CODECHECK certificate 2025-020

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Item	Value
Title of checked publication	Exploring Categorical Colors
Author(s)	Lukas Röseler
Reference	https://doi.org/10.31234/osf.io/gj76p
Codechecker(s)	Prince Oppong Boakye
Date of check	2025-06-28 12:28:00
Summary	The workflow outlined in the authors' README was easily comprehensible. All figures stored in the repository could be recreated in R, and they accurately matched those presented in the manuscript.
Repository	https://github.com/codecheckers/Exploring-Categorical-Colors.git

Table 1: CODECHECK summary

Output	Comment	Size (b)
`ministudy1_analyses_final.R`	Analysis script for pilot study.	2013
`ministudy2_analyses_final.R`	Analysis script for main study.	9262
`study1_data_processed.csv`	Dataset for pilot study.	8645
`study2_data_processed.csv`	Dataset for main study.	54252
`pilot.jpg`	Figure 2 in the manuscript.	185627
`colors_scatterplot.jpg`	Figure 3 in the manuscript.	408634
`colors_violinplot.jpg`	Figure 5 in the manuscript.	557456
`colors_means.jpg`	Figure 4 in the manuscript.	292457

Table 2: Summary of output files generated

Summary

This workflow was straightforward to follow, as per the authors' README. All figures stored in the repository could be recreated and matched the ones presented in the manuscript.

CODECHECKER notes

- Ensure that the `pilot.jpg` file is in the same directory as `codecheck.yml` and `codecheck.Rmd` before running the `make` command.

- The R package codecheck (if used) expects the exact filenames as listed in the manifest. Verify the existence and format of all files in the manifest prior to execution.

- The analysis scripts download data from OSF, so an internet connection is required.

The GitHub repo is at https://github.com/codecheckers/Exploring-Categorical-Colors.git, This check is based on the commit `f91ec9cebf8d1a75dd9f369a181909b595df3f5c`. Code was written in R. I went through the following steps:

- Installed required packages: ggplot2, reshape, dplyr, psych

- Executed ministudy1_analyses_final.R and ministudy2_analyses_final.R which downloaded data from OSF

- Generated all figures in working directory

This took 2 minute to complete on my laptop.

Recommendations

The manuscript's results were successfully reproduced. The analysis code is robust and well-structured. Minor adjustments were required to the manifest to accommodate the actual file format of one figure, which did not affect the computational results which did not affect the computational results.

Manifest files

ministudy1_analyses_final.R

Cannot inlcude output file as figure.

ministudy2_analyses_final.R

Cannot inlcude output file as figure.

study1_data_processed.csv

Summary statistics of tabular data:

```
-- Data Summary ------------------------
                        Values
Name                    read.csv(path)
Number of rows          25
Number of columns       99

-----------------------
Column type frequency:
 character              5
 logical                5
 numeric                89
-----------------------
Group variables         None

-- Variable type: character ------------------------------
 skim_variable n_missing complete_rate min max empty
1 QUESTNNR          0             1   4   4     0
2 MODE              0             1   9   9     0
3 STARTED           0             1  19  19     0
4 DE02_01           0             1   2  15     0
5 LASTDATA          0             1  19  19     0
 n_unique whitespace
1       1          0
2       1          0
3      24          0
4      12          0
5      24          0

-- Variable type: logical ------------------------------
 skim_variable n_missing complete_rate mean count
1 SERIAL           25             0  NaN ": "
2 REF              25             0  NaN ": "
3 MAILSENT         25             0  NaN ": "
4 FINISHED          0             1    1 "TRU: 25"
5 Q_VIEWER          0             1    0 "FAL: 25"

-- Variable type: numeric ------------------------------
   skim_variable n_missing complete_rate   mean       sd p0
1 X                  0             1  40.9    7.89  24
2 CASE               0             1  83.7    8.52  64
3 CO01_01            0             1  47.1   29.7    4
4 CO02_01            0             1  52.5   30.2    6
5 CO03_01            0             1  51.7   23.4    7
6 CO04_01            0             1  46.5   27.5    6
7 CO05_01            0             1  57.3   31.1    5
8 CO06_01            0             1  45.0   30.8    3
9 CO07_01            0             1  46.4   24.2    2
10 CO08_01           0             1  53.7   28.2    7
11 CO09_01           0             1  48.0   26.2    6
12 CO10_01           0             1  52.2   25.2    5
13 CO11_01           0             1  51.7   26.8    7
14 CO12_01           0             1  50.2   27.3    2
15 CO13_01           0             1  54.4   25.5   13
16 CO14_01           0             1  48.0   29.1    8
17 CO15_01           0             1  48.7   24.6    7
18 CO16_01           0             1  45.9   30.0    7
19 CO18_01           0             1  60.7   24.4    5
20 CO17_01           0             1  48.4   31.3    2
21 CO19_01           0             1  50.6   31.5    3
22 CO20_01           0             1  54.7   28.8    3
23 RA01_CP           0             1  43.8    8.16  28
24 RA01x01           0             1   9.88   5.56   1
25 RA01x02           0             1  11.0    6.38   1
26 RA01x03           0             1  10.9    5.04   2
27 RA01x04           0             1   9.64   6.08   2
28 RA01x05           0             1  12.4    6.14   1
29 RA01x06           0             1   9.2    5.75   1
30 RA01x07           0             1   9.6    4.65   2
31 RA01x08           0             1  10.9    5.97   1
32 RA01x09           0             1   9.44   5.62   1
33 RA01x10           0             1  11.0    5.84   1
34 RA01x11           0             1  10.8    5.15   2
35 RA01x12           0             1  10.1    5.35   1
36 RA01x13           0             1  11.7    5.27   3
37 RA01x14           0             1  10.2    6.20   1
38 RA01x15           0             1  10.5    5.17   2
```

39	RA01x16	0	1	9.08	6.45	1
40	RA01x17	0	1	9.72	7.20	1
41	RA01x18	0	1	12.4	5.24	2
42	RA01x19	0	1	10.8	6.74	1
43	RA01x20	0	1	11.0	5.73	1
44	DE01	0	1	1.88	0.332	1
45	TIME001	0	1	600.	1158.	3
46	TIME002	0	1	1.44	0.651	1
47	TIME003	0	1	10.2	8.19	4
48	TIME004	0	1	1.4	0.5	1
49	TIME005	0	1	4.8	2.36	2
50	TIME006	0	1	1.16	0.374	1
51	TIME007	0	1	4.6	2.89	2
52	TIME008	0	1	1.28	0.458	1
53	TIME009	0	1	5.4	5.67	2
54	TIME010	0	1	1.12	0.332	1
55	TIME011	0	1	4.08	2.18	1
56	TIME012	0	1	1.2	0.408	1
57	TIME013	0	1	3.76	1.42	2
58	TIME014	0	1	1.28	0.458	1
59	TIME015	0	1	3.48	1.12	2
60	TIME016	0	1	1.2	0.408	1
61	TIME017	0	1	3.72	2.39	2
62	TIME018	0	1	1.16	0.374	1
63	TIME019	0	1	3.68	1.03	2
64	TIME020	0	1	1.16	0.374	1
65	TIME021	0	1	3.36	1.29	2
66	TIME022	0	1	1.04	0.2	1
67	TIME023	0	1	3.64	1.63	1
68	TIME024	0	1	1.2	0.408	1
69	TIME025	0	1	3.32	1.55	2
70	TIME026	0	1	1.24	0.436	1
71	TIME027	0	1	3.2	1.22	2
72	TIME028	0	1	1.32	0.476	1
73	TIME029	0	1	3.24	1.45	2
74	TIME030	0	1	1.28	0.458	1
75	TIME031	0	1	3.4	1.26	2
76	TIME032	0	1	1.24	0.436	1
77	TIME033	0	1	2.96	1.17	2
78	TIME034	0	1	1.44	0.507	1
79	TIME035	0	1	3.2	1.71	1
80	TIME036	0	1	1.2	0.408	1
81	TIME037	0	1	3	1.15	2
82	TIME038	0	1	1.08	0.277	1
83	TIME039	0	1	3.48	1.36	2
84	TIME040	0	1	1.08	0.277	1
85	TIME041	0	1	3.2	1.44	2
86	TIME042	0	1	7.68	3.47	4
87	TIME_SUM	0	1	118.	18.2	94
88	LASTPAGE	0	1	42	0	42
89	MAXPAGE	0	1	42	0	42

	p25	p50	p75	p100	hist
1	35	41	47	54	
2	78	84	90	98	
3	26	52	62	99	
4	29	55	77	100	
5	36	55	62	98	
6	22	51	73	89	
7	40	57	79	99	
8	12	45	71	97	
9	32	41	62	96	
10	26	55	81	95	
11	32	46	59	98	
12	32	51	63	99	
13	35	54	73	99	
14	33	52	70	94	
15	33	56	75	93	
16	16	54	66	92	
17	29	52	64	93	
18	18	40	71	98	
19	42	57	82	96	
20	16	49	73	96	
21	22	51	82	96	
22	39	50	81	99	
23	38	44	50	58	
24	5	10	15	19	
25	6	13	17	20	
26	8	10	15	20	
27	4	10	16	20	
28	9	12	18	20	

```
29    4    9   14    18
30    6    8   14    18
31    5   11   17    20
32    5    8   13    20
33    7   11   15    20
34    8   10   15    20
35    6   11   13    19
36    8   12   16    20
37    4    9   15    20
38    6   11   14    19
39    4    8   16    19
40    2   11   17    20
41    8   12   17    20
42    4   13   16    20
43    7   11   16    20
44    2    2    2     2
45   20   31   84  2949
46    1    1    2     3
47    6    7   11    39
48    1    1    2     2
49    3    4    6    14
50    1    1    1     2
51    3    4    4    16
52    1    1    2     2
53    3    4    5    30
54    1    1    1     2
55    3    4    4    12
56    1    1    1     2
57    3    4    4     9
58    1    1    2     2
59    3    3    4     6
60    1    1    1     2
61    3    3    4    14
62    1    1    1     2
63    3    3    4     6
64    1    1    1     2
65    3    3    4     7
66    1    1    1     2
67    3    4    4    10
68    1    1    1     2
69    2    3    4     8
70    1    1    1     2
71    2    3    4     7
72    1    1    2     2
73    2    3    4     8
74    1    1    2     2
75    2    3    4     6
76    1    1    1     2
77    2    3    4     6
78    1    1    2     2
79    2    3    4    10
80    1    1    1     2
81    2    3    4     6
82    1    1    1     2
83    3    3    4     7
84    1    1    1     2
85    2    3    4     7
86    6    7    8    22
87  104  119  132   156
88   42   42   42    42
89   42   42   42    42
```

study2_data_processed.csv

Summary statistics of tabular data:

```
-- Data Summary ------------------------
                        Values
Name                    read.csv(path)
Number of rows          73
Number of columns       208
_____
Column type frequency:
 character              5
 logical                28
 numeric                175
_____
Group variables         None

-- Variable type: character -------------------------------
 skim_variable n_missing complete_rate min max empty
1 QUESTNNR            0               1   4   4     0
2 MODE                0               1   9   9     0
3 STARTED             0               1  19  19     0
4 DE03_01             0               1   5   9     0
5 LASTDATA            0               1  19  19     0
 n_unique whitespace
1        1          0
2        1          0
3       73          0
4       71          0
5       73          0

-- Variable type: logical ---------------------------------
   skim_variable n_missing complete_rate      mean
1 SERIAL                73           0     NaN
2 REF                   73           0     NaN
3 DE04_01                0           1       0
4 DE04_02                0           1       0
5 DE04_03                0           1       0
6 FA01_01                9       0.877   0.375
7 FA02_01                9       0.877   0.25
8 FA03_01                9       0.877   0.172
9 FA04_01                9       0.877   0.109
10 FA05_01               9       0.877   0.0781
11 FA06_01               9       0.877   0.0625
12 FA07_01               9       0.877   0.0625
13 FA08_01               9       0.877   0.0781
14 FA09_01               9       0.877   0.109
15 FA10_01               9       0.877   0.109
16 FA11_01               7       0.904   0.136
17 FA12_01               7       0.904   0.106
18 FA13_01               7       0.904   0.121
19 FA14_01               7       0.904   0.106
20 FA15_01               7       0.904   0.0606
21 FA16_01               7       0.904   0.0909
22 FA17_01               7       0.904   0.0455
23 FA18_01               7       0.904   0.0606
24 FA19_01               7       0.904   0.152
25 FA20_01               6       0.918   0.149
26 MAILSENT             73           0     NaN
27 FINISHED              0           1       1
28 Q_VIEWER              0           1       0
  count
1 ": "
2 ": "
3 "FAL: 73"
4 "FAL: 73"
5 "FAL: 73"
6 "FAL: 40, TRU: 24"
7 "FAL: 48, TRU: 16"
8 "FAL: 53, TRU: 11"
9 "FAL: 57, TRU: 7"
10 "FAL: 59, TRU: 5"
11 "FAL: 60, TRU: 4"
12 "FAL: 60, TRU: 4"
13 "FAL: 59, TRU: 5"
14 "FAL: 57, TRU: 7"
15 "FAL: 57, TRU: 7"
16 "FAL: 57, TRU: 9"
17 "FAL: 59, TRU: 7"
```

```
18 "FAL: 58, TRU: 8"
19 "FAL: 59, TRU: 7"
20 "FAL: 62, TRU: 4"
21 "FAL: 60, TRU: 6"
22 "FAL: 63, TRU: 3"
23 "FAL: 62, TRU: 4"
24 "FAL: 56, TRU: 10"
25 "FAL: 57, TRU: 10"
26 ": "
27 "TRU: 73"
28 "FAL: 73"

-- Variable type: numeric --------------------------------
   skim_variable n_missing complete_rate      mean
 1 X.2                   0            1      40.8
 2 X.1                   0            1      41.8
 3 X                     0            1     184.
 4 CASE                  0            1     308.
 5 CO01_01               0            1      48.0
 6 CO02_01               0            1      49.7
 7 CO03_01               0            1      43.4
 8 CO04_01               0            1      47.4
 9 CO05_01               0            1      46.6
10 CO06_01               0            1      46.6
11 CO07_01               0            1      50.5
12 CO08_01               0            1      42.5
13 CO09_01               0            1      46.9
14 CO10_01               0            1      45.4
15 CO11_01               0            1      50.4
16 CO12_01               0            1      46.8
17 CO13_01               0            1      49.0
18 CO14_01               0            1      52.8
19 CO15_01               0            1      46.2
20 CO16_01               0            1      47.7
21 CO18_01               0            1      50.5
22 CO17_01               0            1      47.5
23 CO19_01               0            1      47.6
24 CO20_01               0            1      41.1
25 RA01_CP               0            1     227.
26 RA01x01               0            1      10.8
27 RA01x02               0            1      11
28 RA01x03               0            1      10.2
29 RA01x04               0            1       9.81
30 RA01x05               0            1      10.2
31 RA01x06               0            1      10.6
32 RA01x07               0            1      11.4
33 RA01x08               0            1       8.90
34 RA01x09               0            1      10.5
35 RA01x10               0            1       9.82
36 RA01x11               0            1      11.3
37 RA01x12               0            1      11.1
38 RA01x13               0            1      11
39 RA01x14               0            1      10.8
40 RA01x15               0            1      10.4
41 RA01x16               0            1      10.3
42 RA01x17               0            1      10.6
43 RA01x18               0            1      11.2
44 RA01x19               0            1      10.4
45 RA01x20               0            1       9.79
46 DE01                  0            1       1.70
47 DE02_01               0            1      46.3
48 DE04                  0            1       0
49 DI01_01               0            1    5164.
50 DI02_01               0            1   11471.
51 DI03_01               0            1    7898.
52 DI04_01               0            1   13029.
53 DI05_01               0            1   16622.
54 DI06_01               0            1    9808.
55 DI07_01               0            1   10900.
56 DI08_01               0            1   15691.
57 DI10_01               0            1    9615.
58 DI11_01               0            1    5216.
59 DI12_01               0            1   15957.
60 DI13_01               0            1    5546.
61 DI14_01               0            1    9728.
62 DI15_01               0            1   13804.
63 DI16_01               0            1   11926.
64 DI17_01               0            1    9717.
65 DI18_01               0            1    4810.
66 DI19_01               0            1    8463.
```

```
 67 DI20_01           0      1    13707.
 68 DI09_01           0      1    10169.
 69 FA01              9    0.877    0.375
 70 FA02              9    0.877    0.25
 71 FA03              9    0.877    0.172
 72 FA04              9    0.877    0.109
 73 FA05              9    0.877    0.0781
 74 FA06              9    0.877    0.0625
 75 FA07              9    0.877    0.0625
 76 FA08              9    0.877    0.0781
 77 FA09              9    0.877    0.109
 78 FA10              9    0.877    0.109
 79 FA11              7    0.904    0.136
 80 FA12              7    0.904    0.106
 81 FA13              7    0.904    0.121
 82 FA14              7    0.904    0.106
 83 FA15              7    0.904    0.0606
 84 FA16              7    0.904    0.0909
 85 FA17              7    0.904    0.0455
 86 FA18              7    0.904    0.0606
 87 FA19              7    0.904    0.152
 88 FA20              6    0.918    0.149
 89 TIME001           0      1    155.
 90 TIME002           0      1      1.33
 91 TIME003           0      1     24.1
 92 TIME004           0      1     15.2
 93 TIME005           0      1      1.22
 94 TIME006           0      1     21.8
 95 TIME007           0      1      8.59
 96 TIME008           0      1      1.34
 97 TIME009           0      1     28.2
 98 TIME010           0      1      7.14
 99 TIME011           0      1      1.23
100 TIME012           0      1     21.1
101 TIME013           0      1      6.36
102 TIME014           0      1      1.25
103 TIME015           0      1     33.2
104 TIME016           0      1      6.62
105 TIME017           0      1      1.16
106 TIME018           0      1     25.9
107 TIME019           0      1      6.26
108 TIME020           0      1      1.14
109 TIME021           0      1     25.4
110 TIME022           0      1      6.29
111 TIME023           0      1      1.18
112 TIME024           0      1     28.1
113 TIME025           0      1      6.12
114 TIME026           0      1      1.22
115 TIME027           0      1     22.5
116 TIME028           0      1      5.74
117 TIME029           0      1      1.25
118 TIME030           0      1     20.2
119 TIME031           0      1      7.10
120 TIME032           0      1      1.15
121 TIME033           0      1     20.5
122 TIME034           0      1      6.36
123 TIME035           0      1      1.23
124 TIME036           0      1     25.6
125 TIME037           0      1      6.11
126 TIME038           0      1      1.22
127 TIME039           0      1     15.9
128 TIME040           0      1     17.3
129 TIME041           0      1      1.19
130 TIME042           0      1     19.2
131 TIME043           0      1      7.18
132 TIME044           0      1      2.44
133 TIME045           1    0.986    17.2
134 TIME046           0      1      8.04
135 TIME047           0      1      1.22
136 TIME048           0      1     18.5
137 TIME049           0      1      5.88
138 TIME050           0      1      1.21
139 TIME051           0      1     15.6
140 TIME052           0      1      5.51
141 TIME053           0      1      1.25
142 TIME054           0      1     21.1
143 TIME055           0      1      5.90
144 TIME056           0      1      1.66
145 TIME057           1    0.986    25.4
146 TIME058           0      1      5.37
```

147	TIME059	0	1	1.27
148	TIME060	0	1	23.0
149	TIME061	0	1	5.66
150	TIME062	0	1	77.5
151	TIME_SUM	0	1	688.
152	LASTPAGE	0	1	62
153	MAXPAGE	0	1	62
154	dis01	0	1	0.822
155	dis02	0	1	0.808
156	dis03	0	1	0.712
157	dis04	0	1	0.904
158	dis05	0	1	0.808
159	dis06	0	1	0.836
160	dis07	0	1	0.904
161	dis08	0	1	0.753
162	dis09	0	1	0.918
163	dis10	0	1	0.890
164	dis11	0	1	0.877
165	dis12	0	1	0.753
166	dis13	0	1	0.945
167	dis14	0	1	0.904
168	dis15	0	1	0.904
169	dis16	0	1	0.945
170	dis17	0	1	0.959
171	dis18	0	1	0.904
172	dis19	0	1	0.808
173	dis20	0	1	0.849
174	dis	0	1	17.2
175	rechenzeit	2	0.973	450.

	sd	p0	p25	p50	p75	p100	hist
1	23.8	1	20	41	61	81	
2	24.1	1	21	42	62	83	
3	54.5	85	139	183	232	272	
4	80.4	155	244	308	383	433	
5	29.1	1	28	49	71	99	
6	29.4	3	22	51	71	99	
7	30.2	2	17	40	62	99	
8	27.9	2	26	50	69	98	
9	25.6	3	26	51	66	100	
10	29.5	2	22	50	67	99	
11	30.0	2	22	52	76	99	
12	31.0	3	11	36	68	99	
13	27.4	5	26	49	65	99	
14	27.0	2	27	45	62	99	
15	29.4	3	23	51	75	98	
16	28.2	2	25	49	66	99	
17	28.6	3	24	52	69	99	
18	28.7	5	30	51	82	98	
19	24.3	5	26	45	61	99	
20	25.8	2	28	50	65	97	
21	28.8	3	25	54	77	98	
22	27.5	3	27	47	63	98	
23	30.7	3	26	42	82	98	
24	25.7	3	22	34	57	96	
25	79.0	77	163	227	300	350	
26	5.83	1	6	10	17	20	
27	5.62	1	6	11	15	20	
28	6.14	1	5	10	15	20	
29	5.82	1	5	9	15	20	
30	5.67	1	5	10	15	20	
31	6.06	1	5	11	16	20	
32	5.75	1	7	12	16	20	
33	5.81	1	4	8	13	20	
34	5.73	1	5	11	15	20	
35	5.47	1	5	10	14	20	
36	5.74	1	7	12	16	20	
37	5.95	1	6	11	16	20	
38	6.00	1	6	12	16	20	
39	5.69	1	7	10	16	20	
40	4.99	1	6	11	14	20	
41	5.67	1	6	11	15	20	
42	5.56	1	5	11	16	20	
43	5.98	1	6	12	16	20	
44	6.44	1	4	10	17	20	
45	5.41	1	5	9	14	20	
46	0.491	1	1	2	2	3	
47	14.9	19	37	50	58	78	
48	0	0	0	0	0	0	
49	519.	1326	5194	5194	5194	6434	
50	9310.	1978	10978	10978	10978	87910	

```
51    890.      815  8015   8015   8015    8998
52   1194.     3180 13180  13180  13180   14180
53   2532.     1600 17023  17023  17023   17908
54   1487.     1043 10043  10043  10043   11043
55    181.    10283 10883  10883  10883   11883
56   2528.     1500 16019  16019  16019   19019
57   8951.     8434  8534   8534   8534   85034
58    21.4     5110  5220   5220   5220    5230
59  15163.     1447 14407  14407  14407  143017
60    129.     5521  5531   5531   5531    6631
61    751.     4882  9872   9872   9872    9874
62   9773.     9689 12689  12689  12689   96089
63    118.    11812 11912  11912  11912   12912
64   9381.     4768  8674   8674   8674   88674
65    118.     3832  4828   4828   4828    4828
66    494.     4923  8523   8523   8523    9523
67    182.    13080 13683  13683  13683   14683
68    205.     9323 10144  10144  10144   11044
69    0.488       0     0      0      1       1
70    0.436       0     0      0   0.25       1
71    0.380       0     0      0      0       1
72    0.315       0     0      0      0       1
73    0.270       0     0      0      0       1
74    0.244       0     0      0      0       1
75    0.244       0     0      0      0       1
76    0.270       0     0      0      0       1
77    0.315       0     0      0      0       1
78    0.315       0     0      0      0       1
79    0.346       0     0      0      0       1
80    0.310       0     0      0      0       1
81    0.329       0     0      0      0       1
82    0.310       0     0      0      0       1
83    0.240       0     0      0      0       1
84    0.290       0     0      0      0       1
85    0.210       0     0      0      0       1
86    0.240       0     0      0      0       1
87    0.361       0     0      0      0       1
88    0.359       0     0      0      0       1
89    685.        2    16     32     48    5420
90    0.625       1     1      1      2       5
91    11.9        7    15     22     30      64
92    8.24        4    10     13     20      43
93    0.417       1     1      1      1       2
94    9.19        9    15     20     27      56
95    5.29        2     5      7     11      31
96    0.650       1     1      1      2       4
97    16.4       10    19     23     34     103
98    3.96        3     5      6      8      27
99    0.426       1     1      1      1       2
100   8.33        8    15     20     25      48
101   3.36        3     4      5      7      19
102   0.465       1     1      1      1       3
103   19.1       15    20     26     38     100
104   3.09        2     4      6      7      15
105   0.373       1     1      1      1       2
106   11.4        9    18     23     29      62
107   3.45        2     4      5      7      18
108   0.346       1     1      1      1       2
109   23.9       10    17     21     28     214
110   3.68        2     4      5      8      25
111   0.385       1     1      1      1       2
112   12.9       12    19     26     34      71
113   3.05        2     4      5      8      21
114   0.417       1     1      1      1       2
115   9.55        9    16     22     27      56
116   3.20        2     4      5      7      19
117   0.434       1     1      1      1       2
118   8.59       10    15     17     23      47
119   8.44        2     4      5      7      67
120   0.360       1     1      1      1       2
121   7.88       10    15     20     25      57
122   4.15        2     4      5      8      27
123   0.514       1     1      1      1       4
124   12.9       11    17     21     31      69
125   3.12        2     4      6      7      18
126   0.417       1     1      1      1       2
127   7.71        6    11     15     18      59
128   96.0        2     4      5      7     826
129   0.396       1     1      1      1       2
130   15.5        8    13     17     21     137
```

```
131    8.60     2     4      5      7      72
132   10.8      1     1      1      1      93
133    6.99     6    12.8   16     20.2    40
134   18.3      2     4      5      7     159
135    0.417    1     1      1      1       2
136    6.74     9    13     17     22      36
137    2.82     2     4      5      7      14
138    0.407    1     1      1      1       2
139    5.34     7    12     15     18      30
140    3.05     2     4      5      7      20
141    0.521    1     1      1      1       4
142   10.7      8    14     19     24      63
143    3.56     3     4      5      7      20
144    3.65     1     1      1      1      32
145   17.2     12    16.8   21.5   28.2   144
146    2.67     1     3      5      7      13
147    0.449    1     1      1      2       2
148    9.75    11    16     21     29      65
149    2.75     2     4      5      7      17
150   32.4     26    56     72     99     166
151  156.     361   578    675    774    1117
152    0       62    62     62     62      62
153    0       62    62     62     62      62
154    0.385    0     1      1      1       1
155    0.396    0     1      1      1       1
156    0.456    0     0      1      1       1
157    0.296    0     1      1      1       1
158    0.396    0     1      1      1       1
159    0.373    0     1      1      1       1
160    0.296    0     1      1      1       1
161    0.434    0     1      1      1       1
162    0.277    0     1      1      1       1
163    0.315    0     1      1      1       1
164    0.331    0     1      1      1       1
165    0.434    0     1      1      1       1
166    0.229    0     1      1      1       1
167    0.296    0     1      1      1       1
168    0.296    0     1      1      1       1
169    0.229    0     1      1      1       1
170    0.200    0     1      1      1       1
171    0.296    0     1      1      1       1
172    0.396    0     1      1      1       1
173    0.360    0     1      1      1       1
174    2.45    10    16     18     19      20
175  142.     220   360.   432    510.    892
```

pilot.jpg

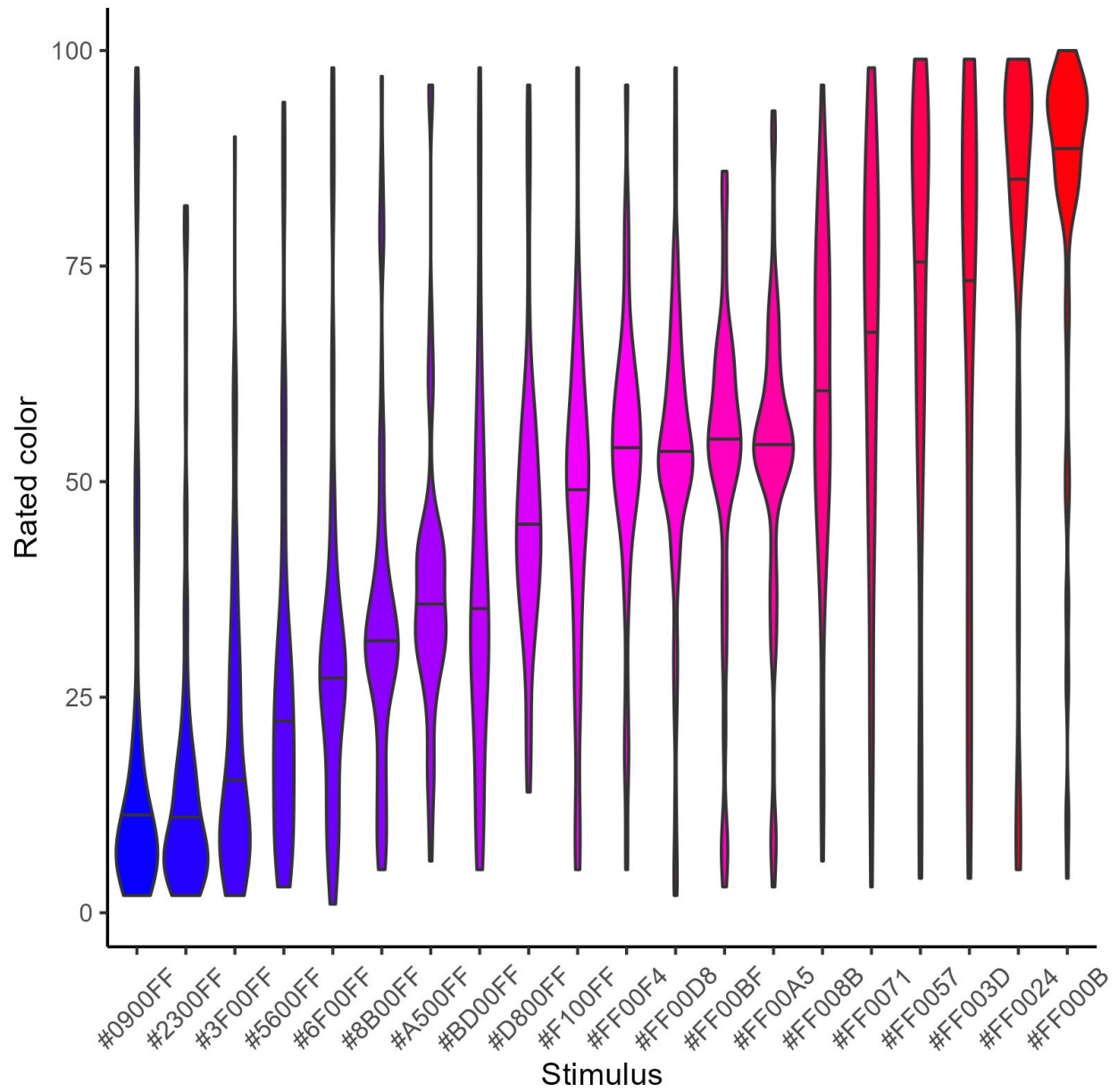Comment: Figure 2 in the manuscript.
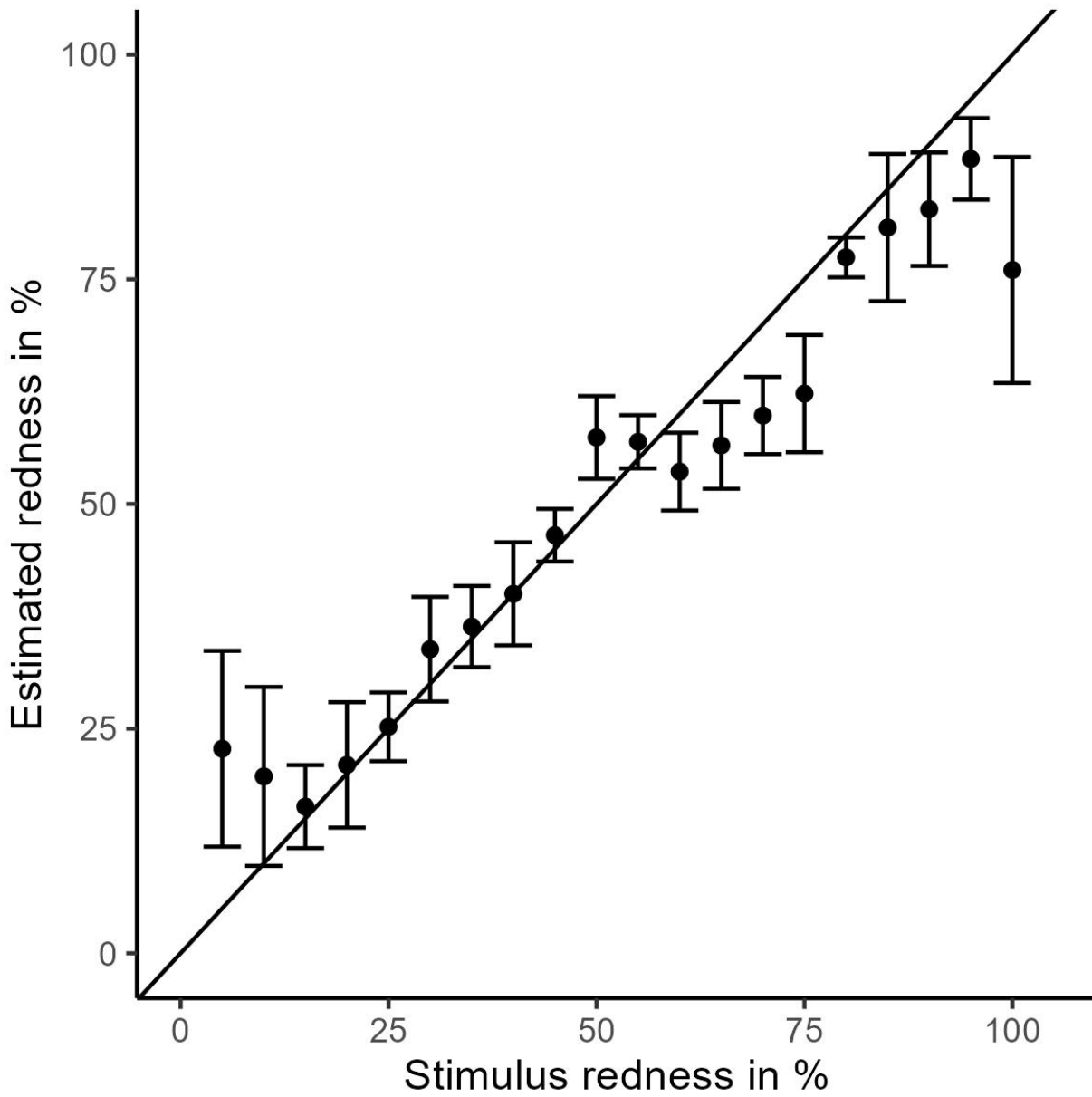
colors_scatterplot.jpg
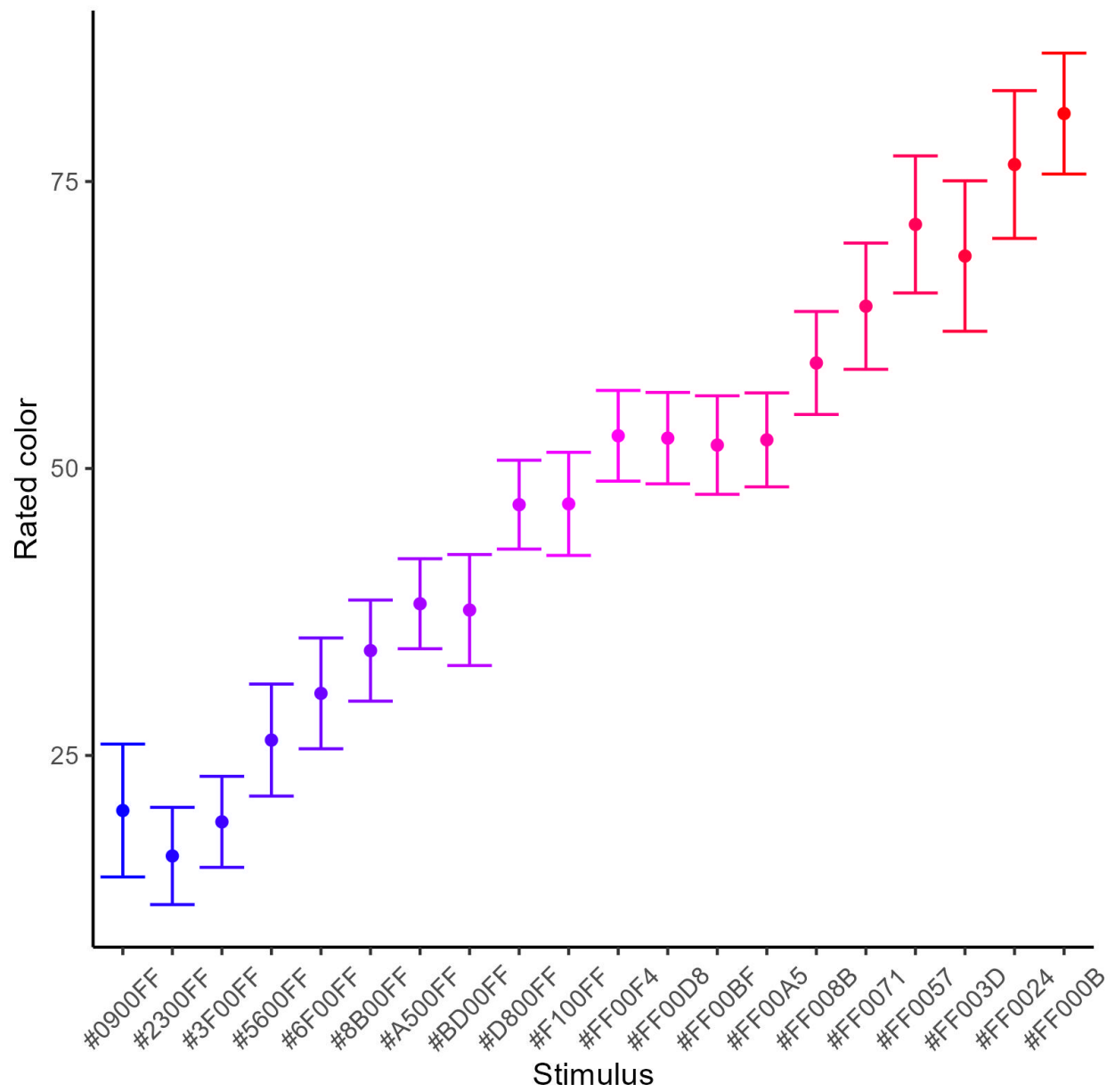
Comment: Figure 3 in the manuscript.
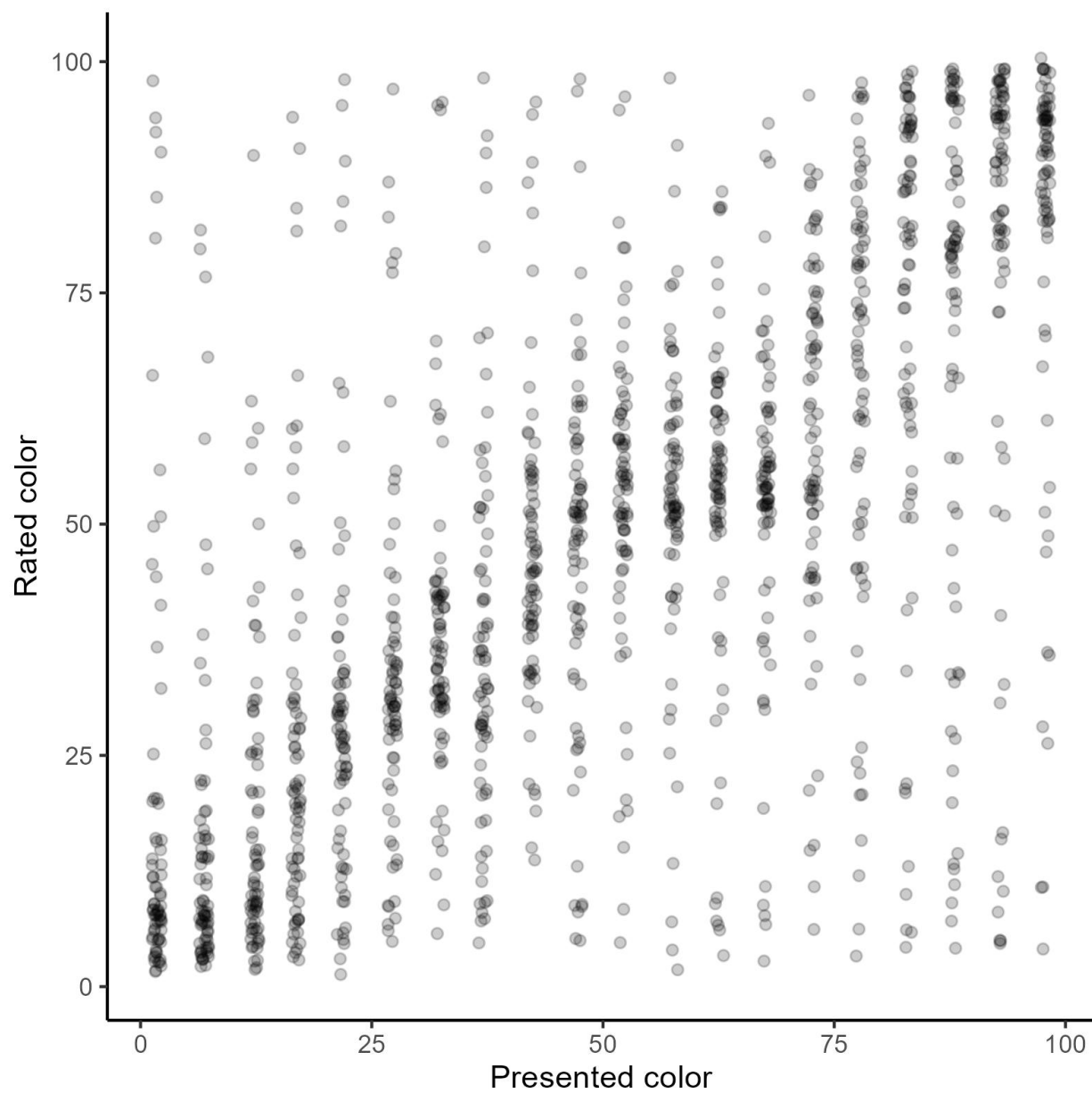
colors_violinplot.jpg

Comment: Figure 5 in the manuscript.

colors_means.jpg

Comment: Figure 4 in the manuscript.

Acknowledgements

Citing this document

Prince Oppong Boakye (2025). CODECHECK Certificate 2025-020. Zenodo. https://doi.org/10.5281/zenodo.15762107

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About this document

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```
sessionInfo()
```

```
## R version 4.5.0 (2025-04-11)
## Platform: aarch64-apple-darwin20
## Running under: macOS 16.0
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRlapack.dylib;  LAPACK v
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## time zone: Europe/Berlin
## tzcode source: internal
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets
## [6] methods   base
##
## other attached packages:
##  [1] readr_2.1.5     tibble_3.3.0     xtable_1.8-4
##  [4] yaml_2.3.10     rprojroot_2.0.4  knitr_1.50
##  [7] codecheck_0.17.0 parsedate_1.3.2  R.cache_0.17.0
## [10] gh_1.5.0
##
## loaded via a namespace (and not attached):
```

```
##  [1] xfun_0.52          rdflib_0.2.9      tzdb_0.5.0
##  [4] vctrs_0.6.5        tools_4.5.0       generics_0.1.4
##  [7] curl_6.4.0         parallel_4.5.0    pkgconfig_2.0.3
## [10] pdftools_3.5.0     R.oo_1.27.1       skimr_2.1.5
## [13] redland_1.0.17-18  lifecycle_1.0.4  git2r_0.36.2
## [16] compiler_4.5.0     atom4R_0.3-3      stringr_1.5.1
## [19] repr_1.1.7         keyring_1.4.1     htmltools_0.5.8.1
## [22] pillar_1.10.2      crayon_1.5.3      whisker_0.4.1
## [25] tidyr_1.3.1        R.utils_2.13.0    cachem_1.1.0
## [28] zen4R_0.10.3       tidyselect_1.2.1  zip_2.3.3
## [31] digest_0.6.37      stringi_1.8.7     dplyr_1.1.4
## [34] purrr_1.0.4        fastmap_1.2.0     cli_3.6.5
## [37] magrittr_2.0.3     base64enc_0.1-3   utf8_1.2.6
## [40] XML_3.99-0.18      crul_1.5.0        osfr_0.2.9
## [43] withr_3.0.2        bit64_4.6.0-1     roxygen2_7.3.2
## [46] rmarkdown_2.29     httr_1.4.7        bit_4.6.0
## [49] qpdf_1.3.5         askpass_1.2.1     R.methodsS3_1.8.2
## [52] hms_1.1.3          memoise_2.0.1     evaluate_1.0.4
## [55] rlang_1.1.6        Rcpp_1.0.14       glue_1.8.0
## [58] httpcode_0.3.0     xml2_1.3.8        fauxpas_0.5.2
## [61] rorcid_0.7.0       rstudioapi_0.17.1 vroom_1.6.5
## [64] jsonlite_2.0.0     plyr_1.8.9        R6_2.6.1
## [67] fs_1.6.6
```