16	29	36	19
5	7	12	33	41	14
5	8	8	37	46	8
6	1	27	8	8	56
6	2	25	11	15	49
6	3	22	14	22	42
6	4	19	16	29	36
6	5	16	19	36	29
6	6	14	22	42	22
6	7	11	25	49	15
6	8	8	27	56	8
7	1	18	8	8	65
7	2	16	10	16	57
7	3	15	11	25	49
7	4	14	12	33	41
7	5	12	14	41	33
7	6	11	15	49	25
7	7	10	16	57	16
7	8	8	18	65	8
8	1	**8**	**8**	**8**	**75**
8	2	8	8	18	65
8	3	8	8	27	56
8	4	8	8	37	46
8	5	8	8	46	37
8	6	8	8	56	27
8	7	8	8	65	18
8	8	**8**	**8**	**75**	**8**

Figure S5. Guide to positions of stimuli within the factorial space of Experiment 2. The color coding scheme used for Experiment 1 is not convenient because of the complexity of the space. We therefore provide the position within the space of each stimulus. Numbers in the figure correspond to row numbers in the table above.

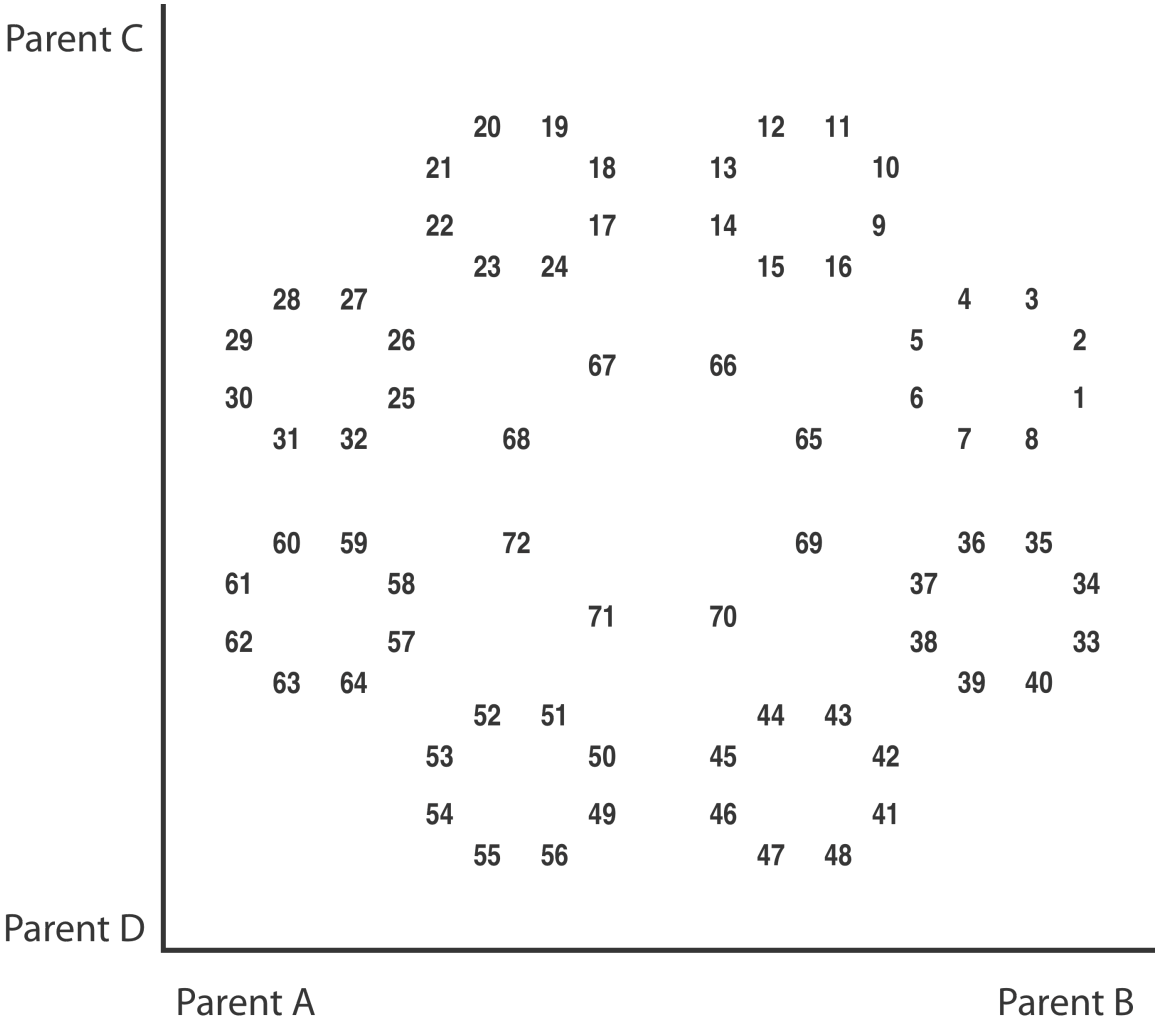

Table S5 Factorial Space, Experiment 2

Stim. #	% Parent A	% Parent B	% Parent C	% Parent D
1	0	50	31	19
2	0	50	35	15
3	3	47	38	12
4	7	43	38	12
5	10	40	35	15
6	10	40	31	19
7	7	43	29	21
8	3	47	29	21
9	12	38	43	7
10	12	38	47	3
11	15	35	50	0
12	19	31	50	0
13	21	29	47	3
14	21	29	43	7
15	19	31	40	10
16	15	35	40	10
17	29	21	43	7
18	29	21	47	3
19	31	19	50	0
20	35	15	50	0
21	38	12	47	3
22	38	12	43	7
23	35	15	40	10
24	31	19	40	10
25	40	10	31	19
26	40	10	35	15
27	43	7	38	12
28	47	3	38	12
29	50	0	35	15
30	50	0	31	19
31	47	3	29	21
32	43	7	29	21
33	0	50	15	35
34	0	50	19	31
35	3	47	21	29
36	7	43	21	29
37	10	40	19	31
38	10	40	15	35
39	7	43	12	38
40	3	47	12	38
41	12	38	3	47
42	12	38	7	43
43	15	35	10	40
44	19	31	10	40
45	21	29	7	43
46	21	29	3	47

47	19	31	0	50
48	15	35	0	50
49	29	21	3	47
50	29	21	7	43
51	31	19	10	40
52	35	15	10	40
53	38	12	7	43
54	38	12	3	47
55	35	15	0	50
56	31	19	0	50
57	40	10	15	35
58	40	10	19	31
59	43	7	21	29
60	47	3	21	29
61	50	0	19	31
62	50	0	15	35
63	47	3	12	38
64	43	7	12	38
65	16	34	29	21
66	21	29	34	16
67	29	21	34	16
68	34	16	29	21
69	16	34	21	29
70	21	29	16	34
71	29	21	16	34
72	34	16	21	29

Figure S6. Guide to positions of stimuli within the blended space of Experiment 2. The color coding scheme used for Experiment 1 is not convenient because of the complexity of the space. We therefore provide the position within the space of each stimulus. Numbers in the figure correspond to row numbers in the table above.

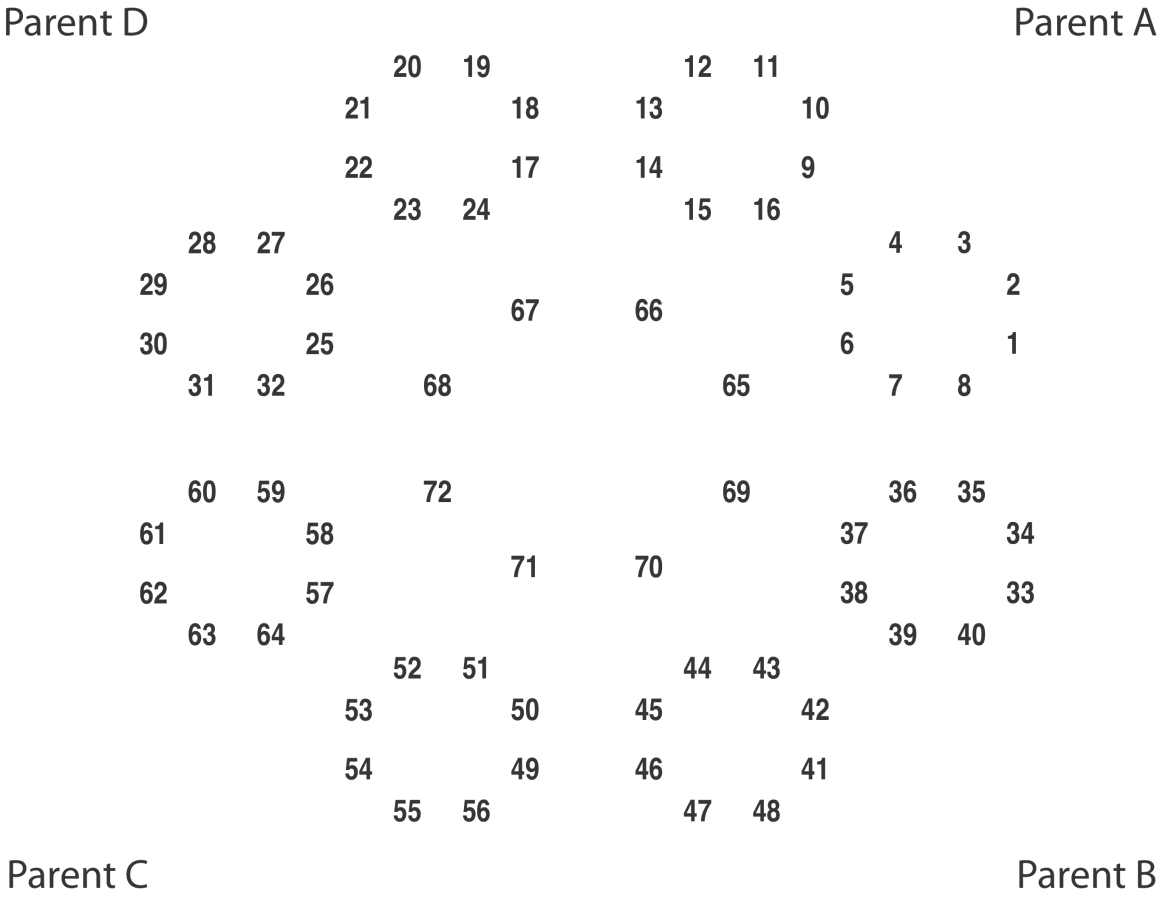

Table S6 Blended Space, Experiment 2

Stim. #	% Parent A	% Parent B	% Parent C	% Parent D
1	63	37	0	0
2	71	29	0	0
3	72	22	1	4
4	66	20	3	10
5	57	24	6	14
6	51	30	7	12
7	49	37	6	8
8	54	40	2	3
9	66	10	3	20
10	72	4	1	22
11	71	0	0	29
12	63	0	0	37
13	54	3	2	40
14	49	8	6	37
15	51	12	7	30
16	57	14	6	24
17	37	6	8	49
18	40	2	3	54
19	37	0	0	63
20	29	0	0	71
21	22	1	4	72
22	20	3	10	66
23	24	6	14	57
24	30	7	12	51
25	12	7	30	51
26	14	6	24	57
27	10	3	20	66
28	4	1	22	72
29	0	0	29	71
30	0	0	37	63
31	3	2	40	54
32	8	6	37	49
33	29	71	0	0
34	37	63	0	0
35	40	54	3	2
36	37	49	8	6
37	30	51	12	7
38	24	57	14	6
39	20	66	10	3
40	22	72	4	1
41	4	72	22	1
42	10	66	20	3
43	14	57	24	6
44	12	51	30	7
45	8	49	37	6
46	3	54	40	2

47	0	63	37	0
48	0	71	29	0
49	2	40	54	3
50	6	37	49	8
51	7	30	51	12
52	6	24	57	14
53	3	20	66	10
54	1	22	72	4
55	0	29	71	0
56	0	37	63	0
57	6	14	57	24
58	7	12	51	30
59	6	8	49	37
60	2	3	54	40
61	0	0	63	37
62	0	0	71	29
63	1	4	72	22
64	3	10	66	20
65	38	29	14	19
66	38	19	14	29
67	29	14	19	38
68	19	14	29	38
69	29	38	19	14
70	19	38	29	14
71	14	29	38	19
72	14	19	38	29

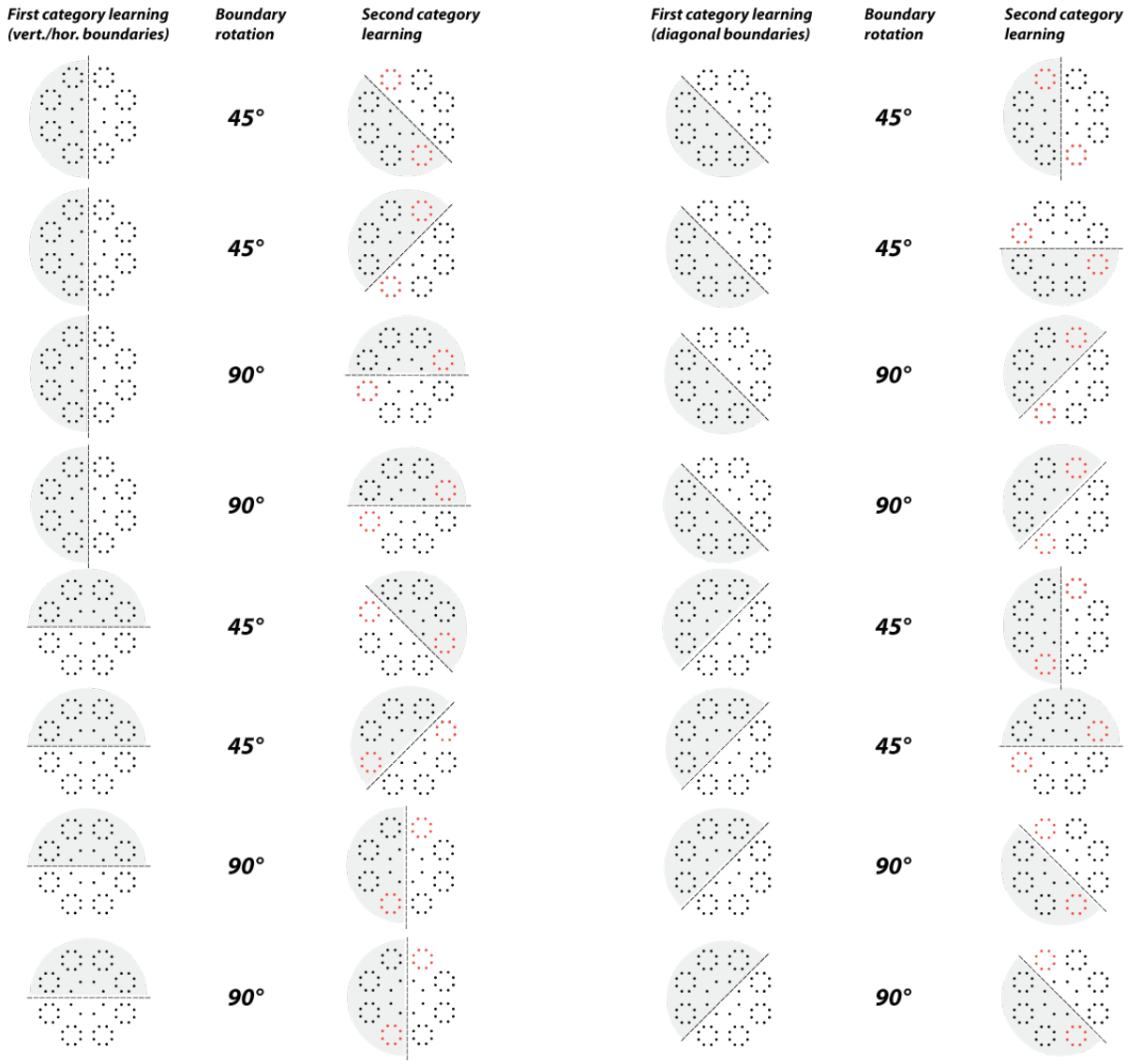

Figure S7. Category boundaries learned during first and second category learning sessions. Critical exemplars compared after 45 degree and 90 degree boundary rotations are shown in red. While we did not attempt to match the exact critical pairs used in the 90 and 45 degree rotation conditions, critical pairs in those conditions were matched for distance from the category boundary.